Panorama

The economic analysis of multinationals and foreign direct investment: A review

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Abstract

This article provides an up-to-date, comprehensive synthesis and evaluation of the existing literature on multinational firms and foreign direct investment. Unlike most previous reviews it combines several insights showing their inconsistencies and complementarities. Through a chronological description it presents the main strands since the earliest perfect competition studies from the 1960s till some new recent contributions such as the knowledge-capital model, heterogeneous firms models, and internalisation issues. The paper also offers a new perspective, by reviewing the available computable general equilibrium models that include multinationals and foreign direct investment.

Keywords: Multinational enterprises, Foreign direct investment, Computable general equilibrium models.

JEL classification: F21, F23, C68.

1. Introduction

Multinational enterprises (MNEs) are nowadays the focus of much attention as they are central players in the world economy. However, their analysis constitutes a young discipline. Most studies begun in the 1960s, a period in which foreign direct investment (FDI) was experiencing an enormous growth, which attracted economists' attention. This was not, however, the first moment in which FDI had grown dramatically. Baldwin and Martin (1999) describe two waves of globalisation which are related to a rise in FDI flows, among other aspects. The first wave had taken place in the period 1820-1914, and was characterised by

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North to South FDI in primary product sectors and railroads. The second wage initialised in the 1960s and still continues nowadays, involving FDI mainly among developed nations with a focus on manufacturing, services and outsourcing. What caused such remarkable growth of FDI in the past? What is causing it nowadays? Which are its consequences?

Since the 1960s, the study of MNEs and FDI has been a fertile research topic. A number of authors have devoted their efforts to review the literature; see Agarwal (1980), Graham (1992), Markusen (1995), Blomström and Kokko (1997), Lipsey (2002), Barba Navaretti and Venables (2004), Feenstra (2004), Helpman (2006), Caves (2007), Greenaway and Kneller (2007) and Antràs and Rossi-Hansberg (2008), to name a few. This article offers a concise but comprehensive review and evaluation of the existing literature on MNEs and FDI since its beginnings, with two main targets in mind. First, we offer an up-to-date, comprehensive synthesis and evaluation of the main theoretical strands. In particular, through a chronological description, we show that some of the earlier studies provided enlightening ideas, which are now being developed through more formal and sophisticated analyses, such as Markusen's (2002) "knowledge-capital model", or the recent studies on heterogeneous firms and internalisation issues. Unlike previous studies, we do not focus on a particular strand of the literature but combine several theoretical insights (i.e., contractual and technological theories), which proves useful to grasp their disagreements and complementarities.

Second, we offer a new perspective for the analysis of the effects of MNEs. These effects have been very much debated indeed, and there is still some controversy regarding their impact on host economies, as can be seen in the active antiglobalisation movements. Instead of offering a common review on econometric and descriptive studies, we focus on new developments following the use of computable general equilibrium (CGE) models, which have recently included the activities of MNEs. Econometric and descriptive analyses have provided fruitful results but they offer dispersed contributions and different strands according to the particular effect analysed. Thus, there is literature on their impact on wages, a different literature on their effects on foreign trade, another one on productivity, on market structure, and so on. Can we see which economic forces prevail among the several simultaneous ones that MNEs unleash in a host economy? Facing such a fragmented literature, it seems difficult to obtain an economy-wide evaluation of their impact. This is why we look at a less known and nascent empirical line of research which seems suitable for this type of analyses, namely, CGE models, which convey a novelty in the available surveys on MNEs and FDI.

The paper is organised as follows. Section 2 successively review the perfect competition approaches from the 1960s, which treated FDI as a mere capital movement (section 2.1); the imperfect competition approaches from the 1970s, in which some aspects of MNEs were added to FDI modeling (section 2.2); the imperfect competition approaches that appeared from the 1980s onwards, which differentiate between vertical and horizontal MNEs, including the "knowledge capital model" (section 2.3); the heterogeneous firms models in the 2000s (section 2.4); and finishes with some recent contributions on internalisation issues (section 2.5). Section 3 goes on with the reviews of CGE models, beginning with a brief dis-

cussion of methodological aspects (section 3.1); and then analysing the main features of the available models that include MNEs (section 3.2). Finally, some concluding remarks are presented in section 4.

2. Multinational firms and foreign direct investment: Main theoretical strands (1960s-1970s-1980s-2000s…)

2.1. Perfect competition approaches (1960s): Foreign direct investment as a capital movement

The first formalisations of FDI tended to model it as capital (i.e., a production factor) moving across countries. This idea was a logical extension of the traditional theory of investment responding to differences in the expected rates of return on capital. This view, therefore, predicted that FDI would go from capital abundant countries (where its return was low) to capital scarce countries (where its return was high). Two early theoretical contributions in this line are Mundell (1957) and MacDougall (1960).

Mundell (1957) analysed the effects of factor movements in a 2-sector, 2-countries and 2-factors (2×2×2) Heckscher-Ohlin model. Under this framework, unless factor endowments differences between the two countries are extreme, so that the factor price equalisation theorem does not hold, product and factor prices remain unchanged after a capital inflow. On the contrary, with extreme factor endowments differences, countries would specialise in the production of the good which is a relatively heavy user of the more abundant and, therefore, cheaper factor of production in each country, thus, excluding factor price equalisation. Another outcome stemming from his model is that the capital inflow reduces imports, i.e., trade and capital movements are found to be substitutes. This is why his contribution has been summarised in the idea that "trade in factors is a substitute for trade in goods".

The suggestion that capital flows do not have any effect on factor prices, obtained in a Heckscher-Ohlin model, is a rather surprising result. In fact, adding the assumption of specific factors to a simple (2×2×2) Heckscher-Ohlin model considerably changes the outcomes, as capital inflows do affect factor rewards and give rise to cross-hauled FDI flows, i.e., there will be two-way flows between pairs of countries (Jones, 1971; Neary, 1978; Caves, 2007). This is a nice characteristic which matches the empirical evidence of most developed countries simultaneously sending and receiving FDI inflows.

Rather than analysing factor movements, as in Mundell (1957), MacDougall (1960) focuses on the simplest case of a capital inflow into a one-sector economy. FDI inflows in this setting lower the capital rent in the receiving economy, but also increase labour productivity. The latter effect predominates, increasing welfare for the receiving economy.

Some findings from the models above, such as two-way flows of direct investment, or the potential substitution between trade and FDI are genuine intuitions. However, this theory

does not seem to be convincing as an explanation of FDI. The bulk of FDI flows originates in (and is directed to) developed economies, which should be capital abundant (Barba Navaretti and Venables, 2004, chapter 1; Markusen, 2002; UNCTAD, several years). In fact, the share of developing economies in world gross FDI flows has usually been around 20-25 percent since the 1970s onwards (Barba Navaretti and Venables, 2004, chapter 1). Furthermore, only a small number of developing economies receive these FDI inflows in the last years, e.g., China accounts for nearly one-quarter of the total, and a few economies in Asia and Latin America account for the rest, whereas flows going to Africa are nearly negligible (Barba Navaretti and Venables, 2004, chapter 1; UNCTAD, several years). This means that capital does not go to high return locations, i.e., developing countries with low capital endowments. Nevertheless, data problems may lead to defend that this theory still holds because it was tested using inappropriate variables. On the one hand, there are many problems to calculate the correct rate of return. Empirical analysis usually relies on profits calculated from an accounting point of view which differ from those derived from economic criteria. This is so because MNEs use transfer prices for transactions between the parent and subsidiaries to make profits arise in countries with the most favourable tax environment, among other reasons. On the other hand, Yeaple (2003a) maintains that aggregation biases might be behind the empirical outcome that FDI is not related to differences in capital endowments (and, consequently, on the rate of return of capital) across countries.

In the 1960s and 1970s some economists worked on the empirical relationship between FDI, the rate of return and risk (Agarwal, 1980). The so called *portfolio theory* predicts a positive relation of FDI with respect to the rate of return and a negative one with respect to risk. Portfolio diversification may help to reduce the total risk involved, i.e., a firm can reduce risks by undertaking projects in more than one country. However, the portfolio theory is an extension of a vision of FDI as capital movements. In this sense, it is still incomplete. We see clearly nowadays, that the essence of FDI is that is related to a particular type of firms' production abroad. Each firm has a unique bundle of factors, competencies and procedures which get transferred to foreign operations when FDI occurs. Therefore, FDI is best thought of as movements of firms, rather than simple movements of capital (Graham, 1992; Barba Navaretti and Venables, 2004, chapter 11). This idea had appeared earlier. Indeed, some authors abandoned the emphasis on FDI as capital movements and turn their attention to the MNE.

2.2. Imperfect competition approaches (1970s): Adding some aspects of multinationals

The theories discussed above are based on the assumption of perfect competition in domestic factor and/or product markets. They belong to the traditional trade theory that has dominated for decades, based on competitive, constant-returns models. Hymer's (1976) work showed that the idea of FDI as a simple capital movement responding to rates of return (with or without risk) did not match the real characteristics of MNEs' activities. His pioneering analysis was in his PhD Dissertation, which dates back to 1960, but was published much later, in 1976. The consequences of his contribution were and still are very important.

He drew attention to the MNE, in particular, to the type of assets the MNE owned and to the difficulty of transferring those assets -due to *market imperfections*-. Two main types of market imperfections are relevant. One arises from MNEs' advantages with respect to firms with no foreign operations (the differentiation between firm types -MNEs versus domestic- violates the assumptions of perfect competition); and the other is due to transaction costs. Let us briefly review both in turn.

First, MNEs have some advantages compared to local firms. When establishing plants in a foreign country MNEs have some disadvantages compared with local firms (e.g., ignorance of customers' preferences, legal system, institutional framework and the cost of operating away from the parent company). If, despite these disadvantages, MNEs decide to establish plants abroad, they must possess some advantages to which existing or potential local competitors have no access and that more than compensate the disadvantages. Second, the concept of transaction costs. Transaction costs arise from the difficulties of using the market to organise transactions (e.g., it is hard to design a contract between the firm and its suppliers that contemplates all the circumstances that may arise in the future), therefore the firms' internal procedures are better suited than markets to organise transactions. This point will be further developed later on.

A different approach to FDI is the product-cycle theory (Vernon, 1966). This theory gave useful explanations for the expansion of US MNEs after World War II. It explains FDI as a reaction to the threat of losing markets as a product matures, and as a search of cheaper factor costs to face competition. Its essence is that most products follow a similar life cycle. In a first stage, the product appears as an innovation which is sold locally in the same country where it is produced (the US). This is so in order to facilitate satisfying local demand while having an efficient coordination between research, development and production units. In a second stage, the product begins to be exported (to Western Europe). In a third stage, some competitors arise in Europe. If conditions are favourable the firm will establish foreign subsidiaries there to face the increased competition and it may also establish subsidiaries in less developed countries to have access to cheaper labour costs to enhance its competitiveness.

Hirsch (1976) worked on the circumstances which influence a firm's decision on whether using exports or FDI to serve the foreign market. His model takes into account the costs of managing production abroad as well as the asset specificity of the capital owned by MNEs in a simple but complete framework. Other studies, this time empirically oriented, worked on the effects of tariffs on FDI and on the predominance of MNEs in industries characterised by differentiated output and more highly educated employees. Thus, we find some authors that were already using modern approaches to FDI, anticipating those of the 1980s. Before moving on to that period, though, we have to devote some attention to the important work of Dunning.

The analysis of Hymer (1976) was given an important step forward by Dunning's work (1977, 1979, 2000). Dunning put together already existing elements in a coherent and uni-

fied framework. He provided a triad of conditions necessary for a firm to become a MNE. These three conditions constitute the basis of the eclectic or OLI paradigm, where OLI stands for "ownership, location, internalisation". Ownership means the sort of advantages that MNEs should have, in the same line pointed out in Hymer's contribution. Location gives the idea that for a MNE to establish a new plant in a foreign country, this country must have some advantages compared to the home country of the MNE. These advantages may be cheaper factors of production, better access to natural resources, a bigger market, and so on. Finally, the internalisation idea had also been noted by Hymer when he dealt with transaction costs. It may be more beneficial for a firm to exploit its ownership advantages within its subsidiaries than to sell or license them to other independent firms.

The central concepts of the OLI paradigm have been also introduced in a dynamic framework known as the Investment Development Path. This concept relates the inward and outward direct investment position of countries with their corresponding stages of development (Dunning, 1981; Dunning and Narula, 1996). It suggests that countries tend to go through five main stages of development. Each of the stages links the GNP level with the net outward investment position, i.e., the difference between outward and inward FDI stocks.

2.3. Imperfect competition since the 1980s: Vertical versus horizontal multinationals

We have already alluded to the emergence of the importance of some aspects related to the firm in the framework of the analysis of FDI. This had also been the case in trade theories. Indeed, trade theories had begun to incorporate important elements of the industrial organisation literature, such as imperfect competition, economies of scale and product differentiation starting at Krugman (1979, 1980) and Helpman (1981). Clearly, this new approach, which is sometimes called "new trade theory", was a considerable improvement in trade models; reviews of this literature can be found in Bajo-Rubio (1991) and Krugman (1995). Triggered by the empirical observation of intra-industry trade (i.e. trade within the MNEs, either between the parent and the subsidiary or between affiliates), it delivered theoretical models able to resemble this form of trade. What is more, it further provided a framework in which MNEs could better integrate into the trade theory. Imperfect competition, economies of scale and differentiated products are more in accordance with Hymer's enlightening ideas regarding the nature of the MNE.

A new literature on MNEs has risen from this perspective. It is an approach that deals primarily with the incentives, or determinants, for FDI to arise. Taking a microeconomic perspective, the theory relies on location and ownership determinants, according to Dunning's terminology. Location advantages are related to the host country (factor prices, factor endowments, and distance measured as transport costs). Ownership advantages are captured from technological aspects of the firm, such as economies of scale, R&D efforts and transport costs. In what follows we will highlight some remarkable contributions stemming from this line of research.

Within this approach some studies concentrate on the analysis of horizontal MNEs or FDI, whereas others do the same on the vertical side of the phenomenon. Vertical MNEs are those which geographically separate each stage of the production process according to relative cost advantages. They, therefore, look for low-cost inputs and supply their output to other subsidiaries of the MNE through intrafirm exports. The link between vertical MNEs and intrafirm trade should not be overlooked, particularly because intrafirm trade, in turn, accounts for a relevant and increasingly growing part of international trade (Hanson *et al.*, 2005). Horizontal MNEs are those producing roughly the same product in different locations in order to gain an easier access to the host market, i.e. they are mainly interested in sales in the foreign country.

Let us begin with the studies on vertical MNEs. They deal primarily with the following question: why do firms sometimes break the production process across borders rather than keeping all stages in the home country? A pioneering model was that of Helpman (1984). He extended a 2×2×2 Heckscher-Ohlin model to include MNEs with monopolistic competition and differentiated products. In his model the incentive for vertical MNEs to arise stems from factor price differences across countries. Helpman showed that by splitting production processes with different input requirements MNEs can exploit cross-country differences in factor prices by shifting activities to the cheapest locations. In the presence of factor price differences across countries, firms have an incentive to geographically separate capital-intensive production of intangible assets (headquarters services, for example) from the more labour-intensive production of goods.

Therefore, the sort of MNEs described by Helpman, the vertical MNEs, tends to be more prevalent when there are differences in relative factor endowments among countries. Furthermore, in the case of vertical MNEs, FDI and trade are complements: "the larger the difference in relative factor endowments the larger is the volume of trade" (Helpman, 1984, p. 467). In addition, the introduction of MNEs increases the possibilities of FDI leading to the elimination of international factor price differences.

Zhang and Markusen (1999) offer a (2×2×2) model of vertical MNEs in a Cournot oligopoly incorporating transport costs that were absent in Helpman (1984). Their model predicts a positive relationship between the size of the host country and the number of vertical multinationals. There is a minimum threshold size below which no FDI takes place. The reason for this lies in transport costs and economies of scale. All production that cannot be sold in the host country market will have to be shipped back to the parent's country, which entails paying for transport costs. If trade costs and economies of scale are low then the host country size is not so important, though. The model also suggests the need for a minimum threshold of skilled labour in the host country where fragmentation takes place. Below that minimum FDI is discouraged. Furthermore, when MNEs arise, their more skilled-labour intensive technologies lead to a more skilled labour-intensive production in both countries. This pushes up the real wage of this factor of production in both countries.

What about the horizontal approach? This is concerned with the question: why do firms decide to serve foreign markets through FDI rather than simply exporting? This is not a re-

cent question (see, e.g., Hirsch (1976)), and we have nowadays a better idea regarding its answer. Markusen (1984) includes the analysis of this decision in a general equilibrium trade model with imperfect competition. Brainard's (1993, 1997) work is also an outstanding contribution. Her main findings are that firms choose horizontal FDI versus exporting when the gains from avoiding trade costs outweigh the costs of maintaining productive capacity in multiple markets, i.e. the so called *proximity-concentration trade off*. More technically, horizontal MNEs are more likely to arise when: 1) firm-level scale economies of scale are high, 2) plant-level scale economies of scale are low, and 3) trade costs are high. She tested her predictions empirically obtaining robust support for them.

Markusen and Venables (1998, 2000) offer two models of MNEs that also support the predictions of Brainard's analysis. Their novelty lies in their well-grounded outcome regarding two other determinants of the emergence of horizontal MNEs (and the corresponding impact on the pattern of trade and factor prices): countries' size and factor endowments. Horizontal FDI flows are increasing in countries similarities in size, as measured by GDP, and factor endowments; i.e., the more similar in GDP and factor endowments two countries are, the more FDI will take place between them. The logic is simple. When countries are very different, MNEs derive their disadvantage from having to locate costly additional "capacity" in a "disadvantaged" country (i.e., the one in which sales are smaller, factor costs are higher, and/or factor productivity is smaller). MNEs, therefore, cannot compete against single-plant national firms settled in an "advantaged" country, which serve the "disadvantaged" countries by exports. Note this outcome is just the opposite to that offered by models of vertical MNEs. Furthermore, these two models deliver a strong prediction regarding the relationship between trade and horizontal MNEs. When countries have a similar size and factor endowments, trade tends to go down and MNEs tend to increase, as horizontal MNEs compete and displace national firms and trade. Thus, trade and horizontal FDI are substitutes, again the opposite relationship compared to that predicted by vertical MNEs models.

Another important contribution is Markusen's "knowledge-capital model", developed in Markusen (1997; 2002, chapters 7 and 8). This is a 2-country, 2-factor, 2-good model in which both vertical and horizontal MNEs are included simultaneously. This means a step forward in MNEs' modeling, which is of particular relevance given the empirical importance of both types of flows (Helpman, 2006). Markusen is, further, one of the few authors, to the best of our knowledge, that offers a detailed study regarding the welfare effects of MNEs to which we turn now[1].

Markusen maintains that MNEs may benefit both countries in his model. However, it is the larger one that loses if indeed one country loses. This is the country in which MNEs' headquarters are, so he concludes that in contrast to some conventional arguments, it is generally the host economies that are ensured of gains and the parent countries that could lose from investment liberalisation. Markusen also looks at the effects on a host economy of trade liberalisation, investment liberalisation, and simultaneous investment and trade liberalisation. This perspective allows him to show that the host economies' welfare is highest under full liberalisation (investment and trade liberalisation). He notes that the "knowledge-

capital model" resembles a "pro-skilled labour bias", which is an important factor in making results go against the logic of traditional theory. The "pro-skilled labour bias" means that the effects of MNEs' emergence are analogous to a change to a more skilled-labour intensive technology in the world in general. In other words, MNEs make both countries specialise in more labour-skilled technologies than before MNEs' arrivals. An important consequence can be drawn from the skilled labour bias. If a factor of production loses from MNEs' emergence it will be unskilled labour. This finding is consistent with the results of Zhang and Markusen (1999).

Using data for inward and outward U.S. affiliate sales, Carr et al. (2001) obtain support for Markusen's "knowledge capital model" which, as noted above, considers the simultaneous presence of vertical and horizontal MNEs. However, with respect to their results, Blonigen et al. (2003) argue that there is some misspecification in the proxy for skill-labour differences that, when corrected, leads to econometric results that support the horizontal MNEs model. This would give less importance to the weight of vertical US MNEs. Nonetheless, in their reply, Carr et al. (2003) explain some flaws existing in the approach of Blonigen et al. (2003), such as the use of FDI stocks rather than MNE's data, which are the focus of the theory developed by Markusen.

Within this framework of location and ownership advantages, a line of research incorporates R&D decisions into theoretical models of the MNE. MNEs are generally characterised by a strong effort in R&D activities. However, the intangible nature of many of these assets makes it difficult to incorporate them into theoretical (and empirical) models. An interesting answer to this is offered by Sanna-Randaccio and Veugelers (2003, 2007). Their theoretical model analyses the costs and benefits of undertaking R&D activities in a subsidiary of the MNE versus keeping those activities within the headquarters. The empirical evidence on this shows that R&D activities are mostly done in the headquarters, however we also have evidence that subsidiaries are increasing the scope of this sort of activities (Sanna-Randaccio and Veugelers, 2003). The authors obtain two important conclusions. First, the more technologically advanced the host economy is, the more likely it will benefit from the presence of foreign subsidiaries performing R&D activities. Second, the potential harmful effects of MNEs are likely to diminish if they are not direct competitors in the same market of the local firm. In other words, vertical (or inter-industry) relationships between foreign and local firms (i.e., backward and forward linkages) are more beneficial than horizontal (or intra-industry) ones.

2.4. Firm heterogeneity models in the 2000s

As noted above, in the 1980s, the "new trade models" had introduced monopolistic competition and product differentiation. In so doing, they resembled a sort of within-industry heterogeneity, because each firm produced a different variety of a good. Further, a new source of welfare gains arose from the presence of economies of scale and several varieties, since foreign trade could make more varieties available for consumers. However, in these

models, *all* exporting firms were treated as having similar productivity levels, size and participation in trade[2]. What is more, these models predicted that *all* firms would export. Empirical data are at odds with this sort of symmetry assumptions. Throughout the 1990s better firm-level data made clearer that only a small fraction of firms within an industry export, and that exporters are larger and more productive than non-exporters. The evidence supporting that the causality runs from higher productivity to exports and not vice versa (Bernard et al., 2007a; Greenaway and Kneller, 2007).

Melitz (2003) and Bernard et al. (2003) offer two pioneering trade models of exporting versus non-exporting firms, which resemble these features of the data. The former has been particularly influential and transmits the idea that more dispersion in productivity raises the share of exporting firms in domestic output. Both models, though, include fixed costs of exporting and productivity differences across firms within the same industry, which were absent in most models of the "new trade" literature and are key ingredients for the results. This "firm heterogeneity models" predict that trade liberalisation or a fall in transportation costs lead to higher average industry productivity, because the more productive firms survive and grow, whereas the lower-productivity non-exporting firms may more easily contract production or exit. Thus, in this type of models, within-industry reallocation of activity is possible. The old theoretical models predicted that trade costs could raise welfare through specialisation across industries and countries according to comparative advantage. An additional source of welfare emerges now because trade increases output and employment in high-productivity exporting firms within an industry, which is a force pulling up average productivity. This latter welfare gain seems to be more sizeable than across-industry reallocations (Bernard et al., 2007a)[3].

Helpman et al. (2004) extend Melitz's (2003) model to include MNEs, analysing the decision to open a subsidiary abroad. Their model is consistent with the above noted conclusions of the models of Brainard and Markusen and Venables on horizontal FDI, which is the type of MNEs that all these models consider. However, the addition of intra-industry firm heterogeneity leads these authors to derive that the sales of foreign affiliates relative to exports are larger in sectors with more firm heterogeneity in productivity, the latter being proxied by firms' sales or size. Furthermore, they obtain strong support for this result in a cross-section of industries using a regression analogous to that in Brainard (1997). Heterogeneity, therefore, arises as an important factor to explain not only trade patterns but also MNEs' behaviour. In their model, exporting involves lower fixed costs than FDI activities, while FDI involves lower variable costs than exporting. MNEs are the most productive firms, followed by exporters which are, in turn, more productive than firms serving only the domestic market. The marginal cost varies across firms generating heterogeneity in productivity, whereas fixed costs are fixed across firms' types, as in Melitz (2003). This assumption is also confirmed by their empirical evidence.

The relationship between firm efficiency and three modes of foreign market access, namely, exports, greenfield investments, and mergers and acquisitions (M&A) is analysed by Nocke and Yeaple (2007). Note that the distinction between two FDI types (greenfield

and M&A) is absent in Helpman et al. (2004). Their findings suggest that, in industries where the source of firm heterogeneity is due to the internationally mobile factors (such as R&D intensive technologies), firms involved in both M&A and greenfield FDI investments are more efficient than exporters. By contrast, in industries where the source of firm heterogeneity is not internationally mobile (such as firm marketing expertise), firms undertaking greenfield FDI are more efficient than exporters but those engaging in cross-border M&A are less efficient than exporters; this latter result would contradict the prediction of Helpman et al. (2004). Accordingly, "the common procedure of pooling industries in regression analysis is inappropriate as the mapping from firm characteristics to mode choices differs qualitatively across industries" (Nocke and Yeaple, 2007, p. 378).

Grossman et al. (2006) provide a model in which MNEs may undertake complex strategies in which horizontal and vertical FDI are simultaneous. Note that, contrary to Markusen's (2002) "knowledge capital model", this does not mean vertical and horizontal MNEs interacting, but that the same firm can undertake both vertical and horizontal (i.e., complex) strategies simultaneously. Grossman et al. (2006) follow Yeaple's (2003b) model of complex strategies and are also inspired by Ekholm et al. (2007) model of export platform FDI. Indeed, they extend Yeaple's (2003b) framework by including heterogeneous firms following Melitz (2003). Their outcomes are in accordance with the productivity sorting of Helpman et al. (2004), with MNEs, exporting and domestic firms exhibiting decreasing levels of productivities, respectively. Their model suggest that not only cross-country differences in costs are important for the complex strategies of MNEs to arise, as in Yeaple (2003b) and Ekholm et al. (2007), but that within industry firm heterogeneity, which is absent in the latter, plays an important role in determining the different strategies of MNEs. In fact, the introduction of firm heterogeneity allows Grossman et al. (2006) to abandon Yeaple's (2003) sort of "symmetric producers" outcome, by which all MNEs within an industry end up developing the same type of complex strategy, which is at odds with the empirical evidence. Through heterogeneity Grossman et al. (2006) also depart from the determinism in Ekholm et al. (2007), which establishes that intermediate goods, which may be assembled in any county, must always be produced where the headquarters are. Aw and Lee (2008) follow Grossman et al. (2006), but instead of analysing complex strategies between two rich countries in the North and one in the South, they construct a 3-country model in which heterogeneous firms of a middle-income country choose between exporting or sending MNEs to a high-income or a low-income country. Using data from Taiwanese electronics firms they also find that the firms sending FDI are more productive than the ones that export. Their original contribution is that MNEs which invest only in the rich country (US) are more productive than those investing only in the poor country (China), which seems due to the higher fixed costs of investment in the rich country compared to those in the poor one.

These latter "3-country models" on "complex strategies" are of particular interest, at least for two important reasons. First, because they deal with the role of "origin and destination" of trade and FDI. This point may be quite influential for results and is frequently overlooked in theoretical and empirical analyses. Second, because they consider the possibility

of firms producing different number of products for several destinations. They, therefore, can explain what seems to constitute the main part of trade, i.e. the extensive-margin, which is explained by both the number of destinations and the number of exported products (Bernard *et al.*, 2007a).

Heterogeneity has brought trade and FDI models closer to reality by capturing the fact that within-industries different types of firms coexist (non-exporters, exporters, and different types of MNEs), which has led to abandon the "representative firm" assumption. Within-industry adjustments and new sources of welfare and growth have been identified. There seem to be still some challenges ahead, however. In particular, it seems that "heterogeneous firms" models are not so good at grasping the differences between vertical and horizontal differentiation in goods, while there is empirical evidence that prices within the product categories traded "vary substantially and systematically across countries" (Bernard et al., 2007a). Furthermore, to come closer and closer to reality, the already identified within-industry adjustments need to take a step further and consider the adjustments "within the firm" (Grossman et al., 2006). We turn to this point in the next section, which belongs to an area often called "contractual theories" of the multinational firm.

2.5. Recent contributions on internalisation issues

The issue of internalisation, which is the center of the "contractual theories" of the MNE, covers a gap present in those theories more oriented to location and ownership advantages, i.e., the so called "technological theories", reviewed in sections 2.3 and 2.4[4]. The latter give an idea of the incentives to produce abroad but do not explain why foreign production of a MNE will occur *within* the firm's boundaries (i.e., within the MNE), rather than through arm's-length subcontracting (i.e., contracts with independent firms, a phenomenon known as foreign *outsourcing*)[5]. Furthermore, the interest on this subject goes beyond the area of firms' internal organisation. Why? Trade statistics seem to exhibit systematic patterns related with internalisation (i.e., the decision of foreign *insourcing* versus foreign *outsourcing* seems related with some firm, industry and country characteristics) and the reallocation of economics activities that these processes bring about may well impact macroeconomic aggregates (Antràs and Rossi-Hansberg, 2008). We showed in section 2.2 how internalisation issues were central in the analyses of Hymer and Dunning. However, there is a recent literature which has formalised internalisation including it in the framework of newer trade theories. We offer in the next paragraphs a brief overview of this literature.

Analysing internalisation decisions leads us to a world where the classical assumption of complete contracting is not possible. Let us explain this briefly. When choosing between arm's-length subcontracting versus internalising, the MNE, as well as a national firm, faces a trade-off. On the one hand, if the firm decides to internalise its foreign operations it will have to pay the higher costs involved in setting up and running a wholly owned plant in a foreign country; on the other hand, if the firm decides to outsource it will have to face some market failures affecting contractual relationships with local firms. Local firms tend to have

more information about their market than a MNE has. If there were no contractual problems firms would decide to outsource activities to local suppliers in order to benefit from their experience. However, there are market failures arising from the difficulty of coordinating and controlling the actions of local firms through contracts. In most cases, the firm that outsources has to pay a high rent to local firms to ensure that the process "will work". This results in a reduction of the profits accruing to the firm that outsources, incentivating internalisation. How has this trade-off been formalised in the literature?

An issue frequently studied is the so called hold-up problem, which has two components. One is the difficulty of writing contracts covering all possible contingencies in the relationship between a firm and its external supplier. The other one is that the local supplier has to do some specific investments to produce the components demanded by the firm it serves, or from a different angle, that the goods he will produce for its customer are very specific, which makes it difficult to sell them to other customers. The local supplier knows that the contract will be incomplete, as well as the specificity of its production. He may fear that after having invested to produce the input for the firm, the contract then should have to be renegotiated as long as some contingencies uncovered have occurred. As the investments made by the local supplier are specific to that relationship he will be in a weak bargaining position. Under these circumstances, local suppliers are likely to underinvest, compared to what they would do if we were in a world of complete contracting. This inefficiency of suboptimal investment reduces the total return to outsourcing.

Ethier (1986) was the first one to analyse the hold-up problem in a context of MNEs' activities within a general equilibrium framework. According to his model, internalisation is more likely when the affiliates are in countries with small factor endowments differences. Note that this result contradicts the outcome of Helpman's (1984) model on vertical MNEs. This suggests that internalisation decisions may change the panorama offered by FDI models of technological theories. Incomplete contracts also arise from the difficulty of protecting intangible assets. Ethier and Markusen (1996) first formalised the case of transferring an intangible asset with superior knowledge embodied. In their model firms may choose among exporting, opening a subsidiary, or licensing their technology to an independent firm. If the knowledge is transferred to the licensee, the latter may set up its own plant and start competing with the original owner of the knowledge. To avoid this, the firm needs to design an optimal licensing contract. In this case, the contract should promise important rents to the local supplier to make defection unprofitable. But these high rents may be too costly to the firm, again incentivating internalisation. Their findings again suggest that similarities in relative factor endowments favour FDI over licensing, as in Ethier (1986).

In the two previous models, as happens in much of the literature on the theory of the firm, the choice of the firm to integrate seems independent of the decisions of other firms within the same industry. McLaren (2000) and Grossman and Helpman (2002) develop models considering the decision of firms to integrate suppliers, in which those decisions affect market conditions, thereby influencing other firms' decisions. Both models transmit the idea that vertical integration may be negative for the remaining non-integrated bilateral relationships, by

thinning the market for inputs thereby worsening opportunism. Trade opening brings about an expansion of the market for inputs and thus favours firms' *outsourcing* over FDI.

So far, the models have neglected the costs of internalisation. They belong to the "transaction-cost approach" which considers the contractual problems among firms that are not integrated, but does not take into account the costs of intrafirm transactions (Antràs and Rossi-Hansberg (2008). A more comprehensive approximation is the "property-rights approach" to internalisation, which includes both types of contractual frictions and is derived from the seminal paper of Grossman and Hart (1986). We review now some influential papers along this latter perspective.

Antràs (2003) has shown that R&D or capital intensity measures are the main determinants of the considerable variation of intrafirm trade across industries. He uses a general equilibrium model of international trade with monopolistic competition, increasing returns and product differentiation combined with insights from the property-rights approach. Simple R&D and capital intensity measures account for almost 75% of the cross-industry variation in the weight of intrafirm imports in total US imports. This implies that more complex goods (which are capital-intensive or research-intensive, e.g., chemicals) are more likely to be produced under vertical integration, thus, bringing about intrafirm trade. By contrast, simpler goods (labour-intensive, e.g., textiles) tend to be bought under contract, through outsourcing and, thus, involve arm's length trade. He derives a parallel result for countries. The share of intrafirm imports in total U.S. imports is larger the higher the capital-labour ratio of the exporting country (i.e., exports coming from capital-abundant countries, such as Switzerland, tend to take place between affiliated units of MNEs, whereas exports of capital-scarce countries, such as Egypt, occur mostly at arm's length). In a cross-section of countries he obtains robust support for the impact of capital abundance.

In brief, Antrás (2003) suggests that capital intensity (both at the country and industry level) is positively associated with internalisation. This is of particular interest, because his model does not consider the presence of important determinants of FDI, according to the technological approach to MNEs, such as, factor price differences across countries, nor a distinction between firm specific and plant specific economies of scale neither transport costs. Remember that factor price differences were the key for the emergence of vertical MNEs in Helpman (1984). Moreover, the rest of characteristics constituted the ingredients of Brainard's *proximity-concentration trade off*, which was also supported and expanded by Markusen and Venables (1998, 2000) and Markusen (2002), whose work also derived the importance of similarities in countries' sizes and factor endowments to explain horizontal FDI. Therefore, the importance of Antràs' (2003) theoretical model and its econometric robustness is that, without those "technological" characteristics, it gives new reasons for the prevalence of FDI among rich countries (versus FDI flows going from rich countries to poor ones). Furthermore, it describes an intrafirm trade pattern which matches the empirical evidence that "the well-known predominance of North-North trade in total trade is even more pronounced within the intrafirm component of trade" (Antràs, 2003, p. 1376).

Antràs and Helpman (2004) combine Antràs (2003) with firm heterogeneity à la Melitz (2003). The model has two countries, North and South. Final-good producers are based in the North, where they produce an input necessary for production called "headquarter services". Intermediate-input producers can be either in the North or in the South, variable costs being lower in the latter. Like in Antràs (2003), the relative intensity in the use of these two inputs (now termed differently, establishing "heaquarter" versus "component" intensive technologies) will be an important determinant of the choice between (home versus foreign) integration and outsourcing[6].

However, the prevalence of the different organizational forms depends in Antrás and Helpman (2004) on a wider range of characteristics than the above commented in Antràs (2003). These are: the wage gap between the North and the South, the trading costs of intermediate inputs and the degree of productivity dispersion within a sector. Other two key determinants, which were already present in Antràs (2003), are the distribution of the bargaining power between the final-good producers and supplier of components[7] and the "headquarter intensity" of the technology (the latter being what Antràs (2003) identified as "capital intensity"). From the interaction of all these characteristics, four organizational forms are possible within an industry: integrating abroad, outsourcing abroad, integrating at home, outsourcing at home, where integrating abroad has the highest level of fixed costs and this sorting reveals their corresponding decreasing level of fixed costs, respectively. Even for alternative sortings of fixed costs, which they also study, the model still keeps the flavour of Antràs (2003) in predicting the prevalence of FDI in relative headquarter intensive sectors, whereas outsourcing dominates in those with lower headquarter intensity (i.e., components-intensive).

The presence of heterogeneity now leads Antrás and Helpman (2004) to derive, that the share of intrafirm imports of components in total imports is higher in industries with higher productivity dispersion. As vertical integration abroad involves larger fixed costs than outsourcing abroad, the most productive firms, among those which are "headquarter" (or capital) intensive, will be in a better position to undertake vertical FDI. By contrast, both the widening of wage gap between the North and the South and a reduction of the trading costs of intermediate inputs, result in a reduction of the costs of foreign sourcing, which raises arm's-length trade rises relative to intrafirm trade[8]. These tendencies for a wider wage gap and lower trade costs seem to prevail and, as commented by the authors, are in accordance with the still scarce empirical evidence suggesting that the growth of foreign outsourcing might have outpaced the growth of foreign intrafirm sourcing in the US and, generally, in world trade flows.

Antràs (2005) uses a dynamic general equilibrium model that provides a theory for Vernon's product-cycle (1966) original one. He shows that firms from the rich North may find it profit maximising to shift production to the low-wage South after a time lag, due to incomplete contracts. More recently, Antràs and Helpman (2008) have extended the setting of Antràs and Helpman (2004) to include varying degrees of contractual frictions across both inputs and countries. The main question analysed in this paper is: How

do improvements in contractibility affect the relative prevalence of the four possible organisational forms? In their model, an improvement in South's contracting institutions (logically) increases offshoring, but whether the expansion of offshoring is biased toward FDI or toward outsourcing depends on whether the easing of contractual frictions disproportionately affects headquarters services or intermediate inputs. In contrast with the transaction-costs literature, where any type of contractual improvement tends to favour outsourcing, in this property-rights approach better contractibility of headquarter services encourages outsourcing, while better contractibility of intermediate inputs encourages integration.

The property-rights approach from Grossman and Hart (1986) and adopted in Antràs (2003) and Antràs and Helpman (2004) suggests that in headquarter-intensive firms/industries it is important that the final good producer be highly incentivised. This is done through vertical integration, because final-good producers are able to appropriate higher fractions of revenue under integration than under outsourcing. In contrast, in component-intensive industries, it is important that the foreign supplier be highly incentivised, which is done by outsourcing. This offers an explanation for the puzzling result in Antràs & Helpman (2008) that more contractibility of the foreign supplier's inputs will typically lead to less outsourcing. As the supplier's share of noncontractible inputs falls, the party that requires relatively more incentives is the headquarters firm, which is achieved through vertical integration.

A firm faces a wider variety of possibilities between the two extremes of outsourcing and internalisation that we have so far considered. There is not much research on these intermediate varieties, though. A firm may, for instance, engage in different types of joint ventures, where this term denotes a situation in which "two or more entities have joint ownership of a firm and none is in the position to exert unilateral control of the firm" (Barba Navaretti and Venables, 2004, p. 300). A recent model of joint ventures (Rauch and Trindade, 2003) can allow us to show a final market failure. The model analyses the matching of firms, i.e., the difficulty for a firm to find the most suitable local supplier to the specific component or activity that the firm needs. The authors conclude that when the uncertainty about the right international partner diminishes, joint ventures lead to a greater integration of international labour markets than autarky. Furthermore, the lower this uncertainty the more the outcome from their model approaches the perfect capital mobility framework of the MacDougall's (1960) one-sector economy. This is again a nascent research topic which seems of great interest.

3. Multinational firms and foreign direct investment in computable general equilibrium models

3.1. Methodological issues

As mentioned earlier, computable general equilibrium (CGE) models allow combining a set of effects arising from the presence of MNEs in a unified framework to obtain their overall impact. This approach offers not only the intuition on how the economy will

adjust but also quantitative outcomes on aggregate variables, such as GDP and welfare, as well as on sectoral variables.

From a theoretical perspective, CGE techniques have been used to perform analyses that do not rely on real data but on a range of simplified values for different variables of the model –the so called "numerical CGE models"–. This is the approach followed in Markusen and Venables (1998, 2000) and Markusen (1997; 2002, chapters 5 to 9), mentioned above, and, more recently, in Markusen et al. (2005). This latter methodology uses sophisticated theories (synthesised in a generous number of equations) for which computational methods greatly facilitate solving the model and establishing interesting taxonomies in solutions for different levels of the variables (e.g., the interaction of factor endowments and the size of the host and home countries, or different values for trade costs, with the absence or existence of MNEs or of different types of MNEs). These models tend to analyse real world problems for which data are difficult to be obtained by simplifying the dataset assumed. The inclusion of real data in such a rich theoretical framework constitutes a challenge for modellers.

The so called "empirical CGE models", by contrast, are based on data from real economies, which are embedded in a robust theoretical framework. As explained in Shoven and Whalley (1984, 1992), neoclassical CGEs are based on the Arrow-Debreu general equilibrium model, with some potential extensions. The interactions among economic agents are, therefore, presented as a system of equations derived from microeconomic optimisation theory. The models usually embody the behaviour of households, firms and the government of the economy, whose microeconomic optimisation decisions are embedded in a framework representing national accounts identities. In other words, the models also rest on the usual progression of the circular flow of the economy: production, income distribution, and domestic and foreign demand. Following that representation, they describe the equilibrium conditions in goods and factor markets, as well as in the foreign sector.

CGE models share with the input-output methodology the fact of including intersectoral links in the analysis. Nevertheless, CGE models can use more flexible forms when modelling these links as compared to the fixed coefficient structure of the input-output framework. Thus, CGE is a methodology that allows dealing with many economic sectors taking into account the linkages among them (Dawkins et al., 2001) and "assessing who gains and who loses", i.e., which sectors are better or worse off after a shock (Shoven and Whalley, 1984, p. 1008). The treatment of intersectoral links seems very relevant when one looks at the weight of intermediates in cost structures across sectors in the economy. If one is to identify the effects of any shock, and in particular the impact of MNEs accruing to different sectors in the economy, as well as the pattern of adjustments across sectors, considering intermediate links seems crucial.

The idea that equivalent FDI inflows may have very different impacts depending on the sector to which they are directed has been stressed by some authors (Smarzynska, 2004; Barba Navaretti and Venables, 2004, chapter 7). CGEs seem appropriate for the

study of this issue. Software packages available nowadays allow using different sectoral disaggregations in a quick and simple way for CGE modellers. Additionally, CGEs do not only offer a great flexibility regarding the number of sectors, but also in the number of households, factors of production and countries included in the analysis (Gómez-Plana, 2005). It is notorious how Rutherford and Tarr (2008) have developed a model with 55,098 households for which they derive the impact of welfare of Russia's accession to the WTO.

Unlike an input-output analysis which concentrates mainly on the production side of the economy, a general equilibrium framework takes also into account the demand side. Further, CGE modelling allows the evaluation of consumers' welfare, "one issue that is missing from the discussion of effects of foreign direct investment (FDI), a strange omission from a literature dominated by economists (…)" (Lipsey, 2002, p. 60).

Due to its very nature, CGE models consider the interaction between goods and factor markets. This seems relevant to assess the impact of any economic shock, and particularly important in order to assess MNEs' effects; as Markusen (2002) says: "(…) general-equilibrium interactions between goods and factor markets are key to interesting results" (Markusen, 2002, p. 129); "(There are) general equilibrium factor-market effects that do not arise in a partial equilibrium model" (Markusen, 2002, p. 91).

A CGE model further yields macroeconomic predictions stemming from its microeconomic aggregation. It has been asserted that the potential of CGE models lies in their ability to integrate micro and macro elements (Devarajan and Robinson, 2005). This means that CGE models can measure the impact over the whole economy of a change in a particular sector or in a particular variable (Scarf and Shoven, 1984), or of several changes or policy measures taking place simultaneously (Devarajan and Robinson, 2005).

This comprehensive approach to the economy demands a model of considerable dimension (i.e. dozens of equations to be solved simultaneously). This is why it is necessary to use a *computable* general equilibrium (Markusen, 2002).

Some critiques have been raised against CGE analysis, though. Kehoe (2005) has emphasised the poor performance of some of them in predicting the effects of NAFTA. However, NAFTA CGE models have received much better evaluations (Burfisher et al., 2001) and, Kehoe, himself, has also recognised the good performance of other CGEs (Kehoe et al., 1995). McKitrick (1998) and Jorgenson (1984) have raised the point of using adequate elasticities and parameters. In particular, they suggest the recourse to econometric estimation in order to obtain elasticities, rather than taking their values from estimations for different countries and sectoral disaggregations. Hertel et al. (2007) offer a way to combine econometric analysis with CGEs, and note how this methodology has been applied to one of the most widely used database, namely, the Global Trade Analysis Project (GTAP). GTAP refers to a 57-sector 113-region 5-factor database of the world economy for general equilibrium simulations, developed at Purdue University, Indiana.

3. 2. The role of MNEs and FDI in CGE models

For decades most applied trade models have not considered the presence of MNEs. This absence seems to be, at least partly, due to data constraints on their activities. National statistics are still anchored in a system of "national" variables, in which there is no information regarding which part of the variable is domestic and which is foreign, e.g., production by domestic firms versus production by MNEs. Recently, the OECD has begun to collect data on MNEs' activities, but they are not still available for many countries and the series are rather short (OECD, 2007). But also, at the theoretical level, it is probably fair to say that the introduction of MNEs has posed an important challenge to trade models for a long time (Markusen, 2002).

It is clear, however, that through its impact on employment, production, R&D and trade, among others, even a small number of MNEs may exert an important influence on the economic restructuring of countries and industries. For instance, MNEs are behind many trade flows. According to UNCTAD (several years), one-third of the volume of world trade is accounted by transactions in which MNEs are in one of the two sides of the exchange; and another third of the volume of world trade is intrafirm trade. Accordingly, including MNEs in the picture should improve, in a significant manner, our understanding of international trade flows and of their subsequent effects. CGE models have not been an exception in ignoring the presence of MNEs, however, in the last decade, a few of them have sought to derive their effects. We review now the available contributions in this line.

Petri's (1997) paper is, to the best of our knowledge, the first CGE model incorporating MNEs. He initialises a small number of papers mainly concerned with the effects of FDI liberalisation (i.e., the lowering of barriers to FDI), which is a central element in most trading agreements. The model is a 3-sector, 6-region perfect competition setting where FDI flows are allocated endogenously responding to the fall in investment barriers. The paper has the clear virtue of providing a framework in which regional agreements may be analysed. In particular, interesting results on the differential impact of different trade liberalisation policies are obtained. His analysis is applied to the APEC (Asia-Pacific Economic Cooperation) liberalisation process. For the World as a whole, trade and FDI liberalisation in the APEC area, produces a higher impact on welfare than restricting liberalisation to trade only (FDI liberalisation accounts for about one-third of the impact). At the regional level, however, FDI liberalisation may exert a greater impact than trade liberalisation.

Following the pioneering work of Petri (1997), the "FDI and Trade Analysis Project" (FTAP) model analyses the impact of liberalising FDI barriers in the services sectors in a 19-region 3-sector setting. The model is explained in length in Hanslow et al. (1999). In a latter variant, Verikios and Zhang (2001a) introduce some more sectoral detail, by disaggregating the tertiary sector into six subsectors. Large-group monopolistic competition within a Dixit-Stiglitz framework is assumed, but, as the authors claim, these features do not seem to be important for their results. These features, however, imply symmetry across all type of firms, which does not allow differentiating between MNEs and national firms' technology.

As in Petri (1997) the impact of MNEs is derived from the removal or reduction of FDI barriers. Verikios and Zhang (2001b) concentrate on the impact of liberalisation in the telecommunications and financial services sectors in turn. FDI barriers are higher in this latter sector, thus, its liberalisation causes a greater reallocation of the world capital stock across regions via FDI. Developed regions, which had lower levels of protection, lose capital which accrues to developing regions. Both regions gain from liberalisation but developing ones gain more. This final result also holds for the liberalisation in telecommunications but it does not occur mainly via FDI allocations, but through different adjustments in the model. Interestingly, unlike the typical effects of removing barriers to goods trade, regions with initial higher services barriers (i.e. developing ones) experience the biggest increases in services output as a result of liberalisation.

Brown and Stern (2001) extend the Michigan Model of world production and trade to incorporate FDI and MNEs in a 18-region 3-sector framework. Their approach also relies on Petri's (1997) work but incorporates monopolistic competition following an earlier version of Markusen et al. (2005). They again derive the effects from MNEs by simulating a fall in barriers to FDI, while explaining in length the difficulties to evaluate their levels. The authors introduce some less common variables in the analysis, such as a risk premium on the rate of return of capital (which influences, probably, their contrasting result on this variable) and a form of profit repatriation (fixed at the 10 per cent level). They emphasise that capital flows are expected to have larger welfare impact than trade flows. For the economies receiving FDI flows, welfare, wages, the rate of return of capital, imports and exports will increase. At the sectoral level, they obtain that capital inflows lead to an expansion of output which is mainly generated by firms realising economies of scale.

Bchir et al. (2002) develop the MIRAGE model, which incorporates some interesting features such as careful calculations of tariff data, imperfect competition à la Cournot and dynamics. Regarding their treatment of FDI it should be stressed that they include FDI in a framework in which MNEs are absent. This means that they model FDI as mere capital flows crossing borders in response to different rates of return. Capital is the same no matter whether it belongs to MNEs or national firms. Furthermore, all firms are symmetric and there is no technological differentiation between MNEs and domestic firms. They simulate the impact of trade liberalisation between the European Union and its periphery. The presence of FDI flows is a source of gains for the periphery. There is an increase in capital profitability in that region, due to trade liberalisation, which attracts FDI flows. FDI inflows, in turn, increase the capital stock and the number of firms (and product varieties) in the periphery. This brings about an increase in wages of skilled and unskilled workers together with a decrease in the rate of return to capital, which lead to an increase in GDP and, to a lesser extent, in welfare compared to the results in which FDI flows are absent (as they also run the model without considering the presence of FDI flows).

Jensen et al. (2007) introduce FDI in order to analyse the impact of Russia's accession to the World Trade Organisation (WTO). The authors analyse the differential effects of tariff reform, improved market access, and reforms of FDI barriers in services sectors. They

conclude that the presence of MNEs in services sectors is the source of largest gains to Russia, accounting for 70 per cent of the overall gains. Their model assumes large-group monopolistic competition within a Dixit-Stiglitz framework in a 35-sector setting, which allows them to impose symmetry. However, their symmetry assumption is *within firm types*, i.e., all MNEs have identical cost structures, and all domestic firms that operate have cost structures identical to other domestic firms. The key distinction lies in the fact that MNEs produce using both domestic and imported inputs whereas domestic firms produce using only domestic factors of production. This distinction is an important step forward in order to model MNEs as a "peculiar" type of firm, which is different to a domestic firm.

The results of their simulations show that the fall in barriers to MNEs in Russia increases their profitability in that region, leading to an increase in the number of MNEs operating in Russia. Despite the reduction in domestic services varieties, due to the increased competition from MNEs, there would be a net increase in varieties; and, importantly, additional services varieties reduce the cost of services in Russia, through a Dixit-Stiglitz-Ethier effect. Wages of both skilled and unskilled workers would increase. The authors estimate that liberalisation of FDI barriers would increase Russian consumption by 5,2 per cent, which, as mentioned above, constitutes approximately 70 per cent of the total gains.

An interesting variant of the model in Jensen et al.'s (2007) is Rutherford and Tarr (2008), who abandon the assumption of a representative agent by introducing a large number of households (up to 55,098). They also analyse the impact for income distribution in Russia, due to its accession to the WTO, showing that accession would be beneficial for 99.9 per cent of households.

All of the models above derive the impact of MNEs from a removal or reduction of the barriers to FDI. However, an accurate estimation of these barriers is difficult to be obtained, while being crucial to properly derive the effects of MNEs. Latorre et al. (2009) extend the GTAP model (Hertel, 1997) to include MNEs. Interestingly, their model does not rely on FDI barriers but on the assumption that the capital arriving with FDI flows will increase the capital stock available for the production of MNEs. Furthermore, MNEs are technologically differentiated from national firms, according to real data on their respective activities (OECD, 2007), so that MNEs are more capital intensive and rely more on imported intermediates.

The model of Latorre et al. (2009) is flexible enough to incorporate publicly available data on the activities of MNEs, unlike most of the models above, that rely to an important extent on activities of particular research teams. This is a 20-sector model for the Czech Republic (that has received a large amount of FDI inflows since the beginning of transition) in which the differential impact of the entry of MNEs in some selected manufacturing and services sectors is simulated. In addition, the role of profit repatriation by MNEs, a nearly neglected aspect in the literature is further explored. The results show that profit repatriation seems to play a key role since, if above certain threshold levels, the positive effects of MNEs' entry on GDP and welfare might be partially or even totally offset.

What can be concluded from this review of CGE models including MNEs? First, CGE models seem to be a particularly suitable methodology for the study of regional trade agreements and the role of FDI in this context. And, importantly, independently of whether they are reported or not, most of the aggregate and sectoral variables are in fact consistently embedded in the framework in which the results are obtained. Furthermore, the models shed light on the quantitative magnitude of a particular shock, which may well offer valuable information for the policy maker in order to assess the relative importance of the phenomenon analysed.

A challenge for this literature, in the light of the theoretical studies analysed earlier, is the introduction of recent developments on within-industry heterogeneity, as well as "internalisation" issues. This, of course, is shared by other methodologies, as it still involves costly demands in terms of data and complexity. A pioneering CGE model of trade including firm heterogeneity following Mélitz (2003) is Zhai (2008), who does not include the role of MNEs. In Zhai's (2008) model, firm heterogeneity offers a theoretically well-grounded way to capture variations in the extensive margin of trade flows. By contrast, the Armington assumption, which does not capture this extensive margin, underestimates both trade and welfare effects from trade liberalisation. Modeling heterogeneity, however, seems to involve important challenges such as reducing the sensitivity of results to the parameter of the dispersion of firms' productivity, the inclusion of firms' entry and exit, or better characterisations of the different levels of fixed costs.

4. Concluding remarks

This article is an attempt to offer a comprehensive, up-to-date and "all-in-one"·review of the main theoretical strands on FDI and MNEs, including insights from CGE models. The earliest analyses, which appeared in the 1960s tended to model FDI as capital crossing borders in perfect competition settings. The work of Hymer drew attention to the idea that FDI flows were better understood as the activity of a particular type of firm, the MNE, which owned some sort of superior or special assets. The introduction of a different type of firm broke the assumption of homogenous producers and goods and led to imperfect competition as a framework for the analysis of MNEs. On the other hand, the need to transfer superior assets across borders by MNEs introduced transaction costs in the analysis, which lies behind the possibility of internalisation versus establishing contracts with independent suppliers. The analysis of Hymer was given an important step further by Dunning's OLI paradigm.

Later on, ownership and location advantages have been formalised in theoretical models of vertical and horizontal MNEs in the context of an industrial organisation approach. Many earlier intuitions were translated into formal models. New and powerful computational methods, have allowed theories to incorporate a great deal of relationships and specifications. This allows playing with simulations of different levels of factor endowments, size, trade costs and types of MNEs, among others, to establish interesting taxonomies in solutions. The "heterogeneous firms" literature has pushed further these efforts, by introducing

into formal models the empirical fact that within an industry many types of firms coexist (non-exporters, exporters and different types of MNEs). Heterogeneous firms models are able to resemble the intra-industry reallocation of economic activity, as more productive firms grow and less productive ones contract or exit. They also reflect that a MNE may undertake a mixture of vertical and horizontal strategies, combining production of different types of goods directed to, or stemming from, several origins and destination countries.

The most recent developments introduce heterogeneity into internalisation models of FDI, in order to analyse a more complete picture of internationalisation strategies, including outsourcing, which may well be shaping not only trade and FDI patterns but also economic aggregates. As we have shown, the issue of internalisation conveys an important insight which introduces its own influences on FDI and trade patterns, sometimes contradicting those of more "technological" characterisations of MNEs. It seems that a complete theory of MNEs would gain much by integrating the complementarities of both perspectives (i.e., contractual and technological theories). The introduction of these recent breakthroughs also constitutes a challenge for empirical methodologies.

Finally, in what means a novel feature of this article, we have reviewed the role of CGE models in providing a comprehensive evaluation of the effects of any economic shock. Real numbers are "plugged" in a robust theoretical framework which combines the interaction of: i) all sectors in the economy, taking into account the important intermediates linkages among them; ii) the demand and production side of the economy; iii) commodity and factor markets; iv) sectoral and aggregate variables; v) other different disaggregations across agents, regions, and production factors.

The available CGE models that introduce MNEs tend to support the idea that the arrival of this type of firms results in higher (both skilled and unskilled) average wage levels in the host economy, as well as, increases in GDP, welfare and foreign trade. Some results, however, have shown that profit repatriation may counteract and, even if repatriation were above a certain threshold, completely offset, the positive impact on GDP and welfare. It is the simultaneous interplay of all these forces which is important to get better approximations to the real effects of MNEs. What is more, this approach offers not only the intuition on how the economy adjusts but also quantitative evaluations of the impact of MNEs on both sectoral and aggregate variables, which may be of help for the policy maker when designing FDI attraction policies.

Notes

1. A deeper analysis of the rich contributions of his book is available in Latorre (2004).

2. These models still assumed a "representative firm", at least within each industry. Even MNEs had also the same productivity and size as exporters, although their trade patterns could be different to those of exporters.

3. Two recent remarkable trade models along these lines, which do not include MNEs, are Bernard et al. (2007b) and Helpman et al. (2007).

4. Following Coase's (1937) and Williamson's (1975, 1985) view, the need for contractual theories also holds for a neoclassical theory of the firm, i.e., a theory based purely on technological considerations.

5. Our discussion uses the notation in Antràs and Helpman (2004). When a firm decides to keeps its operations, e.g., the production of intermediate inputs, within its boundaries, this internalisation or integration or *insourcing* may take place in the home country (vertical integration) or abroad (by which the firm becomes a MNEs and engages in intrafirm trade). When a firm decides to outsource the production of an input, it may buy it at home (domestic outsourcing) or abroad (arm's length trade or foreign outsourcing). *Offshoring* denotes the sourcing of inputs from foreign countries, both via arm's-length trade (international outsourcing) and via intrafirm trade (vertical FDI).Note that if a firm outsources one activity it is not internalising that activity, and that internalisation of activities undertaken abroad is necessary to become a MNE. However, it may be that a MNE is so because it has some activities internalised abroad while it outsources others. Therefore, the relationship between outsourcing and MNEs cannot be taken for granted.

6. Their model offers a richer framework for the choice between integration and outsourcing than the one in Grossman and Helpman (2002) who use a one-input general equilibrium framework without differences in firms productivity.

7. The model keeps the features of Grossman and Hart (1986), by which final-good producers are able to appropriate higher fractions of revenue under integration than under outsourcing, with this fraction being higher when integration takes place in the North than in the South.

8. Why is the reduction in foreign sourcing biased to arm's length trade? On the one hand, in component-intensive industries integration is rare according to these models. Thus, the fall in South wages and/or transport costs favours outsourcing in the South over outsourcing in the North. On the other hand, for headquarter-intensive industries, the sorting of fixed costs mentioned above, implies that among the integrated producers in the North, the most productive are indifferent between integration in the North and outsourcing in the South. Therefore, the fall in wages and transport costs favours foreign outsourcing over integration in the North.

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Resumen

Este artículo ofrece una síntesis completa y actualizada, así como una valoración de la literatura sobre empresas multinacionales e inversión extranjera directa. A diferencia de la mayoría de las revisiones previas de la literatura, combina distintas perspectivas mostrando sus discrepancias y complementariedades. Mediante una descripción cronológica, muestra las principales corrientes, desde los análisis de competencia perfecta de los años sesenta, hasta contribuciones más recientes como el "knowledge-capital model", los modelos de empresas heterogéneas o los de internalización. El artículo ofrece también una nueva perspectiva, al revisar los modelos de equilibrio general aplicado disponibles que incluyen multinacionales e inversión extranjera directa.

Palabras clave: Empresas multinacionales, Inversión extranjera directa, Modelos de equilibrio general aplicado.

Clasificación JEL: F21, F23, C68.