MNES IN THE DIGITAL ECONOMY?

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Abstract
Technological advances are changing many aspects of business activity and in particular the meaning of distance and geography. Such changes are likely to have profound impact on firms whose activities take place over distance, namely MNEs. Using the motivations for FDI identified in the literature as a theoretical framework, this study examines the motivations of firms producing and selling products that can be transferred electronically in real time and at little or no cost, to establish operations outside their home countries. The paper advances a set of hypotheses regarding the likely motivations for foreign activity under such circumstances and provides some statistical testing for their prevalence in US inward and outward FDI. The findings suggest that the investment motivations of firms operating in the digital economy differ from those of firms in the traditional world. The most important motivations for FDI in the digital economy appear to be efficiency and the quest for intangible assets, especially those embedded in human capital, while market seeking and the search for low cost export platforms appear to be the dominant motivations for FDI in the traditional economy.

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The emergence of a digital economy[1], which is based entirely in cyberspace, is changing many aspects of business activity. Notable among these are the obscuring of the material aspects of firms' behaviour and the subsequent changes in the meaning of distance and geography. The digital economy in unconstrained by physical distance, bringing about a virtualization of economic activity, which could potentially reshape the geographies of markets and the organization of business activities (Brynjolfsson and Kahin 1999, Sampler 1998, Evans and Wurster 2000, Yoffie and Cusumano 1999).

Such changes are likely to have profound impact on firms whose activities take place over distance, namely MNEs. Distance – geographic, political, and cultural – has been a fundamental challenge facing MNEs, one that has shaped how they are organised and managed. By dramatically reducing some of the costs of transaction and coordination over distance, digital technology may free MNEs from the geographic confines and costs of establishing physical presence in foreign countries, and may require a reconsideration of these patterns of organization. Products of the digital economy can be transferred electronically in real time at little or no cost, reducing, if not eliminating, at least some of the reasons for investment overseas. Many of the benefits of international activity, such as access to markets, resources and customers, may not necessarily require local presence in foreign markets and can be captured remotely via exports (Dunning and Wymbs 2001, Zaheer and Manrakhan 2001).

Yet, many of the leading companies in this area, companies who sell nothing physical, are investing overseas, and some of them are establishing a significant global presence. For example, Yahoo! operates portals in 23 foreign markets (Business Week 2001); Amazon.com, eBay, AOL have all declared that at the top of their agenda is international expansion and significantly increasing their overseas earnings (Business Week 2000a, Financial Times 2001). Although many firms operating in cyberspace are 'born global' (an internet firm 'enters' foreign markets by virtue of launching a website, or posting its services on the Internet), many of them have

chosen to develop foreign operations and to incur costs related to incorporating local content, culture and demand preferences into their product offering (Kotha et al 2001).

The interesting question is why such firms see a need to invest in foreign activities and whether their motivations differ in this regard from firms in the traditional economy. This study is designed to address, theoretically and empirically, this question. It seeks to examine the motivation of firms producing and selling digital products, whose input and output can be transferred entirely electronically, to establish physical presence outside their home countries.

Examining whether the motivations for foreign investment of firms in the digital economy differ from those of firms operating in the traditional world, and identifying the critical drivers of FDI in both these cases, has important implications for theory and practice. If MNEs operating in different industries invest overseas for different reasons, many characteristics of their subsequent behaviour are likely to differ. This requires different responses – from FDI theorists, firms and policy makers.

The drivers of international activity are a critical factor determining the nature of the subsequent activity. Gaining a better understanding of the various motivations behind investment activities is thus of considerable importance for the understanding of many aspects of MNE's behaviour. There is also a need to deepen the understanding of the variation across industries and activities in terms of investment motivation, and how they are related to the changing nature of technology. In spite of the apparent importance of these issues, extant research has paid only limited attention to them, leaving a gap in our knowledge that this study seeks to fill.

For firms, a better understanding of the rationale for investment, of their own as well as their competitors, has an important strategic implication. Different investment motivations require different

strategic responses. What is adequate for investment driven by the search for proximity to customers and markets might be inappropriate when the intention is to get access to sources of knowledge and learning. Furthermore, technological and market entry strategies were maintained to be highly interrelated and different technologies require different strategic responses (Cheristensen et al 1998). A better understanding of how technological changes and digitisation could change the dominant motivations for investments in their industries, and the strategic challenges associated with such changes, might assist MNEs in deciding how and where to configure their global activities.

A better understanding of MNE's investment motivations would also benefit policy makers seeking to influence both the magnitude of the investment and its implications for the home and host economies. Effective policies towards MNEs require knowledge and understanding of the drivers of their investments, since investments driven by different motivations require different policy responses (Nachum 1999). For instance, many countries have been trying to attract investment in high technology sectors, but with the reduction in the costs of coordination inherent in the digital economy, there is a possibility of both increased dispersion of these activities, and increased concentration in specific locations where certain advanced factor conditions are most favourable (Zaheer and Manrakhan 2001). In such an environment, an explicit reference to the variation among foreign investors in terms of their motivations and subsequent strategic behaviour, would help policy makers propose policies which are better targeted to specific investments.

In the sections that follow, we first generate hypotheses regarding the likely impact of the investment motivations identified in the literature (Dunning 1993) on the establishment of operations overseas in the digital economy, compared with the traditional economy. In generating the hypotheses we bridge a gap between two bodies of theories that have developed largely in separation. That is, we combine advances in international business and management theory with recent developments in theories of digital markets and the

implications of digital technology for competition and strategy (e.g., Christensen et al 1998, Bakos 1998, Brynjolfsson and Kahin 1999). We test the hypotheses in the following section using US inward and outward foreign direct investment (FDI) data applying more rigorous techniques than have previously been employed to examine which factors motivate firms in the digital economy to invest overseas. Foreign activities in the traditional economy are used as the yardstick for comparison, and enable us to highlight those motivations that are specific to the digital economy. We empirically distinguish between the digital and traditional economies based on the intensity of investment in information and communication technologies (ICT) across industries. The paper concludes by summarising the main findings, drawing their implications for the theory of international business, and suggesting directions in which future research may build on this study to further incorporate the implications of technological advances in FDI theory.

Motivations for FDI in The Digital Economy: Theory and Hypotheses

FDI theorists have long recognised that different motivations stand behind the investment decisions of firms, and have subsequently identified the major motivations driving foreign activity. Dunning (1993) classified the various motivations under five major categories: market seeking, resource seeking, efficiency seeking export seeking, and strategic asset seeking. Other researchers have acknowledged that while these motivations are essentially all driven by the search by firms to exploit their firm-specific advantages in foreign countries, under certain circumstances firms also invest due to pressure of the external environment. Notable among these is competitive pressure by their major competitors within an industry (Knickerbocker 1973, Flowers 1976, Graham 1998). Our theoretical framework is based on a combination of these two sets of advantages. We thus conceptualise the pool of factors driving international expansion as consisting of

both firm-specific and industrial characteristics (Govindarajan and Gupta 2001).

These traditional conceptualisations of investment motivations were made with reference to firms producing and selling physical products, in a world in which the possession of tangible assets was a major source of value creation, and where geographic distance and transportation costs were critical drivers of international expansion. Hence, they focus on the need to get access to physical assets and to markets, and to cut costs, as the major drivers of foreign expansion.

A number of characteristics of the digital economy are creating new ways of value creation across distance and may change fundamentally the drivers of cross border activities. Digital technology reduces dramatically the costs of transaction and coordination over distance and thus opens up a range of new possibilities for interaction over distance: both between sub-units of the same MNE, and between MNEs and the market (Roche and Blaine 2000, Brynjolfsson and Kahin 1999, Bakos 1998). By enabling remote access to resources, employees and customers, digital technology is eliminating the importance of physical location and weakens the link that has traditionally been assumed to exist between physical location and value creation (e.g., Dunning 1993). This dissociation of physical location from value creation could affect many of the traditional reasons for undertaking FDI, such as access to immobile resources or cost minimisation (Zaheer and Manrakhan 2001). Digital technology may also introduce new ways by which firms can create and capture value across borders, such as increasing specialisation and capitalising on the advantages of different locations, or introducing new ways of interaction over distance with suppliers and customers (Nachum, Forthcoming, Zaheer and Manrakhan 2001).

Furthermore, digital products and markets also differ from the traditional ones in some fundamental ways that may change the nature of competitive advantages and the rationale for foreign investments. The presence of network effects, which implies that the value of a

product for customers increases with the number of users (Katz and Shapiro 1994, Garud and Kumaraswamy 1993), combined with high switching costs, causing consumers to get locked-in to some historical, legacy system or product (Arthur 1994, Shapiro and Varian 1999), create a different market structure and competitive dynamic than those of the traditional economy. As a result, there is an inherent tendency for a single technology standard to emerge (Arthur 1994, Schilling 2002), often leading to monopolistic market structure (Kats and Shapiro 1994, Bakos 1998). By freeing firms from some of the confines of geography, digital technology provides them the means to reach larger fractions of the market, and often results in an oligopolistic structure that characterises not only domestic markets but the international one as well.

These attributes of the digital economy may erode the need for investment for the reasons traditionally conceptualised, and may create different reasons for international activity. In what follows we hypothesise the extent to which the major motivations identified in the literature are likely to affect the extent of FDI by firms operating in the digital world, in comparison with their likely effect on firms in the traditional economy.

Market seeking.

Market seeking investment is undertaken in order to serve particular markets by local production and distribution, rather than by exporting from the home country or from a third country. Several major reasons are recognised in the literature as driving this type of investment. First, the imposition by host governments of a variety of import barriers on foreign-made goods and services, that raise the costs of servicing a particular market via exports. Although governments increasingly attempt to regulate business activity in the digital industries, at least at this stage, they are not subject to trade restrictions (Kobrin 1998), so this factor should have no impact on international activity in them.

Second, the reduction of transaction costs, primarily those arising from transportation. Such an impetus applies to products that are costly to transport. The negligible cost of transfer over distance of digital products excludes the need for foreign local presence for this reason.

Third, proximity to actual and potential customers in order to be aware of and better able to meet their specific tastes and needs. In many cases, without familiarizing themselves with local language, business customs, legal requirements and marketing procedures, foreign firms might find themselves at a disadvantage vis-à-vis local firms. Digital technology appears to eliminate the need for local presence for this reason by providing MNEs with different ways of developing customer knowledge, which do not require local presence. For example, Dot.com firms are using the information gathered on their web sites to gain better knowledge of their customers than perhaps even geographic proximity may provide (Zaheer and Manrakhan 2001). Exploiting the technologies of data mining and analysis, MNEs operating in the digital world are able to understand patterns of behaviour and customer preferences without being locally present. They might be able to affect customers' buying behaviour in foreign countries from their home servers, eliminating the need for local presence and familiarity with the local market. The mere concept of the location of production and distribution is illusive in this context.

Digital technology not only eliminates the need for local presence, it also increases the advantages of centralised service provision. Serving customers from a central location, or a set of global centers, has some advantages that a locally based site will not be able to provide. It enables MNEs to offer round-the-clock service, taking advantage of different time zones in different parts of the world (Roche and Blaine 2000, Zaheer 2000).

Not only the technological possibility of accessing consumers remotely eliminates the need for market seeking investment, there are also suggestions that consumer preferences and needs are becoming similar, at least within certain geographic areas. For example, more than a third of people from 47 countries surveyed by Andersen consulting chose Yahoo.com as their most favourite site (Andersen Consulting 2000). Likewise, a survey of respondents from 12 Western European and North American countries found that similar site characteristics affect the online purchasing behaviour of customers within these regions (Lynch and Beck 2001). This suggests that Internet users across the world have similar preferences and that existing differences may not necessarily correspond to national differences. Furthermore, standards of many digital products are increasingly developing on a global, rather than local, basis (Christensen et al 1998, Katz and Shapiro 1994), eliminating the need for local adaptation in order to serve particular customers effectively. Hence:

H1: Market seeking is a weaker motivation for FDI in the digital economy than in the traditional economy.

Resource seeking.

The resource seeking motivation is driven by a need to acquire resources not available in the home countries of the investing firms, or available at a higher cost than could be obtained in other locations. Cost minimisation considerations and the need to secure sources of supply are the major factors driving this investment motivation. A fundamental assumption driving the conceptualisation of the resource seeking motivation has been the immobility of the resources sought. If a resource can be transported over distance at low costs, it might be more economic to import it than to establish foreign operations in order to access it. Hence, this motivation was influential primarily with reference to physical, tangible resources, which are costly to transport.

Such considerations are a lesser imperative for undertaking investment in the digital economy than in the traditional one, and hence we would expect that investment driven by the need to access tangible resources would have limited, if any, impact on FDI in the digital economy.

In the digital world, various kinds of knowledge are replacing physical assets as the most critical resources. Rather than access to physical, tangible resources, firms in the digital world seek access to sources of knowledge and innovation, and to human and intellectual capital[2]. These are accessed far more effectively in geographic proximity. Such knowledge is often embedded in individuals or in teams, and in clusters of firms, which in their close interaction create dynamics of collective learning and innovation. These processes are typically strongly embedded in a particular locality (Scott 1998), making these knowledge resources immobile and not accessible from distance. Improvements in communication technology have not eliminated the need for geographic proximity to access these types of knowledge and expertise (Leamer and Storper 2001). Access to such intellectual capital could be a major rationale for cross border activity. As this type of knowledge play more critical role in the production of digital products, we would expect it to drive the investment activities of digital firms to a greater degree than of their traditional counterparts.

Conceptualised in this way, the resource seeking motivation is close to the strategic asset seeking motivation (Wasson 2002), which is driven by the need of firms to access complementary resources, notably various kinds of knowledge, in order to upgrade their own capabilities. In essence this is a kind of resource seeking, where the resources in questions are intangibles such as non-codified knowledge (this similarity will become most apparent as we develop measures of the various motivations). Hence we modify the traditional classification and group resource seeking of intangible resources and strategic asset seeking together. Formally:

H2a: *Tangible resources*. Resource seeking for tangible resources is a weaker motivation for FDI in the digital economy than in the traditional economy.
H2b: *Intangible resources.* Resource seeking for intangible resources such as knowledge and intellectual capital is a stronger motivation for FDI in the digital economy than in the traditional economy.

Efficiency seeking.
Efficiency seeking investment is driven by the intention to spread value adding activities geographically in order to take advantage of differences in the availability and costs of factor endowments in different countries. The extent of such geographic dispersion is dependent on the balance between the advantages to be gained by spreading value-added activities in various locations and the cost of communication and coordination over distance (including transportation costs).

By eliminating the costs of transactions between sub-units of the same firm, digital technology dramatically increases the amount of specialization of value adding activity that can economically take place in specific locations (Zaheer and Manrakhan 2001, Dunning and Wymbs 2001, Roche and Blaine 2000). It enables MNEs to take advantage of differences in country costs and skills to a greater degree than firms in the traditional, non-digital industries can do. Both inputs and outputs of digital activities can be transferred rapidly and reliably at negligible costs between distant locations, enabling firms to co-ordinate and control effectively their geographically dispersed activities. Affiliates located in different parts of the globe can thus collaborate to produce entire product lines economically (Maznevski and Chudoba 2000).

By spurring the introduction of global technical standards, and by its tendency to merge into one dominant technology worldwide (Katz and Shapiro 1994), digital technology also increases the benefits of centralisation of a single activity in one location and capitalising on

the advantages of many locations at the same time. It thus increases the potential for exploiting scale and scope economies resulting from the concentration of particular economic activity in certain locations. Hence:

H3: Efficiency seeking is a stronger motivation for FDI in the digital economy than in the traditional economy.

Export seeking.

Export seeking investment is undertaken by firms seeking economical bases from which to service export markets as costs rise at home. The main drivers of such investments are an abundant supply of factors of production at low costs than those available at home, favourable trade facilities, and conductive investment climate.

The low cost at which digital products can be transferred over distance eliminates the need to engage in foreign activities for this reason. Formally:

H4: Export seeking is a strong motivation for FDI in the traditional economy but has no impact on FDI in the digital economy.

Competitive strategic motivations (oligopolistic reaction)

In addition to the previous motivations, which were driven essentially by internal strategic considerations, firms often invest overseas for pressures of the external environment. Notable among these are competitive pressures of various kinds i.e., reaction to actions undertaken by competitors, or pro-active action to advance the firm's competitive position via-a-vis its major competitors (Knickerbocker 1973, Flower 1976, Graham 1998). Strategic interdependence of this kind as a factor affecting international expansion implies that the moves of firms are conditional upon the actions of other firms, that is, an initial investment by a leading competitor will induce a cluster of countering investments by other competitors.

Such competitive pressures are likely to influence firms in the digital world more than those operating in the more traditional parts of the

economy for a number of reasons. First, mimetic behaviour of competitors as a cause of international expansion is more likely in environments subject to rapid changes and constant modifications of the rules of the game (Haveman 1993, Martin et al 1998). Firms operating in such environments are more likely to expand into new market as a reaction to moves of their competitors than those operating in a more stable environment. Indeed, the competitive reaction hypothesis as a cause of FDI was formulated with specific reference to highly innovative industries, where rapid technological changes introduce a high degree of uncertainty and risk (Knickerbocker 1973, Flowers 1976). These market attributes are more apparent in the rapidly changing digital world than in the relatively stable and mature traditional one.

Second, the high switching costs and lock-in nature characterizing many digital economy products (Arthur 1994) put a high premium on establishing market position rapidly, before customers get locked-in to other products. The timing of entry is an important determinant of the likelihood of the technology being adopted as the standard (Christensen et al 1998), and has been shown to be critical in both domestic (Schilling 2002) and international (Nachum, forthcoming) contexts. Under such circumstances, positioning vis-à-vis competitors is critical. Competitors' moves have to be incorporated in a firm's own strategic expansion strategies.

These theoretical arguments are consistent with casual observations of the international expansion of firms operating in digital industries. For example, the two large US Internet portal suppliers, Yahoo and Lycos, were following each other around the globe (Dunning and Wymbs 2001). Likewise, major US cyberspace firms have expanded overseas at the same time and invested in the same regions and countries (Business Week 2000). Formally:

H5a: Competitive pressure is a stronger motivation for FDI in the digital economy than in the traditional economy.

It is likely that a non-linear relationship better describes the effect of competitive pressure on firms' international expansion (Martin et al 1998, Haveman 1993). Up to a point, the international moves of competitors indicate market attractiveness, but there is a constraint on the number of firms that can expect to imitate industry pioneers successfully. As the number of competitors that invest in a foreign country increases, the level of competition among these firms increases, causing the costs of international entry to rise and the gain from operating in a foreign location to decline (Mitchell, Shaver and Young 1994). A number of empirical studies have found that foreign entry by domestic competitors conform to these theoretical arguments, with the number of new entrants first increasing and then decreasing as more domestic competitors expand (Yo and Ito 1988, Martin et al 1998).

We expect that not only the initial relationships between competitive pressure and FDI would be stronger in the digital than in the non-digital economies, but also the association with the quadratic term would be stronger. The nature of many digital markets is such that they have a natural tendency for highly concentrated industrial structure (Bakos 1998). Under such circumstances, both the need to follow competitors' moves and the crowding effect that acts to decrease the attractiveness of markets as the number of competitors increases, are likely to be stronger. Formally:

H5b: Inverted U relationships between competitive pressure and FDI would have stronger association with digital than non-digital economies.

Data and Methods

To test the hypotheses, we used data on US inward and outward FDI, collected by the *Bureau of Economic Analysis* for the period 1990 to 1998. We examined data from this period, as the emergence of a digital economy is a relatively recent phenomenon.

Selection of industries

The selection of specific industries for the analysis, that is, the identification of digital industries, and the distinction between them and non-digital industries, is a difficult task since the digital and physical worlds are not neatly split. Rather, both exist in many industries and products, albeit to different degrees. Common industrial classifications further complicate this task as they often group physical products with digital products. For example, the category 'computer and office equipment' includes, not only computers and peripherals, but also type writers, cash registers, and simple accounting machines. Likewise, the 'electronic components' category also includes products belonging to the traditional world. However, for reasons of data availability, we have had to use an industry-based classification to distinguish between the digital and non-digital economies, with the caveat that our results must be interpreted with this reservation in mind.

We classified industries as digital or non-digital according to the digital content of their value-added activities, proxied by the intensity of Investment in Communication and Technology (ICT) in that industry. The use of this criterion has some support in extant research. For instance, it was regarded as the most appropriate criterion to draw a dividing line between the digital and non-digital parts of the economy by the OECD (OECD 2000). ICT intensity is measured as the cumulated volume of investment in ICT between 1990-1999. This approach to capitalisation of stock was used previously by Loveman (1994) and by Brynjolfsson and Hitt (1995), and is maintained to provide an accurate picture of current position since it is less sensitive to the bias of the depreciation of the value of equipment. Because the results could potentially be sensitive to the assumed life of the ICT equipment, we conducted the analysis while varying the assumption from 3 to 10 years, and found no significant differences in the final ranking of industries. To adjust for size, we expressed this measure as share of total accumulated investment over the same period.

As the analysis focuses on US FDI, we rely on US data (collected by the *Bureau of Economic Analysis)* for the classification of the industries. ICT investment is defined by the source of the data to include: mainframe and personal computers, storage devices, integrated systems, software, other office equipment, communication equipment, photocopy and related equipment, and instruments. After excluding industries in which there is no FDI activity (e.g., personal services, federal reserve banks, housing, agriculture), we selected the 15 industries with the highest ratios of ICT investment to total investment as representative of 'digital industries'. This classification of digital industries is consistent with the one proposed by the OECD (OECD 2000). The 15 industries with the lowest such values were selected to represent the 'non-digital industries'. Appendix A lists the industries included in these two groups

Measures of investment motivations – operation of the constructs

H1: Market seeking: cost of sales of affiliates as a share of total costs is used as an indication of the extent of marketing and sales efforts directed to the local market. Another possible operation, which directly measures the magnitude of activity directed towards the local market, is local sales of affiliates. Such data are not available for inward FDI and we select the cost-based operation to increase comparability between the inward and outward analyses. In the outward data, these two measures were highly correlated (0.91, $p<0.01$), enabling us to see the cost-based measure as a reasonable operation of market seeking motivation.

H2: Resource seeking: the hypotheses were formulated with reference to two different types of resources: codified, tangible resources and tacit, intangible resources. These are operationalised as follows:
Tangible resources - local purchases by affiliates as a share of total costs. High shares of local purchases imply heavy reliance on the host economy for the acquisition of various resources.

Intangible resources are operationalised by two measures:
1. the level of compensation per employee. High pay levels indicate reliance on highly skilled employees. Wages paid by foreign affiliates have often been used as indications of skilled labour employed in foreign countries (e.g., Lall 1980, Clegg 1987).
2. R&D intensity, measured by R&D investment as share of sales. The R&D intensity of affiliates is often used as an operation of a MNE's search for sources of knowledge in foreign countries (e.g., Kummerle 1999, Kogut and Chang 1991).

H3: Efficiency seeking: The magnitude of intra-firm transactions is used to operationalise the efficiency seeking motivation, as it indicates the intensity of internal linkages within the MNE (Kobrin 1991). Large transfers indicate joint production by various parts of the MNEs, which is spread geographically. We use a variation of Kobrin's index of integration (Kobrin 1991), as follows:

$$\frac{\text{Sales affiliates to parents + sales affiliates to other affiliated bodies + sales parents to affiliates}}{\text{Total sales of affiliates}}$$[3]

Intra-firm transaction data are biased on several grounds (see Kobrin 1991 for a discussion), the most important of which is transfer pricing, a caveat that has to be bear in mind when interpreting the findings.

H4: Export seeking:

$$\frac{\text{Total exports by affiliates - (exports to parents + export to other affiliated bodies)}}{\text{Total sales of affiliates}}$$

This is a direct measure of the export propensity of affiliates. It captures only exports of affiliates to unrelated bodies, and is thus distinguished from intra-firm transactions that were used to operationalise the efficiency seeking motivation. The efficiency and export seeking measures are further distinguished by the source of the

data – the Bureau of Economic Analysis. Exports of goods cover physical shipment of goods across the US custom frontier, that is, only transactions between the US and overseas. Sales cover all sales, irrespective of whether the goods were actually shipped from the US, so these figures also include sales of goods purchased from third parties abroad.

H5: Competitive strategic motivation (Oligopolistic reaction)
The number of foreign entrants in an industry is usually used as an operation measure of competitive pressure to expand overseas (e.g., Martin et al 1998, Haveman 1993, Yu and Ito 1988, Flowers 1976). Following these studies, we use the number of new affiliates entering foreign markets each year, expressed as share of the total number of affiliates in an industry. The higher the value, that is, the more rapid is the growth of foreign activity, the greater the need of an individual MNE to follow the trend in the industry and invest. This measure is expressed in its both linear and quadratic forms, to account for the hypothesised non-linear impact of the number of previous entrants on MNEs' international expansion.

The selection of the relevant reference population of competitors is critical here. Ideally, it should consist of all other firms of the same home country competing in the same market (Martin et al 1998). The definition of 'same' market is difficult to operationalise and leaves room for ambiguity. Our reference to 4 digits SIC is consistent with previous studies (e.g., Flowers 1976), and was found to be a meaningful measure of 'relevant' competitors.

Data availability introduces differences in the measurement of this motivation between inward and outward FDI. For outward FDI we use the growth in the number of US affiliates overseas, and we thus operationalise the competitive pressure of home country competitors. An equivalent measure for inward FDI, that is, the growth in number of different home country firms entering foreign markets, is not easily available and we use instead the growth in the number of all foreign

affiliates entering the US. In this case we actually measure global industry pressure.

Model

In order to test the hypotheses, we constructed a model connecting FDI as the explanatory variable with the set of investment motivations discussed above. The model is of the general form:

$$FDI_{it} = f(\alpha; \beta*M_{it}; \beta*X_{it}) + E_{it}$$

Where:

FDI - total capital flow (capital flow, inter-company loans and reinvested earnings).

M - a vector of FDI motivations

X - a vector of control variables, including firm- and industry-attributes.

i - industries, i=1….n (n=15)

t- time, t=1….m (m=9)

E - random error term.

β's - regression coefficients estimated for various covariates

α - the estimated regression coefficient associated with the constant term

The model is estimated based on inward and outward FDI data for the US, as it is the only country that publishes the data needed for this analysis. We use the totals of the inward and outward data and make no distinction by the destination or source country of investment.

For reasons of data availability, majority-owned (i.e., more than 50%) non-bank affiliates of non-bank parents data is used for the analysis of outward FDI; non-bank affiliates data (that is, more than 10% foreign ownership) is used for the inward FDI analysis. Although this difference implies that the results are not fully comparable, the differences between the two categories are very small. For example, in the 1997 Benchmark Survey (the latest available), there were 2,690 parents of all non-bank foreign affiliates and 2,549 parents of majority-owned non-bank foreign affiliates. The analysis is conducted for the years 1990-1998. 1998 is the latest year for which data is

available. Significant FDI activity in many of the digital industries had only started in the late 1980s and early 1990s, and therefore we start the analysis in this period[4]. The combined number of observations (i.e., the final N) is 135 for inward and outward FDI, that is 15 industries observed over 9 years.

A number of firm- and industry-characteristics are added to the model as control variables. We introduce three firm attributes, to take account of the major characteristics of firms identified in the FDI literature as affecting their propensity to engage in FDI (Dunning 1993). The first is the possession of intangible assets – the single most important factor influencing the propensity of firms to engage in foreign activities and explaining variation in the intensity of such activity among them (Hymer 1960/1976, Caves 1996). Profitability is often used as a proxy for the possession of such advantages (Shaver and Flyer 2000), and is used here. We also control for firms' size and growth, as previous research provides strong support for their influence on firms' international operation. Larger firms are more likely to expand internationally (Horst 1972, Grubaugh 1987). We measure size and growth by the number of employees in an industry and its annual growth. Employment level is often used as a measure of MNE's size (e.g., Martin et al 1998).

At the level of industry, we control for industrial variation in the propensity for undertaking FDI, measured by FDI stocks. This variation indicates the extent to which FDI is considered as an important strategic alternative and growth route, and it may also have a direct and indirect impact on the preference for various motivations. We also control for industrial variation in market structure, because it affects the competitive pressure to expand overseas (Knickerbocker 1973, Flowers 1976). The number of firms in an industry, an indicator of overall industry structure, is commonly used to operationalise the prevalence of oligopolistic reaction as a driver of FDI (e.g., Yu and Ito 1988). We use the number of parent firms in an industry, and include also a quadratic term of this measure to account for a non-linear impact of the number of competitors on investment behaviour.

Such data are not available for inward FDI, and we control for the possible impact of market structure only in the outward analysis.

Shapiro-Wilk test reveals that stocks and size (number of employees) are not normally distributed. Hence we took the natural logarithm of these data.

Table 1 presents the explanatory variables included in the inward and outward analyses, their operation measures, descriptive statistics and correlation coefficients. Most correlation coefficients are low, implying that for the most part there are no problems of correlation between the independent variables. The exceptions are the coefficients between variables and their quadratic terms. These tend to be high, but raise no statistical concern. Other high coefficients are those between variables with common denominators. Three of the independent variables are constructed as share of sales, to control for the overall magnitude of activity. Their correlation coefficients are high (particularly in the outward data) and exceed the standard cut off point of .5. To correct for this, we introduce these variables gradually, generate their residuals and use these in the following analyses.

Independent sample t-tests suggested that the missing value patterns are not random, and they were estimated from available observations, by testing a model based on all observations for which there were no missing values, and using it to estimate the missing values. This analysis was conducted separately for the inward and outward samples. This approach is based on the assumption that the missing values have similar distribution to the non-missing values, an assumption commonly made when estimating missing values (e.g., Schafer and Olsen 1998).

The nature of the dataset raises a concern regarding the possibility of unobserved heterogeneity, arising due to differences among industries in omitted variables that may affect both independent and dependent variables (as a common cause). For example, certain developments in foreign markets may affect both the total investment in this market, as

well as the preference for certain motivations for investment. To eliminate any spurious effects due to unobserved differences among industries, we add fixed industry effects by entering dummy variables for each industry (minus one). The estimated coefficients are interpreted as the amount by which industry deviation on the dependent variable shifts in response to a preceding change in the deviation of the independent variable. None of these industry dummies were significant in any of the analyses that follow. We do not correct for endogeniety (by the normal fix of introducing lagged variables) since we do not have causal hypotheses.

The model was estimated by means of panel data analysis (Hsiao 1999), using STATA software. Panel data techniques enable the introduction of different slopes to test for industry and time effects. The hypothesis that the time effects are the same was rejected for all models at the 0.1, 0.01, 0.1 and 0.001 for (F=8.75; F=9.95; F=7.95; F=12.67 for inward digital, inward non-digital, outward digital and outward non-digital FDI respectively). The hypothesis that the industry effects are the same was not rejected at the 0.01 level (F=3.97) for inward non digital FDI and at the 0.1 for outward non digital FDI (F=2.33). It was rejected for inward digital and outward digital FDI at the 0.1 level (F=13.12, F=11.10 for inward digital and outward digital FDI respectively). The models were estimated accordingly with time effects, industry effects or both.

The time and industry effects can be introduced as fixed (that is, different intercepts estimated for each pool member) or random (whereby intercepts are treated as random variables across pool members). A Hausman test was conducted to test which of these effects would be more suitable. The test was not significant (χ^2) for both the inward and outward industries (F=10.95 and F=12.36 respectively), implying no significant differences between fixed and random effects. The random effect is regarded as more suitable for a balanced panel (Hsiao 1999), like the one analysed here. The results of the White's general test and Breusch-Pagan test did not enable us to exclude the possibility of heteroskedasticity and cross section

correlations (χ^2=5.6e-21 and 0 in the inward data, and χ^2= 2.3e-06 and 1.1e-155 in the outward data for the White's general test and Breusch-Pagan test respectively). Therefore, we used the Generalised Least Square (GLS) analysis, which is a modification of the random effect that is less restrictive on heteroskedasticity and cross-section correlation.

We also conducted a test of stability, using the Chow test, to see whether the parameters are the same in each of the years analysed. The F value of 3.546 enable us to conclude that there are no structural changes in the variables over time (Hsiao 1999).

The hypotheses were tested by estimating two regression equations, for the digital and non-digital samples (table 2), and then testing differences in the explanatory power of individual independent variables between them (table 3). The analytical methodology wherein regression coefficients are compared across two models has been utilised extensively in prior research to compare between two groups of firms or industries (e.g., Dean, Brown and Bamford 1998, Mata and Portugal 2002). In order to provide support for the hypotheses, three criteria have to be met. First, individual coefficients in the regressions have to be significant and follow the expected direction of causality with the dependent variable, to allow one to conclude that this motivation for FDI is in line with theoretical expectations. Second, the differences between the explanatory power of each pair of variables in the two models have to be in the direction predicted in the hypotheses. For example, if a hypothesis predicts that a variable is more important in the digital world than in the non-digital world, t-values in the former model should be greater than t-values in the latter model. Third, individual explanatory variables should possess significant explanatory power in discriminating between the digital and non-digital samples. Difference statistics were introduced by calculating interaction variables (Friedrich 1982), constructed by multiplying each of the explanatory variables by a dummy variable that gets the value 1 for digital industry, 0 otherwise (table 3). A significant sign of the interaction term implies that the

variable in question is a significant discriminator between digital and non-digital industries.

Results and Discussion

Before we discuss the results of the hypotheses tests, it is useful to bear some caveats in mind. For one, changes in patterns of FDI might be slow because of inertia in the rate of organizational change (Greve 1999). It may be a slower process than the process of digitization of the economy and thus it might be too early to see changes in the motivation of firms to invest overseas, reflected in their FDI behaviour. Another caveat is that the different motivations tested are not mutually exclusive, in the sense that a single investment might be driven by more than one motivation and it might be difficult to distinguish between them. For example, resource seeking motivation might exist in combination with export platform investment. Investment motivations may also change over time in a way that cannot be detected by our data. For example, what started as an export oriented investment may develop over time to market seeking, as firms become more familiar with the host environment and recognise opportunities to serve the domestic market.

With these reservations in mind, we turn to the discussion of the results. *Hypothesis 1, that market seeking will be a stronger explanation for FDI in the non-digital rather than in the digital world, received strong support in both the inward and outward analyses.* The market seeking motivation has the expected strong positive relationship to both inward and outward FDI in the non-digital economy, suggesting that the higher the expense incurred in local marketing efforts, the higher the amount of foreign activity. The analyses in table 3 show that the differences between the digital and non-digital industries are significant in both the inward and outward analyses. These findings confirm the theoretical arguments regarding the diminishing need for physical presence in order to serve markets effectively in the digital economy.

Only partial support is found for Hypothesis 2a, that the resource-seeking motivation for tangible resources would be weaker in the digital than in the non-digital economy. As hypothesised, this driver is a positive, significant motivation for FDI in the non-digital industries, for both inward and outward FDI. For the digital industries, the results are highly significant but negative, implying that the lesser the dependence on tangible assets in foreign countries, the greater the tendency for FDI. However, these results become insignificant with the addition of the control variables. This suggests that MNEs in the digital economy are less motivated by the search for tangible resources that can be purchased in the home country or elsewhere than those operating in non-digital industries. However, the test of difference in table 3 shows that these differences are not statistically significant. The highly significant sign for the digital industries in all the analyses suggests that for these industries access to tangible factors of production continues to be a critical driver of FDI, and that technology has not affected the search for tangible assets as drivers of investment motivations for firms in these industries.

Hypothesis 2b, that intangible resource seeking would be a stronger motivation for firms in the digital than in the non-digital economy, receive some support in the case of intangible assets embedded in human capital, in the outward analysis but not in the inward analysis. In the latter, the search for intangible resources appears to drive FDI in both the digital and non-digital industries (table 2), with no significant differences between them (table 3). These differences between the inward and outward analyses perhaps imply that investment to the US is strongly driven by the search for knowledge resources, and this cuts across all industries, regardless of the nature of their technology. This is a lesser important drive for US investment overseas. R&D investment is only significant in the digital model without the control variables, and become insignificant as the control variables are added (table 2). No significant differences are found between the industries in terms of R&D investment in both the inward and outward analyses (table 3).

This difference in the role played by human capital versus R&D investment is interesting in itself. For one, intellectual capital embedded in human capital is more appropriable by competitors than that embedded in patents developed through the patenting process. The development of human intellectual capital may also require less financial capital than the development of R&D based knowledge, and this could explain the development of people-based intellectual capital in developing countries (e.g. programmers in India), though there is certainly an element of endogeniety there. The difference between the digital and non-digital worlds in the importance of R&D versus human capital as drivers of foreign investment may also reflect the weaker patent protections available internationally in the digital world.

The ease with which both the inputs and outputs of the digital industries cross borders (Kobrin 1998) often implies that many cross border transactions – both within and between firms – go unrecorded. This may explain, at least to some extent, the inability to support this hypothesis.

Hypothesis 3, that efficiency-seeking motivations will drive FDI more strongly in the digital economy, received strong support, in both the inward and outward FDI samples. This reinforces the role played by reduced transportation and coordination costs in the digital economy, which in turn might contribute to the greater international dispersion of economic activities (Zaheer and Manrakhan, 2001).

Hypothesis 4, that the motivation to find low-cost export platforms would be a more significant driver of FDI in the non-digital world, is strongly supported. As expected, export-seeking was positive and statistically significant as an explanation of both inward and outward FDI in the non-digital industries, and is only weakly, if at all, related to FDI in the digital world.

Hypothesis 5a and 5b, that competitive pressure would be a stronger driver of FDI in the digital world (in both its linear and quadratic forms) receives no support in both the outward and inward analyses. Both the untransformed measure of the number of affiliates and the quadratic terms have only weak explanatory power, mostly in some of the inward analyses (table 2). Neither of the differences tested in table 3 is significant.

A number of possible explanations for this finding might be proposed. One is that the argument that firms seek to imitate other firms in their international expansion, on which the competitive pressure hypothesis lies, is based on the assumption that firms regard these other firms as competitors, whose actions might be a threat. However, many activities in the digital world are based on open systems, standard-based technologies and network interconnections that break many of the isolating mechanisms between firms in the traditional economy (Garud and Kumaraswamy 1993). Under such circumstances, rather than competing in isolation from one another, firms are engaged in various types of mutually beneficial cooperation and collaboration agreements (Katz and Shapiro 1994). Many of these collaborations are formed precisely in order to avoid direct competition with other firms. The non-significance of competitive pressure as an investment motivation in the digital industries may imply a different notion of competition in these industries.

The differences between the inward and outward analyses are most telling. It will be recalled that, due to data constrains, the operations of this investment motivation are not identical in the two analyses. The operation in the outward analysis is a direct measure of the oligopolistic reaction motivation (Knickerbocker 1973), as traditionally conceptualised, that is, as rooted in the structure of home markets, and as the product of domestic industry rivalry. The operation of the inward analysis is the number of all foreign affiliates entering the US, and might be interpreted as a pressure of global competition. The non-significance of this measure in the outward analyses and its somewhat greater significance in the inward analyses

may thus provide support to the views that the traditional oligopolistic reaction hypothesis is losing its power, as competition is taking place on a global rather than domestic basis, and a firm's most relevant competitors, whose actions its needs to watch and imitate, are not likely to be from its home country.

It might also be that the notion of home-based competition, that undermines the competitive pressure hypothesis, is weakening in the digital world, where geography is arguably playing a less important role than in the traditional world. Firms are increasingly competing globally, not only with those competitors residing in the same territory. The emergence of global standards to many digital industry products acts to enhance the global, rather than domestic, base of competition. This may explain the non-significance of the difference between the digital and non-digital industries.

Throughout the previous discussion we have alluded to the differences between the inward and outward analyses. Given the unique attributes of the US markets, and the distinguishing characteristics of US firms, these results are not surprising. These differences may suggest that investment motivations can only be analysed meaningfully with reference to a specific context. Other things being equal, they would vary by the nationality of the investing firm, and the home and host countries involved. Certain markets are more suitable for achieving certain motives, and firms of particular nationality are more likely to be driven by certain motives.

The inclusion of the control variables has somewhat changed the signs and directions of some motivations. This is intriguing, because investment motivations and firm-specific characteristics have usually been studied in separation. This may suggest a possible need to take explicit account of firm-specific attributes when analysing investment motivations because, other things being equal, certain motivations might be more common among firms with certain characteristics. It might be that the nature of the competitive advantages of firms, whether it lies in technology, organisational practices, etc., would

affect the motivation for undertaking FDI. Firms' past experience in international activity and the length of their foreign activity may also affect investment motivations.

We conduct additional difference test to see whether the differences between the entire models are significant between the digital and non-digital industries. F-tests on the residual sum of squares of the two models found that the null hypothesis that there are no differences between digital and non-digital industries in terms of the motivations for FDI is rejected for both inward and outward FDI (F=1.578; p=.0458; F=0.985; p=.0032 respectively).

Taken together, the findings confirm the underlying argument of this study, namely that the nature of the technology modifies the rationale for FDI, and hence the investment motivations of firms operating in the digital economy differ from those of firms in the traditional world. The most important motivation for FDI in the digital economy appears to be efficiency seeking, taking advantage of the ease with which digital products can be transferred within the MNEs across borders. The quest for intangible assets in the form of highly-paid human capital, is also an important explanation for international activity in the digital economy, reinforcing the value of intangible resources such as intellectual capital in this sphere. In the traditional economy, on the other hand, market seeking and the search for low cost export platforms appear to be the dominant motivations for FDI.

The industries classified in the digital industry category include also some industries that although involving high component of knowledge and information, may not conform to our conceptualisation of digital industries, as industries in which both the inputs and outputs can be transferred electronically. To test for the extent to which the inclusion of such industries affected our conclusions we conducted the entire analyses with a smaller set of digital industries, including: business services, insurance, communication, information services and data processing, motion pictures, printing and publishing, and finance (N=63). The results

continue to hold, at similar significance levels (the stronger significance levels expected were not obtained probably due to the smaller number of observations in these analyses)[5].

Conclusion

This paper sought to examine theoretically and empirically the likely impact of the digital economy on the propensity of firms to engage in cross-border activities. It used as its theoretical framework the motivations for FDI identified in the FDI literature and generated hypotheses regarding their likely influence on the propensity of firms operating in the digital economy to engage in FDI. Estimations of a model connecting inward and outward FDI flows with a set of investment motivations for samples of digital and non-digital industries have illustrated considerable differences in the motivation of firms to invest overseas in these two groups of industries. By changing the meaning of time and space, and the efficiency through which market and non-market activities take place, digital technology is creating different motivations for international activity, and is modifying the main reasons beyond them. The intuitive idea that investment motivations, and the entire rationale for FDI, would differ as the characteristics of the technology change, received strong support by our analyses.

This paper made an important methodological contribution to the study of investment motivations, by introducing a rigorous methodological procedure to test for their influence. With the notable exception of competitive motivation (e.g., Yu and Ito 1988, Martin et al 1998), the impact of investment motivations on actual FDI flows has not been put forward for statistical testing. Existing knowledge is based on surveys of managers' opinions/intentions, and is not linked with actual behaviour (see Lecraw 1993, Ajami and Ricks 1981 for a representative approach). This approach may suffer the shortcomings of self-reporting figures (Podsakoff and Organ 1986), including the bias resulting from differences between declared and actual behaviour (Golden 1992). To our knowledge, this is the first study to develop

objective, statistically robust, measures of investment motivations and to test their relative influence on actual FDI flows in a large-scale statistical analysis. By so doing, we develop both methodological procedure and measurement tools to advance the study of this topic.

This study also suggests that the motivations for FDI put forth by Dunning (1993) might benefit from a recategorization. For instance the export-seeking motivation, which essentially looks for low-cost export platforms, appears to be closely related to the efficiency motivation. More importantly, the resource-seeking motivation appears to consist of two very different types of resources. The traditional "natural" resources such as low-cost labour and minerals again seem to be naturally linked to cost-reduction or efficiency considerations, while intangible resources such as intellectual capital would appear to belong more naturally in the strategic assets category that currently includes knowledge assets. It might, in this context, therefore be useful to group the various motivations into four broader categories of motivations, as follows: *Growth*, *Efficiency*, *Knowledge* and *Competitive positioning*. Govindarajan and Gupta (2001) come up with a similar typology for the imperatives for international business activity. The growth motivation would encompass the market-seeking and partially, the export seeking motivations (at least as measured by actual export sales). The Efficiency motivation would include all of the cost based location choices; the Knowledge motivation would include intellectual and social capital, and Competitive positioning would cover the strategic issues involved in international expansion, such as the possibility of oligopolistic reaction (Knickerbocker, 1973) and preemptive entry. Each of these groups might be affected by digital technology in different ways. The first group – the pull factors of growth and efficiency – might be considered to be the most affected by digital technology, as they are most likely to be affected by the elimination of the importance of distance that technology entails. It is in these two areas that there is likely to be a major difference between digital and non-digital industries. Knowledge, on the other hand, tends to be sticky and locally embedded, and may need co-location to absorb.

The digital economy is relatively new, and foreign activities in these areas are even more recent. This paper is therefore offered as a beginning in terms of some suggestions as to the drivers of international activities in the digital economy. Much work is left for future research to incorporate the impact of digital technology on international business theory and practice. One direction, which may follow from the present study, is an extension of the analysis to the choice between export and FDI as two distinctive modalities to serve foreign markets. The changing motivation for FDI is likely to affect trade. For example, if market seeking diminishes, it will be replaced with more trade. Likewise, less resource seeking might be compensated, in part, with more trade. By altering the efficiency of transactions both within firms and between them and the market, digital technology modifies the entire set of considerations that traditionally affected the choice between these two modalities to serve foreign markets. More research is needed in order to understand the implications of these changes for the balance between the advantages of internalisation and those of the market.

Further, in the digital world, all one needs to enter international markets at a basic level is a website. Entry and exit may take on quite different meanings than in traditional product markets. An important task for future research is to examine the implications of this type of entry to our understanding of FDI. In pursuing these tasks, much can be learnt from the literature on digital technology and the way it affects competition and strategy. The attempts made here to draw on this literature for the understanding of international business activity in the digital industry appear to be fruitful and may well be pursued by future research.

The validity of the findings reported here beyond the specific industries on which the model was tested should also be tested by future research. The industries analysed were not randomly selected from any population. Rather, the procedure used to select them was based on the application of a number of pre-determined criteria

(existence of FDI activity; level of ICT investment), imposed as a condition of entry into the study. This procedure was adopted in order to reinforce a contrast between the two specific sets of industries. However, these groups of industries cannot be taken a-priori to represent a wider group than the one studied, and the validity of the findings beyond the set of industries analysed here is a question left for future research.

Notes

[1] The term 'digital economy' is used to signify those parts of the economy that are composed of goods that can be ordered, paid for, processed and delivered digitally (Brynjolfsson and Kahin 1999, Kobrin 1998). These include computer software, magazines and newspapers, movies, music, financial information and the like.

[2] We confine the discussion only to tacit, non-codified knowledge, since standardised, codified knowledge can be accessed from distance at negligible or no costs, using advances in technology. Access to this kind of knowledge is unlikely to drive foreign investment.

[3] Kobrin's index also includes in the denominator 'parents exports'. These data are not available for inward FDI and the ratio is estimated with affiliates sales only to increase comparability between the inward and outward analyses.

[4] In part, this was a result of the large-scale deregulation and privatisation of industries such as telecom and finance during this decade, and in part due to the development of advanced technologies that facilitated greater cross border activity in these industries (e.g., electronic networks in financial services – Zaheer and Manrakhan, 2001).

[5] The findings of these analyses are available upon request.

Table 1. Descriptive statistics and correlation coefficients of the independent variables included in the model

		Descriptive statistics (Mean; (SD))		Correlation coefficients (Pearson correlations) (**The outward sample in the upper right part of the table; the inward in the lower left part**)													
Investment motivations																	
Motivations	Operation measures (% unless otherwise stated)	Inward	Outward	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Market seeking	1. Costs of sales/total costs (H1)	.948 (0.032)	.927 (0.041)	**1**	.054 (.473)	.028 (.647)	-.087 (.187)	-.033 (.594)	.113 (.071)	-.046 (.450)	-.133 (.029)*	-.351 (.000)**	.018 (.767)	-.059 (.334)	-.051 (.408)	.138 (.033)*	.134 (.038)*
Resource seeking	2. Tangibles: Local purchases/total costs (H2a)	.707 (.455)	.699 (.186)	.138 (.029)*	**1**	-.025 (.736)	-.445 (.000)**	-.331 (.000)**	-.371 (.000)**	-.070 (.354)	-.045 (.552)	.241 (.001)**	.151 (.044)*	.309 (.000)**	.139 (.063)	-.045 (.588)	-.103 (.210)
	3. Intangibles: Compensation per employee ($) (H2b)	47.441 (20.990	33.846 (13.997)	.112 (.072)	.105 (.097)	**1**	.105 (.112)	.060 (.335)	-.125 (.046)*	-.054 (.376)	-.074 (.227)	.486 (.000)**	-.216 (.000)**	-.011 (.863)	.461 (.000)**	.057 (.375)	.014 (.828)
	4. Intangibles: R&D investment/sales (H2b)	0.021 (0.028)	0.010 (0.020)	-.126 (.057)	-.159 (.018)	.151 (.023)*	**1**	.580 (.000)**	.595 (.000)**	-.076 (.251)	-.044 (.503)	.035 (.598)	-.035 (.598)	-.530 (.000)**	-.044 (.510)	.284 (.000)**	.352 (.000)**
Efficiency seeking	5. Intra-firm transactions/sales (H3)	0.034 (0.036)	.224 (.239)	.136 (.038)*	-.169 (.011)*	.037 (.577)	.571 (.000)**	**1**	.697 (.000)**	-.026 (.679)	-.087 (.160)	.117 (.058)	.011 (.854)	-.464 (.000)**	.048 (.437)	.359 (.000)**	.398 (.000)**
Export seeking	6. Exports to unrelated bodies/sales (H4)	0.039 (0.041)	0.087 (.137)	-.099 (.132)	-.019 (.782)	.114 (.079)	.164 (.019)*	-.083 (.232)	**1**	-.057 (.362)	-.060 (.336)	-.129 (.039)*	-.024 (.696)	-.437 (.000)**	-.097 (.121)	.349 (.000)**	.410 (.000)**
Oligopolistic reaction	7. Growth foreign affiliates (H5a)	.129 (1.343)	0.042 (0.130)	-.127 (.041)*	.152 (.016)*	-.023 (.713)	-.052 (.439)	-.195 (.003)**	.051 (.432)	**1**	.445 (.000)**	.008 (.896)	.062 (.307)	-.015 (.802)	-.014 (.813)	.027 (.677)	.023 (.725)
	8. (Growth foreign affiliates)^2 (H5b)	.377 (3.350)	0.018 (0.091)	.047 (.454)	-.115 (.070)	.016 (.794)	.080 (.226)	.202 (.002)**	-.058 (.369)	-.897 (.000)**	**1**	-.048 (.429)	.013 (.830)	-.006 (.925)	-.035 (.564)	-.052 (.420)	-.026 (.694)
Control variables																	
Profitability	9. Net income ($)	184.189 (14160)	1831.883 (2712.71)	.042 (.500)	.044 (.488)	.232 (.000)**	.025 (.709)	-.167 (.011)*	.081 (.214)	-.062 (.315)	.006 (.918)	**1**	.240 (.000)**	.054 (.376)	.527 (.000)**	.143 (.027)*	.056 (.392)
Size	10. No. employees ('000)	125.906 (13.490)	131.322 (124.082)	.153 (.014)*	.050 (.431)	-.326 (.000)**	-.133 (.046)*	-.231 (.000)**	-.126 (.051)	.081 (.187)	-.053 (.392)	.038 (.544)	**1**	.099 (.105)	.076 (.215)	.440 (.000)**	.351 (.000)**
Growth	11. Annual change no. employees	.263 (1.843)	0.003 (0.480)	-.016 (.797)	-.012 (.848)	.016 (.793)	.043 (.521)	.030 (.643)	.059 (.362)	.053 (.386)	-.140 (.022)*	.013 (.834)	.086 (.161)	**1**	.033 (.586)	-.181 (.005)**	-.244 (.000)**
FDI stocks	12. ($)	11638 (11696)	13996 (30756)	-.008 (.902)	.094 (.137)	.431 (.000)**	.008 (.907)	-.116 (.077)	.092 (.153)	.020 (.740)	.018 (.770)	.630 (.000)**	.166 (.007)**	.043 (.485)	**1**	.067 (.302)	.018 (.784)
No. parents	13. No.	-	51.383 (32.669)	-	-	-	-	-	-	-	-	-	-	-	-	**1**	.862 (.000)**
(No. parents)^2	14. (No.)^2	-	3703 (4912)	-	-	-	-	-	-	-	-	-	-	-	-	-	**1**
N		135	135														

**Correlation significant at the 0.01 level (2-tailed)

* Correlation significant at the 0.05 level (2-tailed)

Table 2 Motivation for FDI in the digital and non-digital economy: US inward and outward FDI

		Outward FDI				Inward FDI			
Investment motivations									
Motivations	Operation measures	Digital	Non-digital	Digital	Non-digital	Digital	Non-digital	Digital	Non-digital
Constant		-6801.61 (-2.52)**	9498.34 (7.68)***	-3044.73 (-0.68)	.128 (0.58)	-1706.58 (-0.59)	-34034.59 (-4.84)***	-9195.67 (-1.81)	-74648.54 (-5.28)***
Market seeking	Costs of sales/total costs (H1)	2894.61 (1.06)	8973.90 (6.53)***	-1480.74 (-0.32)	3710.17 (2.90)**	-1379.04 (-0.42)	37150.29 (4.56)***	-1293.01 (-0.28)	71011.01 (4.42)***
Resource seeking	Local purchases/total costs (H2a)	2085.94 (2.56)**	-219.64 (-3.11)***	-0.00 (-0.03)	1749.89 (2.22)**	1861.12 (4.77)***	-4941.84 (-2.73)**	-2297.07 (-0.89)	1391.09 (6.06)***
	Compensation employees (H2b)	117.45 (6.21)***	-2.89 (-0.65)	20.17 (1.42)	0.00 (0.02)	69.70 (5.06)***	70.26 (3.94)***	34.25 (2.66)**	-77.80 (-3.81)***
	R&D investment/sales (H2b)	15682.75 (4.34)***	-5327.44 (-0.48)	-20193.86 (-1.29)	1.06 (0.82)	-2362.01 (-0.67)	-22578.83 (-1.13)	2448.38 (0.36)	3738.82 (0.13)
Efficiency seeking	Intra-firms transactions/sales (H3)	4655.42 (5.70)***	-0795.98 (-1.50)	2560.72 (3.33)***	0.17 (1.57)+	4861.89 (5.68)***	-0554.67 (-1.75)+	8524.15 (6.94)***	-766.83 (-1.06)
Export seeking	Exports to unaffiliated bodies/sales (H4)	459.61 (0.52)	5814.82 (5.51)***	1244.38 (0.33)	0.87 (3.79)***	3911.96 (1.49)	2873.16 (1.89)*	4426.83 (1.69)*	-9398.08 (-2.04)**
Oligopolistic reaction	Number of foreign affiliates (H5a)	14.17 (0.02)	16.76 (1.85)*	1842.18 (1.16)	.15 (0.93)	-3903.94 (-0.81)	6720.08 (1.49)+	-4986.94 (-1.23)	16695.86 (1.06)
	(Number of foreign affiliates)^2 (H5b)	690.03 (0.36)	-1687.87 (-2.19)**	-174.11 (-0.02)	.15 (0.93)	-30.94 (-1.90)**	1054.40 (6.06)***	-457.61 (-0.92)	1882.77 (4.69)***
Control variables									
Profitability	Net income ($)	-	-	.46 (3.43)***	0.007 (4.67)***	-	-	.35 (3.45)***	.16 (0.84)
Size	No. employees (‘000)	-	-	-186.12 (-0.61)	0.00 (0.42)	-	-	-728.55 (-1.49)+	-2306.67 (-5.17)***
Growth	Annual change no. employees	-	-	720.43 (1.21)	0.01 (0.20)	-	-	53.68 (2.54)**	-1244.71 (-4.98)***
FDI stocks	($)	-	-	851.53 (2.60)**	-0.04 (-2.51)**	-	-	1387.17 (4.14)***	2550.43 (6.11)***
No. parents	No.	-	-	.175 (1.45)	0.00 (0.74)	-	-	-	-
(No. parents)^2	(No.)^2	-	-	-35.94 (-1.76)*	-.00 (-0.34)	-	-	-	-
Wald χ^2		372.23	844.22	264.24	389.94	103.55	155.36	798.52	380.15
Prob > χ^2		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*** p<.001; ** p<.01; * p<.05; + p<.10

Table 3. Test of difference: estimation of the model for the digital and non-digital samples combined

Investment motivations		Outward		Inward	
Motivations	Operation measures				
Constant		-9432.21 (-2.16)**	7270.35 (1.05)	-9051.73 (-0.80)	-8590.82 (-0.34)
Market seeking	Costs of sales/total costs	625.42 (0.14)	20261.11 (2.53)**	-1240.50 (-0.11)	-3595.42 (-0.14)
Resource seeking	Local purchases/total costs	-1054.28 (-1.08)	-3710.16 (-1.45)	1278.68 (3.52)***	777.66 (0.07)
	Compensation employees	-30.72 (-2.04)**	-219.92 (-1.68)*	27.78 (1.34)	-33.56 (-0.24)
	R&D investment/sales	2843.52 (0.15)	66452.61 (0.74)	26181.22 (1.56)+	13950.14 (0.15)
Efficiency seeking	Intra-firms transactions/sales	-1388.23 (-1.61)+	-9911.04 (-0.84)	-21255.92 (-2.00)**	3636.65 (0.06)
Export seeking	Exports to unaffiliated bodies/sales	5461.94 (1.04)	-32339.13 (-1.30)	6893.26 (1.29)	7662.53 (0.40)
Oligopolistic reaction	Number of foreign affiliates	730.23 (0.18)	-784.81 (-0.11)	-76.06 (-0.06)	11083.56 (1.80)*
	(Number of foreign affiliates)^2	-27251.81 (-1.01)	-17367.38 (-0.43)	-606.33 (-0.30)	10089.99 (1.12)
Control variables					
Profitability	Net income ($)	0.15 (1.53)+	.29 (2.42)**	.12 (0.78)	-0.09 (-0.21)
Size	No. employees (‘000)	-257.07 (-0.70)	-3062.448(3.27)***	-547.36 (-1.05)	-217.08 (-0.09)
Growth	Annual change no. employees	3497.71 (3.24)***	6928.33 (2.33)**	-139.00 (-1.09)	-983.84 (-2.82)**
FDI stocks	($)	1501.29 (4.38)***	1276.11 (2.95)**	1336.80 (3.10)***	1424.41 (1.86)*
No. parents	No.	-12.07 (-0.64)	-218.41 (-2.00)**	-	-
(No. parents)^2	No.	0.03 (0.22)	1.31 (2.00)*	-	-
Interaction variables					
Market seeking	Costs of sales/total costs	-	-1806.91 (-2.09)*	-	-28550.12 (-3.15)***
Resource seeking	Local purchases/total costs	-	1493.33 (0.41)	-	412.92 (0.04)
	Compensation employees	-	281.34 (1.93)*	-	60.91 (0.41)
	R&D investment/sales	-	-61261.03 (-0.67)	-	37394.70 (0.40)
Efficiency seeking	Intra-firms transactions/sales	-	4435.78 (2.39)**	-	4853.48 (2.54)**
Export seeking	Exports to unaffiliated bodies/sales	-	-49164.65 (2.05)*	-	-17662.53 (1.98)*
Oligopolistic reaction	Number of foreign affiliates	-	4530.43 (0.60)	-	-13936.70 (-1.78)
	(Number of foreign affiliates)^2	-	14388.82 (0.36)	-	-13063.04 (-1.19)
Profitability	Net income ($)	-	0.13 (0.81)	-	0.05 (0.07)
Size	No. employees (‘000)	-	11.89 (1.28)	-	-4.89 (-0.13)
Growth	Annual change no. employees	-	-6255.57 (-2.09)**	-	1035.75 (2.64)**
FDI stocks	($)	-	0.01 (0.96)	-	0.01 (0.26)
No. parents	No.	-	223.96 (1.60)+	-	-
(No. parents)^2	No.	-	-1.34 (-1.23)	-	-
Wald χ^2		123.04	195.05	183.82	160.15
Prob > χ^2		0.0000	0.0000	0.0000	0.0000

*** p<.001; ** p<.01; * p<.05; + p<.10

References

Arthur W. B. 1994. *Increasing Returns and Path Dependence in the Economy* Ann Arbur, The University of Michigan Press

Andersen Consulting. 2000. Keynote speaker delivered at the AIB annual conference, Phoenix

Brynjolfsson E. and Hitt L. 1995. Information technology as a factor of production: The role of differences among firms. *Economics of Innovation and New Technology* 3(4): 183-200, (Special issue on information technology and productivity paradox)

Business Week. 2000. The internet: Portal combat. January 17th: 34-35

----------. 2000a. The internet: Portal combat. January 17th: 34-35

----------. 2000b. Surfing in tongues. December 11th: 11

----------. 2000c. Masters of the Web world. May 15th: 12-48

----------. 2001. The General says Charge! February 19th: 35-38

Dean T.J., Brown R.L. and Bamford C.E. 1998. Differences in large and small firm responses to environmental context: Strategic implications from a comparative analysis of business formations. *Strategic Management Journal* 19: 709-728

Dunning J.H. 1993. *Multinational Enterprises and the Global Economy* Addison-Wesley Publishing, Wokingham

---------- and Wymbs C. 2000. The challenge of electronic markets for international business theory. mimeo, Rutgers University

Evans P. and Wurster T.S. 2000. *Blown to Bits: How the New Economics of Information Transform Strategy* Boston, Harvard Business School Press

Financial Times. 2001. AOL plans European expansion. Match 9th: 1

Flowers E.B. 1976. Oligopolistic reaction in European and Canadian direct investment in the US. *Journal of International Business Studies* 7: 43-55

Glascock S. 1998. "Microsoft becomes a new global language" *Computer Reseller News* March 2nd: 113

Jolly V.K., Alahuhta M. and Jeannet J.P. 1992. Challenging the incumbents: How high technology start-ups compete globally. *Journal of Strategic Change* 1: 71-82

Katz M.L. and Shapiro C. 1994. System competition and network effects. *Journal of Economic Perspectives* 8(2): 93-115

Knickerbocker F. T. 1973. *Oligopolistic Reaction and the Multinational Enterprise* Cambridge, MA, Harvard University Press

Kobrin S.J. 1991. An empirical analysis of the determinants of global integration. *Strategic Management Journal* 12: 17-31, special issue

----------. 1998. You can't declare cyberspace national territory: Economic policy in the digital age. in D. Tapscott, A. Lowy and D. Ticoll (Eds.), pp. 355-370

Kotha S., Rindova V. and Rothaermel F.T. 2001. Assets and actions: firm-specific factors in the internationalisation of US Internet firms. *Journal of International Business Studies* 32(4): 769-792

Leamer E.E. and Storper M. 2001. The economic geography of the Internet age. *Journal of International Business Studies* 32(4): 641-666

Loveman G.W. 1994. An assessment of the productivity impact of information technology. in T.J. Allen and S.S.M. Morton (Eds.), *Information Technology and the Corporation of the 1990s: Research Studies* MIT Press, Cambridge MA, pp. 84-110

Lynch P.D. and Beck J.C. 2001. Profile of Internet buyers in 20 countries: Evidence for region-specific strategies. *Journal of International Business Studies* 32(4): 725-748

Martin X., Swaminathan A. and Mitchell W. 1998. Organisational evolution in the interorgansiational environment: Incentives and constraints on international expansion strategy. *Administrative Science Quarterly* 43(3): 566-601

Maznevski M.L. and Chudoba K.M. 2000. Bridging space over time: Global virtual team dynamics and effectiveness. *Organisation Science* 11(5): 473-492

McDougall P.P., Shane S. and Oviatt B.M. 1994. Explaining the formation of international new ventures: The limits of theories from international business research. *Journal of Business Venturing* 9: 469-487

Nachum L. 1999. Motivations of TNCs for investment in Central and Eastern Europe: Some policy implications. *Journal of East-West Business* 5(3): 5-40

Nachum L. 2002. International business in a world of increasing returns. *Management International Review* Forthcoming

OECD. 2000. *OECD Information Technology Outlook: ICTs, E-Commerce and the Information Economy* OECD, Paris

Roche E.M. and Blaine M.J. (Eds.). 2000. *Information Technology in Multinational Enterprises* Edward Elgar, Cheltenham and Northampton

Sampler J.L. 1998. Redefining industry structure for the information age. *Strategic Management Journal* 19(4): 343-355

Scott A. 1998. *Regions and the World Economy: The Coming Shape of World Production, Competition, and Political Order* Oxford and New York, Oxford University Press

Smith M., Bailey J. and Brynjolfsson E. 1999. Understanding digital markets: review and assessment. in E. Brynjolfsson and B. Kahin (Eds.), *Understanding the Digital Economy* Boston, MA: MIT Press

Tapscott D., Lowy A. and Ticoll D. (Eds.) 1998. *Blueprint to the Digital Economy: Creating Wealth in the Era of E-Business* New York and San Francisco, McGraw-Hill

U.S. Department of Commerce. 1999. Electronic commerce in the digital economy. www.ecommerce.gov/ede

Wesson T.J. 2002. *Foreign Direct Investment and Competitive Advantage.* Edward Elgar, Cheltenham and Northampton

Yoffie D.B. and Cusumano M.A., 1999. The competitive dynamics of Internet time. *Harvard Business Review* Jan/Feb: 70-81

Zaheer S. and Manrakhan S. 2001. Concentration and dispersion in global industries: Remore electronic access and the location of economic activity. *Journal of International Business Studies* 32(4): 667-686

Appendix A. Classification of industries by ICT intensity (*)

Digital industries (highest ICT intensity)		Non-digital industries (lowest ICT intensity)	
Industries	ICT intensity	Industries	ICT intensity
Business services	0.895	Oil and gas extraction	0.260
Insurance	0.876	Hotels and other lodging places	0.259
Communication	0.846	Other transportation equipment	0.237
Information services and data processing	0.823	Industrial machinery and equipment nec	0.225
Drugs	0.778	Retail trade	0.189
Household audio and video, and communication equipment	0.757	Textile and apparel products	0.186
Motion pictures, including tv tape and film	0.723	Food and kindred products	0.182
Electric and electronic components and accessories	0.680	Paper and allied products	0.175
Electronic and electric components nec	0.629	Stone, clay and other non-metallic mineral products	0.165
Printing and publishing	0.598	Rubber products	0.154
Finance (except depository institutions)	0.590	Fabricated metal products	0.159
Transportation	0.565	Petroleum and coal products	0.129
Computer and office equipment	0.481	Lumber, wood, furniture and fixtures	0.079
Instruments and related products	0.458	Primary metal industries	0.055
Industrial chemicals and synthetics	0.447	Construction	0.017

(*) ICT intensity = ICT investment as share of total investment, calculated as accumulated investment during 1990-99.

Source: http://www.bea.doc.gov/bea/dn2/facd.htm