Multinationality Matters in Innovation:
The Case of the UK Financial Services

Marion Frenz
Department of Management
Birkbeck College
Malet Street
London WC1E 7HX
Tel: 020 76316829
Email: m.frenz@bbk.ac.uk

Claudia Girardone
Department of Accounting, Finance and Management
University of Essex
Colchester CO4 3SQ
Tel: 01206 874156
Email: cgirardone@essex.ac.uk

Grazia Ietto-Gillies*
London South Bank University
103 Borough Road
London SE1 0AA
Tel: 020 7815 7701
Email: iettogg@lsbu.ac.uk

Other affiliations: The Open University and King’s College London

*All correspondence through Grazia Ietto-Gillies.
Multinationality Matters in Innovation:  
The Case of the UK Financial Services Sector

Abstract

The paper starts with a brief summary of theoretical perspectives on the relationship between multinationality and innovation and the move from a centralized and hierarchical perspective to a more decentralized and integrative one, in which internal and external networks play a relevant role in the innovation capabilities of the firm. Four hypotheses are set up to test the relationship between multinationality and innovation, using data from the Community Innovation Survey for the financial services sector. In all models we control for the size of the enterprise. The results show that multinationality is positively related to innovation activities. The positive impact of being part of a MNC on the propensity to innovate seems largely due to the fact that MNCs operate in different countries rather than, or more than, to the enterprise being part of a group. The relevance of multinationality appears to be higher, the higher the degree of internationalization of the company of which the enterprise is part. The country of origin of the company appears also to be important.

JEL classification: F23; G20; O31

Keywords: Innovation; Multinational companies; Internal and external networks; Foreign-owned companies; Financial services; Community Innovation Survey UK.

Approximate word count: 9,410 (excluding references, tables and appendix)

Acknowledgements: This research has been supported by funds from the EC TSER V programme in relation to the project ‘Assessing the Impact of Technological Innovation and Globalization: The Effects on Growth and Employment’ (contract no. SER-199-00092). Earlier versions of the paper were presented at the 12th International Conference of RESER, University of Manchester 25-26 Sept. 2002; at the 28th EIBA Conference, 8-10th Dec 2002 and at a staff seminar at King’s College London, 19th March 2003. We have benefited from discussions at these events as well as from comments by Howard Cox, Martha Prevezer and
Antonello Zanfei. We are very grateful to an anonymous referee of this journal for insightful and useful comments on an earlier version.
1. Introduction: theoretical context of the study

The last forty years have seen a growing interest in the relationship between multinational activities and innovation. This has been brought about by the post WWII growth in the activities of multinational companies (MNCs) and in particular by the fact that the increased level of foreign direct investment (FDI) was largely in the manufacturing sector at first and then, increasingly, in services, both of which can be knowledge and research intensive sectors.

In the 1960s and 1970s the accepted view of the relationship between multinationality and the development and spread of innovation was that deriving from the International Product Life Cycle (IPLC) model (Hirsch, 1965; Vernon, 1966, 1974 and 1979). The model dealt with the development, production and marketing of a new product by a specific firm in a specific country, the US in Vernon’s original model.

The view of innovation activity that emerged from it was: product-centred; country-centred and also centred on the innovation capabilities of a single, specific firm. It was also a hierarchical view in the sense that – in terms of innovation – it envisaged the following. (1) A hierarchy of countries\(^1\) (the US, Europe and developing countries). Here the home country plays a pivotal role because its congenial environment helps the firm to build competitive advantages in innovation (Knickerbocker, 1973; Dunning, 1977). (2) A hierarchy of firms (innovative and non innovative). (3) A hierarchy of products (innovative and imitative) and (4) a hierarchy of potential and actual innovation centres within the firm: the headquarters of American firms had the lead in the

---

\(^1\) The relevance of a hierarchy of countries in innovation has more recently been considered by Gupta and Govindarajan (2000) with the view that foreign subsidiaries look to the ‘import’ of knowledge from internal company units located in more advanced countries than the one they operate in.
development of innovation and the foreign subsidiaries would follow and imitate. Rival firms would also imitate the product. The innovation potential of the home country was linked to macroeconomic (largely demand side) and technological conditions: favourable income per capita, consumers’ tastes, and labour skills (engineering, production and marketing ones) create ideal conditions for the introduction of new products.

The model leaves little scope for decentralization of innovative activities; for interaction between subsidiaries and between subsidiary and headquarters; and between subsidiary and the local cultural and innovation environment of the host country. In terms of the internationalization issue the model stresses the nationality of ownership rather than multinationality per se.

This perspective on innovation changed in the 1980s and 1990s in response to a variety of developments ranging from: the new information and communication technologies (ICTs) that facilitated the transmission of knowledge; to the increased internationalization of activities; to the increase in FDI in services; to the growth in interfirm collaborative agreements (Contractor and Lorange, 1988; Hergert and Morris, 1988; Hagedoorn, 1996; Narula, 2000). The MNC has gradually come to be seen as an evolutionary institution in terms of the way it organises its businesses and in terms of the development of its competitive strategies among which a prominent role is played by strategies on innovation.

In particular John Cantwell (1989 and 1995) developed a theory of the MNC in which innovation and technological accumulation are used strategically to enhance the firm’s competitive advantages.

The following are key elements in this view. Ownership advantages – specifically in the innovation field – can be ‘created’; innovation is transmitted internally to the firm
from country to country; there is also a strong interaction with the external environment: innovation activities within the companies generate spillover effects and thus have external benefits on the local environment; this leads to the view of endogenous location advantages. The latter view is supported also by arguments in Tushman and Anderson (1986). Moreover, the subsidiary of a MNC learns from the local environment and thus the scope for further innovation in the subsidiary, and through it in the other parts of the firm, increases.

In this perspective on the development and spread of innovation, multinationality *per se* plays a very large role; so does the existence of internal networks and the integration of the various parts of the MNCs group within the local environments in which they operate. It is a decentralized, network-centred view of innovation development and spread. Moreover, integration – within the group and between elements of the group and their external environment – rather than hierarchy becomes relevant in this approach.

The results of other relevant and parallel research work reinforce this view. Bartlett and Goshal (1989) stress the relevance of linkages among dispersed units of the same company for innovation processes. Hedlund (1986) and Hedlund and Rolander (1990) shift the firm’s organizational perspective from the classical hierarchical structure to one based on *heterarchy*. They write: “This entails a geographical diffusion of core strategic activities and co-ordinating roles, a break with the notion of one uniform hierarchy of decision as well as organizational positions, and an increased focus on normative control mechanisms” (p. 15). Gupta and Govindarajan’s (1991 and 2000) view of the firm as a ‘bundle of knowledge’ stresses also the relevance of internal networks for the transfer of knowledge. The elements that affect such transfer are seen in the context of a detailed
analysis of inflows and outflows of knowledge exchanges between the different units of the company.

The notion of the MNC as a system of interdependent units with flows of knowledge, products and capital between them is part of Ghoshal and Bartlett’s (1988) investigation into innovation processes in a multinational context. So is Zanfei (2000), a work that sees the MNC as a network of innovators. Zanfei identifies two types of networks. Internal networks are formed by the headquarters and subsidiaries of the company and they may span many countries. The external network emerges from the business links between parts of the company and other independent business units. Internal networks facilitate the transfer of knowledge and innovation internally to the company and within and across countries. These networks together with the use of ICTs facilitate the generalization and the transfer of knowledge developed for a specific context/environment. Moreover, local subsidiaries, if given enough autonomy, can engage in cooperative agreements thus generating external networks which facilitate the transfer of knowledge between the local environment and a specific part of the firm. The internal network can then help to transfer this knowledge and innovation across the firm. This process of internal transfer would be facilitated by a fairly centralized organization with strong centripetal forces. Here Zanfei sees a source of conflict between decentralized organizations – that facilitate centrifugal forces and thus help the transfer of knowledge between the external environment and the local subsidiary – and a centralized organizational structure in which centripetal forces facilitate the internal transfer of knowledge and innovation.

---

2 On the relevance of the local environment and agglomeration for R&D and innovation see also Holm and Pedersen (2000).
Zanfei’s work builds on Andersson and Forsgren (1996), which stresses the possible conflicts between internal and external networks in terms of the following elements: (a) the mechanism of control of subsidiaries by headquarters\(^3\); and (b) the degree of embeddedness of the subsidiary in the local economy.

Altogether, these evolutionary views stress the following elements: (1) Multinationality is important because firms learn from the various and diverse local environments and because the subsidiaries spill over innovation effects into the locations in which they operate. (2) Moreover, the existence of internal networks facilitates the spread of knowledge within the company. (3) They also stress the strategic role of innovation activities; and (4) the relevance of the organizational structure of the company, specifically the degree of autonomy enjoyed by the subsidiaries and the related control mechanisms within the company.

There are, nonetheless, some dissenting views from this general framework in which internal and external networks are seen as contributors to the generation and diffusion of knowledge and innovation. Feldman (2000) stresses that “…knowledge spillovers are geographically bounded within a limited space…” (p. 389). In the same volume, though in a different context, Lundvall and Maskell (2000) also move away from the emphasis on networks and stress the role of nation-specific factors in the development of innovation advantages. Zander and Solvell (2002) shed doubts on the extent and relevance of internal transfers of knowledge.

The present paper attempts to test recent views of innovation and multinationality in the context of data generated by the Community Innovation Survey (CIS) and for the Financial Services sector. It draws inference on the theoretical view of innovation

\(^3\) Control mechanisms are also seen as important by Hedlund and Rolander (1990) as we saw above.
underlying the CIS. The paper proceeds as follows. Section two analyses the relationship between multinationality and innovation and sets up our hypotheses; section three and four discuss the general features of the CIS and of the financial services sector respectively; section five discusses data, variables and methodology; section six presents the results; section seven summarises and concludes while the last section draws implications for future research.

2. Multinationality and innovation

The brief review in the introduction highlights how multinationality per se does not play a strong role in the early theories of the relationship between the company’s propensity to innovate and multinationality. The stress is on the nationality of the investor and thus on the type of country where the innovative product originates. In the 1960s and 1970s the relevance of the nationality of the investors in terms of a wide range of effects on the various countries in which they operated, was indeed a very important issue (Servan-Schreiber, 1968; Hymer and Rowthorn, 1970).

Several studies based on survey databases have analysed the nationality of ownership of the enterprises in relation to various innovation elements such as outputs, inputs, performance and processes. Tether et al. (1999) in a study of the UK CIS 2 find that the nationality of ownership is relevant in terms of size, propensity to innovate and involvement in collaborative work on innovation, though not in relation to R&D expenditure, or to innovation aims. Tomlinson and Coombs (1998) analyse the innovative behaviour of foreign firms operating in the UK versus UK multinationals using the CBI 1998 survey. They find that foreign companies show a higher innovative behaviour than the UK-based MNCs. Tether (2001) in an analysis of co-operative agreements and
innovation from the UK CIS 2 finds that both ‘foreign nationality’ and ‘being part of a group’ are significant characteristics in relation to innovation output as well as to co-operative agreements.

Theories put forward in the more recent decades stress the relevance of multinationality per se in terms of effects at the micro, meso and macro levels. This shift in emphasis has moved the focus of research from the nationality of ownership to the degree of multinationality (Sullivan, 1994; UNCTAD, 1995; Ietto-Gillies, 1998, 2001 and 2004; Van den Berghe, 2003; Dorrenbacher, 2000). This issue will be revisited in section five.

While the more recent views on the drivers of innovation give a strong role to multinationality, the country of origin also retains an important role for the following reason. Because the company learns from its environment, the location of activities in countries which are innovation and technology intensive is likely to have a positive effect on the company’s innovative capacity (Knickerbocker, 1973; Dunning, 1977; Gupta and Govindarajan, 2000). Therefore the origin from a country with high innovation intensity puts the company at a great innovative advantage which it can then exploit and further augment by appropriate choice of foreign locations for its investments. Moreover, some experts give evidence on the fact that companies tend to perform most of their R&D activities at home. Pavitt and Patel (1999: 94) write on this issue: “As a consequence, companies’ innovation activities are significantly influenced by their home country’s national system of innovation: the quality of basic research, workforce skills, systems of corporate governance, the degree of competitive rivalry, and local inducement mechanisms…”.
In this perspective the nationality of the company is important but not in the way envisaged in the international product life cycle. In the latter theory, the relevance of the country of origin is largely in terms of macro elements leading to high demand for new consumers’ products, though the availability of skills is also relevant. The view taken in the antecedents leading to this paper stresses supply side elements related to the innovation environment in the home country.

From our discussion so far, it emerges that multinationality is likely to be an important dimension for innovation. However, its relevance could come about in a variety of ways and in particular the following.

First, because all units/enterprises that are part of a MNC are automatically part of a group and the internal network of the group helps the process of acquisition of knowledge (from the various localities in which the units operate) and its transfer from unit to unit. Internal networks are important as vehicles of absorption of innovation environments and of internal transfers of knowledge and innovation. Thus a business unit that is part of a group is – *ceteris paribus* and allowing for control mechanisms within the company as highlighted in Andersson and Forsgren (1996) –more likely to be innovative than an independent unit. However, enterprises belonging to a MNC are not the only ones that are part of a group. Some companies have all their subsidiaries and group units within the same country. If multinationality turns out to be relevant for innovation activities, this could be due to: (a) the fact that the enterprise is *part of a group*; and/or (b) the fact that the different parts of the group operate across national borders.

This leads to our second point. If the different environments are also different countries, the diverse cultural and innovation environment may further enhance the company’s innovation capabilities. Therefore being part of a MNC may increase the
innovation potential of the company and of each enterprise within it, over and above the fact that the enterprises belong to a group.

However, there is also the company’s culture – or cultures – to be reckoned with in terms of impact on knowledge and knowledge exchanges. Zander (2002) – through a study of the ABB company – analyses the impact that the history of the company and its internationalization modes and processes has on the culture and on the organization of the company itself and, through them, on its innovation potential\(^4\).

Third, if multinationalization is important, then the degree of multinationality may also be relevant for innovation. Fourth, the nationality of the company may be important whether this is due to the relevance (for innovation) of demand conditions (Vernon, 1966) or of the home country’s innovation environment. In terms of innovation we focus on variables that can be considered indicators of innovation propensity, i.e. indicators of commitment to innovation on the part of the surveyed enterprise. Against this background, we formulate one main hypothesis and three related sub-hypotheses as follows:

- **Main Hypothesis (1):**

  Being part of a multinational as opposed to being uninational has a positive impact on innovation propensity. Uninationals can be: (i) independent UK enterprises or (ii) enterprises that are part of a wider company group that has subsidiaries in the UK but not abroad.

- **Sub-Hypotheses (a-c):**

---

\(^4\) Conversely, Heiman and Nickerson (2002) stress how the attributes of knowledge and knowledge transfer may affect the choice of governance.
(a) Enterprises that are part of a multinational company (MNC) have a higher innovation propensity compared not only to independent entities but also in comparison with enterprises that are part of a uninalteral company group. This is because the internal network of a MNC is spread over different countries – as opposed to being bound to a single country – and their diverse environments give scope for additional innovation potential.

(b) The degree of multinationality – measured by (a) the MNCs proportion of activities abroad, and (b) the geographical (by nation-state) extension of its network of subsidiaries – impacts positively on innovation activities: the higher the degree of multinationality, the higher the innovation propensity.

(c) The home country of the MNC to which the enterprise belongs is relevant for innovation activities.

If the main hypothesis (1) is not confirmed while (c) is, we would interpret this to mean that a process similar to the one envisaged in the IPLC is in operation: i.e. there is a hierarchy of countries and companies in terms of potential for innovation. If both the main hypotheses (1) and the sub-hypothesis (c) are confirmed this indicates that multinationality is important and that, moreover, the country of origin of the MNC adds to the innovation capabilities of the company. If neither is confirmed then innovation is not related to multinationality at all, neither is the nationality of ownership important.

In all our models we control for the size of the enterprises, proxied by the (log of) number of employees. The extent to which we can test the hypotheses must be seen in the context of the dataset and sector we use and to these we now turn.
3. The CIS and other databases

For our investigation we need variables related to two elements: innovation and multinationality. Information on the former is taken from the Community Innovation Survey (CIS). Innovation activities in EU countries have been the focus of a series of large surveys – currently in their third phase – in which the unit surveyed is the enterprise. An enterprise may be an independent unit or part of a wider company. If an enterprise belongs to a wider group/company, then the CIS questions refer to the activities of the enterprise and not the activities of the company as a whole. Given the nature of the survey, the valuation of innovation activities generated by it, is self-assessed by the participating enterprise.

The UK CIS are conducted by the Office of National Statistics (ONS) on behalf of the Department of Trade and Industry (DTI). We use the CIS 2 in which a total 2,344 UK enterprise units were surveyed, 744 in the service sector. The reference period is 1994 to 1996.

The CIS questionnaire contains questions on: structural characteristics of the enterprise (size, establishment period, M&A activities); performance elements (exports); innovation outputs and inputs; aims of, and constraints on, innovation; collaborative agreements, information sources on, and public support for, innovation.

Additionally to the questionnaire data, the ONS matched the CIS with the Inter-Departmental Business Register (IDBR). Among the information on structural features of

---

5 According to the CIS an enterprise is defined as: “… the smallest combination of legal units that is an organisational unit producing goods or services, which benefits from a certain autonomy in decision making, especially for the allocation of its current resources. An enterprise carries out one or more activities at one or more locations. An enterprise may be a sole legal unit.” (see UK CIS 2 questionnaire, p. 1)
the surveyed enterprises from the IDBR is information on whether the respondent is part of a wider company/group or whether the enterprise is independent.

As regards the multinationality elements, the CIS/IDBR does not contain data on multinationality as such; although information is available on the national origin of the ultimate company of which the enterprise is part. If an enterprise belongs to a foreign company, then it is automatically part of a MNC. However, this does not give us full information on multinationality for two reasons: (a) we have no information on how relevant their activities abroad are in terms of proportion of activities or in terms of number of countries in which they operate. (b) because some companies that are UK owned may also be MNCs: we have no way – within the CIS information – to discriminate between those UK enterprises that are part of a MNC and those that are part of a uninationa (UK) company.

In order to get these vital pieces of information on the multinationality characteristics we used Dun and Bradstreet’s *Who owns Whom (WoW)*, a large database that gives company tree data in the form of name, number and location of subsidiaries, associates and trade partners\(^6\). The variable on foreign or UK ownership used in this paper also derives from WoW. We matched the CIS 2 with the company tree data on WoW. This paper is confined to the application of a specific sector – the financial service sector – and to this we now turn.

---

\(^6\) WoW defines subsidiaries by a 50 per cent or more ownership, and associates and trade partners by a 10 to 50 per cent ownership. When assessing multinationality we do not discriminate between subsidiaries, associates and trade partners. All three categories of affiliates are represented in most company trees that are part of our sample.
4. The financial services sector

The CIS covers 16 sectors in services and we are here concentrating on all the enterprises surveyed which are included in the financial services category. This gives a total of 149 enterprises belonging to SIC 65, 66 and 67 (respectively: financial intermediation with 45 enterprises; insurance and pensions with 50 enterprises; and activities auxiliary to financial intermediation with 54 enterprises). There are two sets of reasons for our choice of sector: some are economic in nature and some are more pragmatic.

On the economic side, over the period surveyed (1994-96) the financial sector has been very dynamic in terms of growth, innovation, organizational changes and internationalization.

Computer technology in particular had a crucial role in the developments of the financial sector given the suitability to computerization of all types of financial transactions (Barras, 1986 and 1990). Moreover, the financial sector is relevant to all or most of the other sectors in the economic systems, as it plays an essential role in the overall economic performance (Herring and Santomero, 199; Bhattacharya and Thakor, 1993).

However, recent studies in the EU have largely focused on either the manufacturing sector and/or services sector as a whole (Metcalfe and Miles, 2000) and as far as we are aware, there is a paucity of studies focusing specifically on the financial services industry. In fact, much about the innovation potential in financial services and their effects on performance is yet to be understood (Frei, Harker and Hunter, 1997).

On the pragmatic side, the choice is also directed towards a sector with a relatively high number of enterprises surveyed (21 percent of services firms) and a relatively high
number of replies to many questions. This was essential to have a degree of confidence in our results.

Three major interconnected changes have been taking place within the financial services sector, all significant from the point of view of this study. The first relates to changes in innovation patterns and activities. Traditional innovation literature suggests that organizations innovate by getting new and/or improved products to market or by new or improved production processes\(^7\), therefore via their involvement in either radical or incremental innovations in products and/or processes (Tushman and Anderson, 1986; Henderson and Clark, 1990). However, in a service the product and the process tend to be more closely related than in manufacturing. Innovation for FSFs (Financial Services Firms) has often been identified more in process and organizational changes than in new product development in a traditional sense (Frei, Harker and Hunter, 1997). Recent innovations in FSFs raise also fundamental questions concerning competition among, for example, banks and non-banks, interaction with the consumer and the delivery of innovative products, organizational issues within the firms and the industry, including vertical integration (Harker and Zenios, 1998).

Among the most important conditions that encourage innovation within FSFs is the nature of technology and its diffusion within the industry (White, 1997)\(^8\). In this context, FSFs increasingly use information technology (IT) as an important strategic tool to achieve cost-efficiency, improve their profitability and retain or increase their competitive advantages. According to ECB (1999: 8), IT affects FSFs in two main ways:

\(^7\) Schumpeter (1939: 62) defined innovation as follows: “... the setting up of a new production function. This covers the case of a new commodity, as well as those of a new form of organisation such as a merger, of the opening up of new markets, and so on ...”.

\(^8\) Other important conditions that appear to affect innovation are (White, 1997): the structure (e.g. firm size) and competitiveness of the industry and the economic and regulatory environment of the industry.
(1) it contributes to the reduction in costs associated with the management of information (collection, storage, processing and transmission) by replacing paper-based and labour-intensive methods with automated processes; and (2) it modifies the ways in which customers have access to FSFs’ services and products, mainly through automated channels (e.g. remote banking). Moreover, the use of IT: (3) allows stronger control of internalised and externalised networks of activities; and (4) also gives the company valuable access to its customers’ data.

Tether et al. (2001) in a comprehensive EU-wide report on the results of CIS 2 by sector, give the following findings for EU financial services and the UK in particular. For the EU as a whole, the enterprises for the financial sector are more likely to innovate than enterprises for the whole of services (p. 96). The UK firms record innovative activities just below the EU averages. The UK firms are very likely to declare that they had developed their innovations in-house. In general, for the EU as a whole, financial services are less likely to conduct R&D than all services together. However, the UK enterprises are less likely to conduct R&D than the EU average (p. 97). UK financial services enterprises are less likely to engage in co-operation for innovation than the average EU enterprise surveyed (p. 99).

The second relevant set of changes relates to consolidation and restructuring of the sector. This must be seen in the context of a general trend towards restructuring particularly through mergers and acquisitions (M&As) in all sectors of the economy (European Commission, 1997: 58; Ietto-Gillies et al., 2000). From 1995-99 the UK has experienced an average of 16 M&As per year in the banking sector alone (ECB, 2000). M&As have also taken place across the financial sector, for example those involving domestic banks and non-banking providers of financial services, in particular insurance
companies (so-called bancassurance). Considerable numbers of M&As have taken place across borders.

The end result is a growing concentration in the industry within the EU as well as in other regions and countries (ECB, 2000). A small core of banks now accounts for a relatively large proportion of total financial sector assets. In the UK banking industry, for example, the level of concentration measured by the Herfindahl index has increased by 37.7 per cent from 0.0191 to 0.0263 over the 1995-99 period.\(^9\)

The third main change relates to the process of internationalization which has affected the sector to a very considerable degree (Miozzo and Miles, 2002). A study of the world’s largest 664 companies found that the financial services exhibits indices of internationalization higher than the same indices for the whole of services. (Ietto-Gillies, 2001: ch 4, tables 4.5 and 4.6, 83 and 84).

In this context of major environmental and structural changes for the financial services industry, multinationality and internal knowledge flows can interact in the production of innovation activities. There may be a potential advantage from multinationality due to the transfer of intangible assets; this could be achieved even in the face of observable institutional diversities that might pose difficulties to the transfer of resources. Examples include new services (e.g. on-line security trading) and new processes (e.g. credit scoring) associated with major global banks.

For global FSFs the multinationality factor is expected to have a significant impact on innovation. For example, Citigroup, based in the US and the world’s largest bank, has offices in over 100 countries and regions; the UK-based Barclays, one of the largest

---

\(^9\) See for more details, ECB (2000). The Herfindahl index (Hi) is equal to the sum of squared market shares.
financial services groups, has a presence in over 60 countries and serves over 20 million customers world-wide; HSBC, another UK-based FSF, has an international reach of more than 9,500 offices worldwide.

Such global institutions know how to use the most advanced technology to reduce significantly the costs of information management (i.e. collection, storage, processing and transmission) and increase the range of products and services they offer to a diverse range of customers.

Moreover, their knowledge and expertise applied in different cultural contexts is likely to stimulate their search for new products, often in an attempt to circumvent regulatory constraints. In this respect technology and innovation can be considered basic strategic tools for FSFs to safeguard their long-term competitiveness, cost-efficiency and improve profitability. However this does not imply that smaller and less global institutions necessarily have a lower potential to innovate. In financial services, issues like reputation and long-term relationships with customers are so relevant that they often generate “local monopolies” for small and medium-sized financial institutions. In the presence of increasingly lower switching costs, this factor is an obvious incentive for the less global financial firm to offer new products that minimise the potential loss of customers.

There is disagreement in the literature on the extent to which the internationalization process in financial services and banking in particular, is led by strategies of ‘follow the leader’ or by wider market-seeking strategies (Arora, 1995; Roy, 2002). As Molyneux et al. (1996) note, the important element in the recent process of financial deregulation has been the opening-up of the EU banking systems to domestic as well as foreign competition. The opening of the EU banking market has provided domestic banks and
other FSFs with an opportunity to expand their activities abroad, but also forced them to face increased foreign competition in their domestic market place. Financial integration has been generating incentives for FSFs to increase their activities in international markets and to develop a broader network of connections among financial institutions, both at the domestic and cross-border level.

5. Variables and methodology

In order to examine the impact of multinationality on innovation activities, we need two sets of variables: the first set of variables, our dependent variables, relates to innovation propensity and derives from the CIS 2. The second set relates to multinationality characteristics, which form our independent variables, and derives from linking information from WoW to the CIS.

As regards innovation variables, we consider some of those which can be seen as indicators of innovation propensity and for which we have a sufficient number of observations. We include three variables deriving from the CIS: two are considered as ‘output’ variables in the survey, and one is considered an ‘input’ variable. We see all three as important indicators of firms’ propensity to innovate, because they all show the enterprise’s commitment to innovation. The output variables are, in effect, ex post indicators of commitment; the input variable can be seen as an indicator of ex ante commitment.

The CIS gives us two types of innovation output: the first type focuses on whether the enterprises have introduced a new service between 1994 and 1996. The new service includes those services that are new to the firm but not necessarily new to the firms’
market. We call this ‘service innovation’. Service innovation is our broadest measure of innovation output.

The second type of innovation output derives from the so-called ‘novel innovation’ activities. These are innovations which are not only new to the firm but also new to the firm’s market. ‘Novel innovations’ are a narrower definition of innovation activities than the one deriving from service innovation in terms of the number of service products they include. However, they correspond to a deeper definition of innovations, to what is regularly labelled inventions. By including both types of innovations we can therefore assess the impact of both incremental and radical innovations (Tushman and Anderson, 1986; Henderson and Clark, 1990). In our models, both, service and novel innovation are dummy variables selecting all those CIS respondents who declared to have had service/novel innovation output.

Our third indicator of innovation propensity is a variable often used for such purpose in the literature (Pearce and Papanastassiou, 1999; Pavitt and Patel, 1999): R&D expenditure. The relevance of R&D expenditure in our context is twofold. First, because it is an input into the innovation process and, as such, is also, traditionally, considered to be a good indicator of innovation results. Second, because it signals the general ex ante commitment of the company to engage in innovation strategies. In our case we have data on the total amount of enterprise expenditure on activities related to research and development (R&D) in 1996. The resulting variable is continuous and measured in £000s.

As regards variables related to multinationality we are looking at: (1) whether the company to which the enterprise belongs is a uninational or multinational company; (a) whether the enterprise belongs to a wider group or not, (b) the degree of multinationality
on which we consider two types of indices (as discussed below); and (c) whether the company to which the enterprise belongs is foreign or UK-owned.

In hypothesis (a) we disaggregate uninational firms into (i) independent entities and (ii) enterprises belonging to wider company group. Therefore, we need a variable stating whether an enterprise is part of a wider group as opposed to being an independent entity. This binary variable is extracted directly from the CIS/IDBR (as mentioned in section three).

For the other hypotheses we construct four variables by linking the CIS data to the WoW dataset\textsuperscript{10} and we proceed as follows. First, we create a dummy variable identifying all CIS respondents which belonged to multinational companies (both foreign and UK).

For hypothesis (c) we create a dummy variable distinguishing between foreign ownership and UK ownership. Enterprises that are foreign-owned are, by default, part of a MNC that originates from outside the UK. There are 44 foreign-owned enterprises\textsuperscript{11}.

Table 1 gives an overview of the number and proportion of innovators amongst: independent enterprises, enterprises belonging to a company group, enterprises belonging to a MNC and enterprises belonging to a foreign MNC.

---

\textsuperscript{10} In total our sample contains 127 enterprises. We must note that the data is biased towards multinational firms. There are 100 MNCs; only 27 firms are UNCts (12 belonging to a uninational group and 15 are independent entities).

\textsuperscript{11} Of the foreign-owned enterprises, 12 are American and 10 French. The Netherlands, Switzerland and Australia account for 4 enterprises each. The remaining 10 enterprises are spread over seven countries. All originate from developed countries, except for 2 enterprises whose home countries are Hong Kong and Singapore respectively.
Table 1: Number and per cent of innovators and average amount spent on R&D across different enterprise groups

<table>
<thead>
<tr>
<th>Category</th>
<th>Service innovator</th>
<th>Novel innovator</th>
<th>Total R&amp;D spent in £000s</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No of obs</td>
<td>Freq</td>
<td>Per cent</td>
</tr>
<tr>
<td>Independent enterprises</td>
<td>15</td>
<td>6</td>
<td>40.0</td>
</tr>
<tr>
<td>Enterprises part of a company group</td>
<td>112</td>
<td>75</td>
<td>67.0</td>
</tr>
<tr>
<td>Enterprises part of a MNC</td>
<td>100</td>
<td>70</td>
<td>70.0</td>
</tr>
<tr>
<td>Enterprises part of a foreign MNC</td>
<td>44</td>
<td>28</td>
<td>63.6</td>
</tr>
<tr>
<td><strong>Total enterprises</strong></td>
<td><strong>127</strong></td>
<td><strong>81</strong></td>
<td><strong>63.8</strong></td>
</tr>
</tbody>
</table>

No of obs (number of observations) = Number of enterprises in each category. Freq (frequency) = number of enterprises that are innovators. Per cent = freq/no of obs x 100.
Source: CIS 2; own calculations.

On average 63.8 per cent of enterprises in our sample were service innovators. Out of the independent enterprises only 40 per cent engaged in service innovation compared to 70 per cent of enterprises belonging to a MNC. Amongst foreign-owned enterprises and enterprises part of a uninational group 63.6 and 67 per cent of enterprises, respectively, were service innovators. In terms of novel innovation, the foreign-owned enterprises had the highest proportion of innovators (45.5 per cent) followed by enterprises part of an MNC and enterprises part of a group. Looking at the final column of table 1 we see that foreign-owned enterprises had, on average, a lower total R&D expenditure compared to enterprises part of all (UK and foreign) MNCs. Independent firms had a particularly low overall R&D spent.

---

12 Innovators are enterprises that declared to have had any service innovation or novel innovation output during the three year period 1994 to 1996. The amount spent on R&D refers to the total expenditures for the year 1996.
Furthermore, two indices of the degree of multinationality are constructed. The background to the construction of such indices is the following. Several authors have developed indices designed to capture the companies’ degree of multinationalization (Dunning and Pearce, 1981; Sullivan, 1994; UNCTAD, 1995; Ietto-Gillies, 1998 and 2001: ch. 4; Davies and Lyons, 1996: chs 7 and 11; Van den Berghe, 2003). Some of these indices are based on single variables, some on a combination of several. Moreover, the conceptual framework of the indices can vary considerably\textsuperscript{13}. With respect to the last issue, some indices assess the degree of ‘foreignness’ i.e. the relative extent to which the company’s activities take place abroad. Others take account of the number of countries or regions in which MNCs operate and therefore the spread of activities by country or the concentration of activities in certain regions\textsuperscript{14}.

The indices to be used as variables in this work relate to both these dimensions. They were developed in Ietto-Gillies (1998 and 2001: ch. 4) and are: the Internationalization Index (Ii) and the Network Spread Index (NSi). Ii is designed to capture the \textit{intensity} of internationalization, that is the degree of international activities in relation to the total activities of the company. Ii is calculated as the ratio of foreign to total companies’ affiliates and it therefore gives the degree of ‘foreign projection’ of the company.

NSi aims to capture the degree of geographical (by nation-state) \textit{extensity} of the MNC. It is the number of foreign countries in which the company has affiliates in relation to the total number of foreign countries in which it could potentially have operated. The

\footnote{A discussion of the relevance of setting the indices in the context of a theoretical framework is in Ietto-Gillies (2004).}

\footnote{Indices have also been developed to assess the degree of multinationalization at the macro level. For example, UNCTAD, \textit{World Investment Report} has been publishing for many years, ratios of FDI to GDP and to GDDCF for most countries and regions. Ietto-Gillies (1989) develops an indicator of multinational domination of national economies. UNCTAD (2001) develops and estimates a new FDI index in an attempt to capture the countries’ propensity to attract FDI.}
latter is identified as the number of countries in receipt of inward stock of FDI: an indication that the country is potentially willing to accept foreign investment. Both indices are based on the number of affiliates rather than value of their assets or activities. This is due to paucity of data on such values by affiliates for each host country.

Both indices have value 0 for those enterprises which are part of UK uninational companies, whether these are independent or part of a group. The average $I_i$ for all MNCs amongst the financial services enterprises in our sample is 44.5 per cent; the highest value is 94.0 per cent. The average $NS_i$ is 10.3 per cent; the highest value is 33.1 per cent. On average the companies of which our enterprises are part have affiliates in 18 foreign countries.

Table 2: Number of MNCs and selected indicators of the degree of multinationality

<table>
<thead>
<tr>
<th>Country of origin</th>
<th>No of MNCs</th>
<th>$I_i$</th>
<th>$NS_i$</th>
<th>No. of foreign countries</th>
<th>No. of foreign affiliates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foreign MNCs</td>
<td>Number</td>
<td>Average</td>
<td>Average</td>
<td>Average</td>
<td>Average</td>
</tr>
<tr>
<td></td>
<td>44</td>
<td>48.2%</td>
<td>11.6%</td>
<td>21</td>
<td>107</td>
</tr>
<tr>
<td>UK MNCs</td>
<td>56</td>
<td>41.7%</td>
<td>9.3%</td>
<td>16</td>
<td>105</td>
</tr>
<tr>
<td>All MNCs</td>
<td>100</td>
<td>44.5%</td>
<td>10.3%</td>
<td>18</td>
<td>106</td>
</tr>
</tbody>
</table>

*Source*: WoW; own calculations.

Table 2 breaks down the MNCs in our sample by foreign and UK. It gives values for the two indices of the degree of multinationality ($I_i$ and $NS_i$) as well as data on the number of foreign countries in which the MNCs operate and the number of foreign affiliates they have. The UK MNCs appear to be a little less internationalised than the foreign ones on both indicators of intensity ($I_i$) and extensity ($NS_i$, number of foreign countries and of foreign affiliates).
In all our models, we control for the size of the firm using the natural log of the number of employees. Size can be considered one of the “classic” variables of innovation studies, having often been found to relate to the nature and patterns of innovation (Cohen, 1995; Tether, 2001). It should be noted that the size variable refers to the enterprise and not the company to which the enterprise belongs.

The methodology used is regression methods in which we examine the association between innovation activities and a variety of multinationality elements of the enterprise and the company to which it belongs. Due to the relatively high correlation between the variables under investigation (see table I in the Appendix for details), four separate regressions are run to test our hypotheses. We use linear and logistic regression models as appropriate and as will be explained in the discussion of the results for each hypothesis. The results, where statistically significant, support an association rather than causality between elements of multinationality and innovation activity. They may be interpreted as the probability or likelihood of a firm being innovation active when certain elements of multinationality are present (e.g., foreign ownership).

6. Results

As outlined in section two, this paper sets out to test one main hypothesis (1) and three (a-c) related sub-hypotheses through regression analysis. Here are the results.
Main Hypothesis

To test our main hypothesis we compare the innovation activities of enterprises belonging to MNCs with the innovation activities of non-MNCs that is of enterprises which are either independent UK units or part of a group whose units are all located in the UK.

We divide our sample of 127 CIS FSFs into 100 enterprises which are part of a MNC and 27 which are not. A dummy variable selecting the 100 MNCs (i.e. value of 1) and deselecting the 27 UNCs (i.e. value of 0) is our independent variable, which we call MNC. Regression model 1 has a binary dependent variable assigning a value of 1 to all enterprises declaring to have had some service innovation output between 1994 and 1996. In models 2 and 3 the dependent variables are: (model 2) a dichotomous variable selecting all enterprises which ‘had introduced new or improved services also new to the market’ (novel innovation); and (model 3) the natural log of the ‘amount spent on R&D’.

Models 1 and 2 are logistic regressions. Model 3 is a linear regression because the dependent variable is continuous as opposed to dichotomous.

Table 3 presents the regression results related to the impact of multinationality on indicators of innovation propensity. We compare the likelihood of the propensity to innovate for enterprises which are part of a MNC with those which are not.
Table 3: The impact of belonging to a MNC on indicators of innovation propensity

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Service innovation</td>
<td>Novel innovation</td>
<td>ln (total R&amp;D expenditure)</td>
</tr>
<tr>
<td></td>
<td>Exp(B)</td>
<td>Exp(B)</td>
<td>Standardized B</td>
</tr>
<tr>
<td>MNC</td>
<td>1.618</td>
<td>3.591*</td>
<td>0.223**</td>
</tr>
<tr>
<td>ln(emp)</td>
<td>1.573***</td>
<td>1.309**</td>
<td>0.473***</td>
</tr>
<tr>
<td>N</td>
<td>127</td>
<td>127</td>
<td>91#</td>
</tr>
<tr>
<td>Model χ²</td>
<td>23.420***</td>
<td>15.443***</td>
<td>-</td>
</tr>
<tr>
<td>Nagelkerke R²</td>
<td>0.231</td>
<td>0.158</td>
<td>-</td>
</tr>
<tr>
<td>F value</td>
<td>-</td>
<td>-</td>
<td>26.546***</td>
</tr>
<tr>
<td>R² adjusted</td>
<td>-</td>
<td>-</td>
<td>0.362</td>
</tr>
</tbody>
</table>

Source: Own calculations CIS 2 and WoW.

* # N equals 91 in model 3 because of 'partial missing values' in the CIS (i.e. respondents leaving a question unanswered). Amongst the 91 enterprises analysed in model 3 are 17 UNC and 74 MNC.

** *, **, *** indicates significant at 10%, 5% and 1% respectively.

In terms of our CIS respondents we find some indication that being part of a MNC is positively associated with novel innovation and with a higher expenditure on R&D.

Model 1 shows that being part of an MNC has no significant impact on the likelihood of engaging in wider measures of innovation, i.e. service innovation. In model 2 the logistic regression coefficient is significant at the 10 per cent (with p=0.058) and thus gives an indication of a possible relationship between multinationality and the likelihood of being a novel innovator. Model 3 shows a positive impact of the MNC variable on the amount spent on R&D. This is significant at the 5 per cent level (p=0.023).

We find some support for the hypothesis that enterprises that are part of a MNC are more likely to engage in novel innovation and have relatively higher expenditure on research and development as opposed to enterprises which belong to uninational enterprises (either as independent UK companies or as part of a UK company group).

This might suggest that enterprises belonging to a MNC exhibit a higher propensity to engage in more radical forms of innovation – innovations new to the market - and have a
stronger ex ante commitment to innovation as exemplified by their expenditure on R&D. They have, however, no apparent advantage in terms of imitative and incremental forms of innovation i.e. improvements to existing services.

*Hypothesis (a)*

In table 3 we tested our first and main hypothesis: multinationality *per se* has an impact on firms’ propensity to innovate. There are indications of some support as regards the variables ‘novel innovation’ and ‘R&D expenditure’ though not in terms of the broader measure of innovation: ‘service innovation’. We now set about investigating the first of the three characteristics of multinationality identified in section two. Being part of a wider group as opposed to being a standalone independent entity might affect innovation propensity because the units learn from each other; moreover, if the group operates in many countries, this can have additional positive effects because of contacts with more diverse cultural environments and innovation systems. This differs from the main hypothesis in the way that it discriminates between two types of uninationals, (i) the independent enterprises and (ii) those part of a uninational group.

In order to examine the extent of impact of both phenomena – group belonging and operating in different countries – we look at all those enterprises which are part of a wider group, be it uninational or multinational. There are 112 such enterprises. A dummy variable (MNC group) selects the ones which – according to the WoW dataset – are part of a multinational group (100 firms) and deselected the ones which are part of a uninational group (12). A total of 15 independent enterprises included in the regression in table 3 (first hypothesis) have, therefore, been dropped from the analysis that follows in table 4.
Table 4: The impact of belonging to a multinational group as opposed to a uninational group on indicators of innovation propensity

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Service Innovation</td>
<td>Novel innovation</td>
<td>ln(total R&amp;D expenditure)</td>
</tr>
<tr>
<td></td>
<td>$\text{Exp}(B)$</td>
<td>$\text{Exp}(B)$</td>
<td>$\text{Standardized } B$</td>
</tr>
<tr>
<td>MNC/GROUP</td>
<td>1.982</td>
<td>5.692*</td>
<td>0.236**</td>
</tr>
<tr>
<td>ln(emp)</td>
<td>1.722***</td>
<td>1.398***</td>
<td>0.463***</td>
</tr>
<tr>
<td>N</td>
<td>112</td>
<td>112</td>
<td>84#</td>
</tr>
<tr>
<td>Model $\chi^2$</td>
<td>21.754***</td>
<td>13.711***</td>
<td>-</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>0.246</td>
<td>0.157</td>
<td>-</td>
</tr>
<tr>
<td>F value</td>
<td>-</td>
<td>-</td>
<td>19.979***</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>-</td>
<td>-</td>
<td>0.314</td>
</tr>
</tbody>
</table>

*Source: Own calculations CIS 2 and WoW.*

# N equals 81 in model 3 because of ‘partial missing values’ in the CIS with respect to the variable ‘total R&D expenditures’. In model 3 there are 10 enterprises that are part of a uninational company groups (base group) and 74 enterprises part of a multinational company groups.

In model 1 and 2 there are 12 enterprises belonging to a uninational company group (base group) and 100 enterprises belonging to a multinational company group.

*, **, *** indicates significant at 10%, 5% and 1% respectively.

Being part of a MNC (as opposed to a uninational group) appears to have a positive impact on ‘novel innovation’ and ‘R&D expenditures’. Model 2 shows that the likelihood of being a novel innovator is greater for MNCs than for enterprises which are part of a uninational group. However, the significance level is 10 per cent so the results should be interpreted with some caution. The impact on R&D expenditures is positive and significant at the 5 per cent level. Again, we find no relationship with ‘service innovation’.

The results give some indication that enterprises that are part of a MNC have additional benefits through operating in different countries – as opposed to being part of a group that operates in only one country. The results have to be treated with caution, however, because the correlation between GROUP and MNC variables is high, i.e. the
correlation coefficient between MNC and GROUP equals 0.7 and significant at the 1 per cent level (see appendix).

**Hypothesis (b)**

From the results for our main hypothesis (1) and first related sub-hypothesis (a) it emerges that operating abroad – for the company as a whole - has a positive impact on the enterprise’s propensity to innovate. Does this mean that the more a company is involved abroad, the more innovative is the enterprise belonging to it? In order to explore this issue we look at the impact of the two multinationality indices considered in section five, on the probability to innovate. We are considering the indices of a total of 127 enterprises for which we have the relevant information. The 27 UNCs have an Ii and NSi of 0. Table 5a and 5b give the results of the logistic regressions in relation to service and novel innovation as well as R&D expenditure.

**Table 5a: The impact of the degree of internationalization (Ii) on innovation propensity**

<table>
<thead>
<tr>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Service Innovation</strong></td>
<td><strong>Novel innovation</strong></td>
<td><strong>In (total R&amp;D expenditure)</strong></td>
</tr>
<tr>
<td>Exp(B)</td>
<td>Exp(B)</td>
<td>Standardized B</td>
</tr>
<tr>
<td>Ii</td>
<td>1.133</td>
<td>5.043**</td>
</tr>
<tr>
<td>ln(emp)</td>
<td>1.635***</td>
<td>1.364***</td>
</tr>
<tr>
<td>N</td>
<td>127</td>
<td>127</td>
</tr>
<tr>
<td>Model $\chi^2$</td>
<td>22.589***</td>
<td>15.947***</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>0.163</td>
<td>0.163</td>
</tr>
<tr>
<td>F value</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

*Source: Own calculations CIS 2 and WoW.*

# N equals 91 due to partial missing values in the R&D expenditure data.

*, **, *** indicates significant at 10%, 5% and 1% respectively.
The degree of internationalization as captured by the index $I_i$ (i.e. the number of foreign affiliates as a proportion to the number of total affiliates) increases the likelihood of being a novel innovator by a factor of 5. This is significant at the 5 per cent level. The overall model is significant at the 1 per cent level and explains around 16 per cent of variation in the dependent variable.

**Table 5b: The impact of the degree of network spread ($NS_i$) on innovation propensity**

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Service Innovation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Exp(B)$</td>
<td>1.046</td>
<td>32.984*</td>
<td>0.013</td>
</tr>
<tr>
<td><strong>Novel innovation</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$Exp(B)$</td>
<td>1.641***</td>
<td>1.370***</td>
<td>0.578***</td>
</tr>
<tr>
<td><strong>ln(total R&amp;D expenditure)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Standardized $B$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$NS_i$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$ln(emp)$</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>127</td>
<td>127</td>
<td>91#</td>
</tr>
<tr>
<td>Model $\chi^2$</td>
<td>22.561***</td>
<td>14.110***</td>
<td>-</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>0.163</td>
<td>0.145</td>
<td>-</td>
</tr>
<tr>
<td>F value</td>
<td>-</td>
<td>-</td>
<td>22.516***</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>-</td>
<td>-</td>
<td>0.323</td>
</tr>
</tbody>
</table>

*Source: Own calculations CIS 2 and WoW.*

# N equals 91 due to partial missing values in the R&D expenditure data.

*, **, *** indicates significant at 10%, 5% and 1% respectively.

Table 5b indicates a positive relationship between the degree of network spread ($NS_i$) and novel innovation. This is significant at the 10 per cent level. The overall model is significant at the 1 per cent level and explains around 15 per cent of variation in the dependent variable. There is no statistically significant relationship between service innovation, R&D and $NS_i$. 
**Hypothesis (c)**

If multinational enterprises are more likely to innovate, does foreign ownership matter in terms of firms’ propensity to innovate, i.e. are enterprises which are part of foreign owned MNCs more likely to innovate than enterprises belonging to UK-owned MNCs? The descriptive statistics in table 1 above indicate that this might be the case for novel innovation. In table 6 we test for the degree of association between non-UK ownership of an MNC and its innovation propensity. In order to do so we use a dummy variable selecting all those firms that are part of a foreign multinational. There are 44 such enterprises. The variable is called FOM.

### Table 6: The impact of belonging to a foreign MNC as opposed to a UK owned MNC on indicators of innovation propensity

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Service Innovation</td>
<td>Novel innovation</td>
<td>ln (total R&amp;D expenditure)</td>
</tr>
<tr>
<td>Exp(B)</td>
<td>Exp(B)</td>
<td>Exp(B)</td>
<td>standardized B</td>
</tr>
<tr>
<td>FOM</td>
<td>0.918</td>
<td>2.440**</td>
<td>0.015</td>
</tr>
<tr>
<td>ln(emp)</td>
<td>1.746***</td>
<td>1.619***</td>
<td>0.551***</td>
</tr>
<tr>
<td>N</td>
<td>100</td>
<td>100</td>
<td>84#</td>
</tr>
<tr>
<td>Model $\chi^2$</td>
<td>16.608***</td>
<td>13.064***</td>
<td>-</td>
</tr>
<tr>
<td>Nagelkerke $R^2$</td>
<td>0.217</td>
<td>0.165</td>
<td>-</td>
</tr>
<tr>
<td>F value</td>
<td>-</td>
<td>-</td>
<td>15.277***</td>
</tr>
<tr>
<td>$R^2$ adjusted</td>
<td>-</td>
<td>-</td>
<td>0.281</td>
</tr>
</tbody>
</table>

*Source: Own calculations CIS 2 and WoW.*

# N equals 84 due to partial missing values in the CIS. There are 47 UK MNCs and 27 foreign MNCs in model 3.

*, **, *** indicates significant at 10%, 5% and 1% respectively.

The regression results indicate that in terms of novel innovation, the foreign MNCs appear to be around 2.5 times more likely to be active than the UK ones. This is significant at the 5 per cent level. Moreover, there appears to be no difference between
the two groups, foreign and UK-owned MNCs, in terms of service innovation and the amount spent on R&D.

Overall, in the context of the results from previous hypotheses (particularly hypothesis 1), these results indicate that the country of origin does matter for the innovation capabilities of the enterprise because the company as a whole benefits from the innovative environment of the home country. These benefits spread over to the enterprises belonging to the company. In the case of our specific sector we may be able to hint at further inference. The financial service sector is a sector on which the UK has particular strengths. The relevance of foreign companies in terms of innovation may be a sign that only the very strong and innovative foreign companies locate and compete in the UK. The results for this sector in countries which are less advanced or for other sectors in the UK, might be different15.

Finally, there are two issues that apply to all our models and that we ought to mention here. Firstly, the variable explaining the size of the enterprise appears positive and statistically significant in all the models tested above. Indeed, the inclusion of size as a control variable improved all our models considerably. Models 1 and 2’s $\chi^2$ and Nagelkerke $R^2$ were significantly lower when estimated without the inclusion of size for all our hypotheses. Similar results were found for Model 3’s F-value and $R^2$ adjusted. This confirms the findings of numerous studies in the area (see for example Cohen, 1995) on the importance of size for innovation. The second important issue derives from the possibility that the independent variables are intertwined a priori, because of an overlap

---

15 An anonymous referee has suggested to us that another possible explanation could be related to the fact that UK firms that are acquired by foreign ones are likely to undergo some restructuring in the post-acquisition period. This restructuring may involve the transfer and introduction of novel service concepts and products that represent the particular strengths of the acquiring company.
between the Group, MNC and FOM variable and because larger firms are more likely to innovate and to be multinationals.

While the results support the general hypothesis that multinationality is relevant for innovation, we cannot rule out reverse causality. Indeed, in a dynamic sense, innovation generates competitive advantages that facilitate further internationalization. We see the possibility of multinationality and innovation feeding on each other in a dynamic cumulative process.

A general result, that emerges from all our hypotheses, is the fact that innovation that are more radical – as indicated by the variable ‘novel innovation’ – appear to be more strongly associated with multinationality than incremental innovations – indicated by the variable ‘service innovations’.

7. Summary and conclusion
The paper starts with a brief summary of various theoretical positions on the relationship between multinationality and innovation. In particular, it highlights the shift in perspective between the periods 1960-80 and later decades. This is a sector not much researched in terms of innovation and yet one in which the new technologies have made a considerable impact. We wanted to test whether the new theoretical perspective finds corroboration in the information available from the UK CIS 2 and for financial services. Four different hypotheses were set up to test the impact of multinationality on innovation propensity. The hypotheses relate to the following: multinationality in general (i.e. whether a MNC is more likely to innovate than a uninaional company); multinationality versus group belonging (i.e. whether belonging to a multinational group is more relevant for innovation than belonging to a uninaional group); the impact of the degree of
multinationality on innovation; and the nationality of ownership (whether belonging to a foreign versus UK multinational is relevant). In all our models we control for the size of the firm using the natural log of the number of employees. We discussed the datasets, variables chosen and the methodology used and then presented and discussed the results.

Our dependent variables are indicators of innovation propensity and because we utilize both service and novel innovation variables, the results we get can be interpreted in terms of both incremental and radical types of innovation (Tushman and Anderson, 1986). Our findings indicate that there is a relationship between innovation and radical types of innovation as measured when examining novel innovation activity. Our findings on service innovation suggest that multinationality has no statistically significant impact on incremental improvements.

The results appear to corroborate the following: multinationality per se is important for innovation propensity over and above the relevance accruing to it because an enterprise which is part of a MNC belongs to a group. Moreover, the higher the degree of multinationality, the higher the innovation propensity. This is particularly pronounced when examining the network spread of MNCs; this means that operating in different national environments does contribute to the development and spread of innovation.

These results suggest that a better understanding of innovation activity and its diffusion may have to take account of the fact that each enterprise within the company learns from the other internal parts of the company. The results confirm other findings in the literature (Hedlund, 1986; Ghoshal and Bartlett, 1988; Cantwell, 1989 and 1995; Bartlett and Ghoshal, 1989; Hedlund and Rolander, 1990; Zanfei, 2000) in relation to multinationals. Moreover, they suggest that the impact on innovation is stronger if the enterprise is linked – via the rest of company – to diverse innovation environments. This
can occur because the enterprise belongs to a foreign company or because it is part of a domestic MNC.

8. Implications for future research

The results show that multinationality _per se_ is a characteristic worth exploring in future explanatory work on innovation. As pointed out, it is a characteristic of the company rather than the enterprise; nonetheless it may affect the innovation level and activities within the enterprise as well as the overall company. From the various results in this paper it is clear that a study of innovation in specific enterprises makes it necessary to take account of characteristics related to the company as a whole as well as to the enterprise.

Overall, these findings point to the desirability of more research on the role of multinationality in all its aspects on innovation. However, the European Community Innovation Surveys do not contain many questions – to be used as variables – on the issue of possible transfer of knowledge and innovation internally within the group, though these are issues now considered of great relevance in both the economics and the managerial/organization literature. Essentially we do not have potential variables on the learning process via internal – within the group – networks or via external ones (between the enterprise and the external environment). The only questions in these respects are: (1) collaboration activities on innovation within the company group whether at the local, national or international levels\(^\text{16}\). (2) information sources used to innovate within the company.

\(^\text{16}\) Moreover the variable on collaboration activities is particularly prone to partial missing values (questions skipped and left unanswered by CIS participants).
This brings us to the issue of the theoretical perspective underlying the CIS. Essentially the surveys are enterprise-centred. Most questions related to outputs, inputs, activity, performance, aims, constraints etc. of innovation refer to the enterprise. This means that, as it stands, the CIS cannot provide enough information to test the new approaches which stress the role of the company and its internal and external networks in the relationship between multinationality and innovation. We have attempted to do it by recourse to other databases. Our effort would have been made easier if: (a) some of the information on structural features we had to extract from other databases had been available within the CIS, and the CIS had provided us with performance and structural features related to the company as a whole (such as company size, performance indicators and R&D), and (b) the CIS contained more questions on the role of the company as a whole – as opposed to the single enterprise within it – on the innovation capability of the enterprise; the role of multinational versus uninational networks in innovation.

This takes us to the overall shortcomings of our findings of which the one just highlighted is part. Others include the fact that we confine our research to one sector only. It would be good to be able to extend the research to all the industries; moreover a break down of empirics by country of origin of the company would give us richer results in terms of the nationality issue. As the size of the enterprise seems to play an important role in the explanation of the innovation propensity, its full extent could only be ascertained by using a much larger sample than the one available for a single sector. Furthermore, within the overall perspective of this paper, the size of the company – and
not just the enterprise – should be tested for its impact on innovation. However, we do not have the relevant information from the CIS.\footnote{17 We attempted to obtain information on companies’ size and performance but low availability of data would have compromised our sample size.}

We are also aware that we have not established causal relationships. Nonetheless, we feel that the results give us enough corroboration for the hypotheses of a strong relationship between multinationality and innovation of the type envisaged in the more recent theories on the subject. The degree of corroboration seems strong enough to warrant further research on the CIS itself as well as using other datasets. It is also strong enough to warrant the consideration of possible amendments to the Community Innovation Survey to include more questions on the possible impact of elements related to the company - and its internal and external networks - on the innovation capabilities of enterprises and companies.
References


Knickerbocker, F. T. 1973: *Oligopolistic Reaction and Multinational Enterprise*. Cambridge, MA: Division of Research, Graduate School of Business Administration, Harvard University.


Appendix

Table I: Correlation between independent variables

<table>
<thead>
<tr>
<th>Correlation coefficients</th>
<th>MNC</th>
<th>GROUP</th>
<th>Li</th>
<th>NSi</th>
<th>FOM</th>
<th>Ln(emp)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MNC</td>
<td>1.00</td>
<td>0.704***</td>
<td>0.655***</td>
<td>0.441***</td>
<td>0.378***</td>
<td>0.409***</td>
</tr>
<tr>
<td>GROUP</td>
<td>1.00</td>
<td>0.461***</td>
<td>0.311***</td>
<td>0.266***</td>
<td>0.389***</td>
<td>0.244***</td>
</tr>
<tr>
<td>Li</td>
<td>1.00</td>
<td>0.619***</td>
<td>0.343***</td>
<td>0.269***</td>
<td>0.204***</td>
<td></td>
</tr>
<tr>
<td>NSi</td>
<td>1.00</td>
<td>0.269***</td>
<td>0.204***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>FOM</td>
<td>1.00</td>
<td>0.244***</td>
<td>0.204***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ln(emp)</td>
<td>1.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.059</td>
</tr>
</tbody>
</table>

Source: CIS 2; own calculations.

**, *** indicates significant at 5% and 1% respectively.