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Why FDI? An Empirical Assessment Based on Contractual Incompleteness and Dissipation of Intangible Assets

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Abstract

This paper makes an empirical assessment of Foreign Direct Investment (FDI), by analysing the boundaries of a large sample of Italian Multinational Enterprises (MNEs). Firm level data from the eighth and the ninth Capitalia Surveys on Manufacturing Firms, AIDA and Centrale dei Bilanci is gathered in a comprehensive dataset that accounts for more than 8000 observations. In line with the *Dissipation of Intangible Assets* explanation of Foreign Direct Investment, our estimates show that MNEs endowed with superior technology and better human capital tend to operate abroad via FDI, to avoid knowledge spillover. By contrast, we do not find strong support to the *Contractual Incompleteness* hypothesis: indeed there quite a weak correlation between the degree of contractual incompleteness, at the industry level, and the likelihood of Foreign Direct Investment by Italian enterprises.

JEL: *F23, C25*
Keywords: *FDI, Contractual Incompleteness, Intangible Assets, Italy*

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1. Introduction

This paper makes an empirical assessment of Foreign Direct Investment (FDI) by analysing the boundaries of a large sample of Italian Multinational Enterprises (MNEs)[1].

When expanding abroad, firms take crucial decisions about the most appropriate mode of entry into a foreign country. This implies a critical consideration of outsourcing and offshoring strategies to define which activities are better performed within firms' boundaries and which are better externalized; which activities call for a domestic location and which for a foreign one.

For the sake of simplicity, consider a multinational firm that is willing to produce a final good abroad; assume that final good production requires two activities – input manufacturing and final good processing – and that the MNE is responsible for processing. How does it secure the needed components? It is clear that the multinational can either manufacture inputs within its boundaries or it can purchase them from an independent supplier: this is what we call *outsourcing* or *ownership* decision. Moreover, the MNE can decide either to make/buy inputs in the home country or in the foreign one: this is the *offshoring* or *location* choice as referred to in the present paper.

The boundaries of the multinational firm thus result from the intersection between outsourcing and offshoring concerns, as depicted in Figure 1. Depending on whether the input supplier is a domestic or a foreign enterprise, and whether it belongs to the MNE or not, four contractual arrangements may emerge: Domestic Integration, FDI, Domestic Outsourcing, and International Outsourcing.

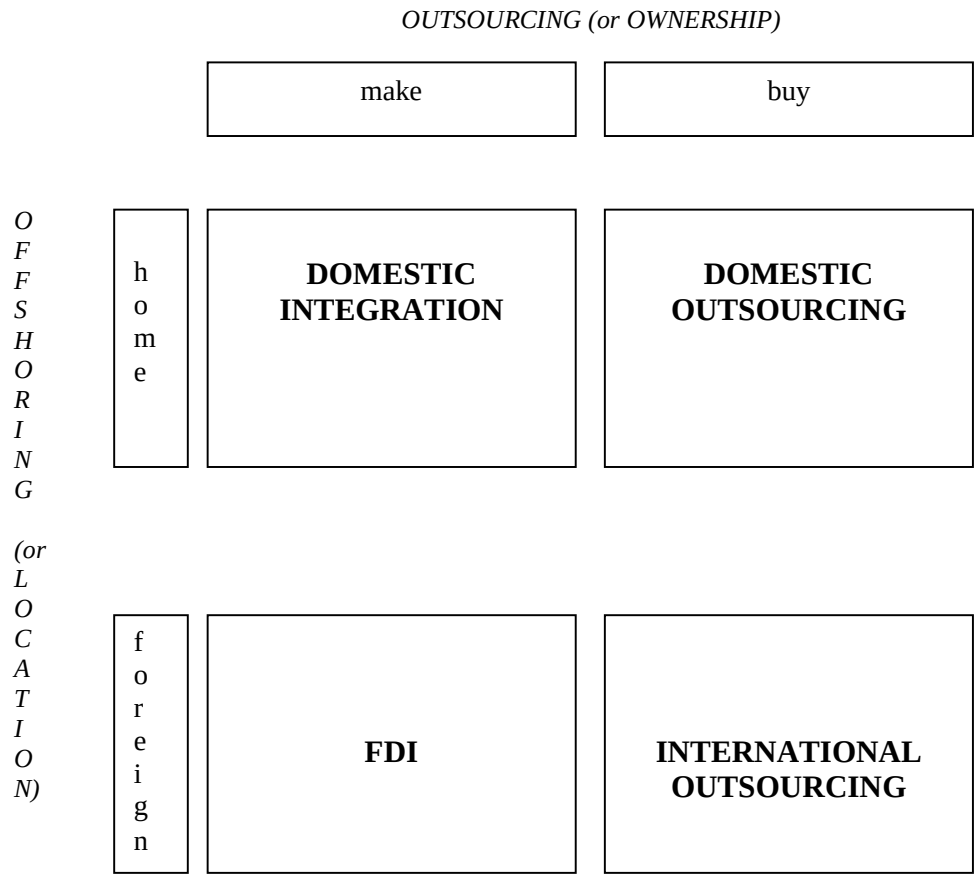
For the purpose of the present research, we are particularly interested in the foreign dimension of the make-or-buy trade-off. Therefore, when discussing about MNE's boundaries, we focus on the relative profitability of Foreign Direct Investment versus International Outsourcing.

This is quite a novel and urgent issue in International Economics, both from an academic and a policy perspective. Indeed, recent evidence points to the surge of Foreign Direct Investment and international production: in the 1990s, more than 40 percent of US

[1] In lines with the IMF/OECD definitions, we call FDI an investment in a foreign company where the investor owns at least 10 percent of the ordinary shares, undertaken with the objective of establishing a lasting interest in the country, a long term relationship and significant influence on the management of the firm (IMF 1993; and OECD 1996). In our terminology, Multinational Enterprises are those engaged with international operations of any kind.

imports took place within the boundaries of multinational firms (Zeile 1997), and every third transaction in the world now occurs intra-firm (Antras 2003; Helpman 2006). These trends are closely related to the growing fragmentation of production which has become a reality since globalization has stretched the manufacturing process across many countries, pushing corporations towards a global structure (Hummels et al. 2001; Feenstra 1998; Feenstra and Hanson 1996).

Figure 1: the boundaries of the Multinational Enterprise



To account for the main changes occurred in trade and investment patterns, in the last twenty years, the literature on Multinational Enterprises has developed around the so called OLI framework, considering *Ownership*, *Location* and *Internalisation* advantages as an explanation of Foreign Direct Investment (Dunning, 1993). If MNEs were exactly identical to domestic firms, they would not find it profitable to enter the domestic market;

since FDIs indeed exist, it must be the case that multinational firms possess some inherent advantage, easily exploitable through direct investment. While earliest studies combined Ownership and Location considerations (see, for instance Helpman 1984, 1985; Helpman and Krugman 1985; Horstmann and Markusen 1987a, 1992; Brainard 1993), this paper is about the *Internalisation* issue, since it investigates the boundaries of global enterprises.

In theoretical terms, two candidate explanations of why multinational firms should operate via FDI stem from the risk of Dissipation of Intangible Assets (DIA) (Horstmann and Markusen 1987b; Ethier and Markusen 1996; Fosfuri 2000; Mattoo et al. 2001; Markusen 2001; Fosfuri at al. 2001; Saggi 1996, 1999; Glass and Saggi 2002b; Gattai and Molteni 2007) and the wish to avoid hold-up problems in a setting of Contractual Incompleteness (CI) (Grossman and Helpman 2002, 2003; Antras and Helpman 2004, 2008; Antras 2003; Feenstra and Hanson 2004; Ottaviano and Turrini 2007).

In empirical terms, there have been only a few attempts at testing DIA and CI models (see Mansfield et al. 1979; Mansfield and Romeo 1980; Smith 2001; Yeaple 2006; Nunn and Trefler 2008) and a serious limitation of these studies lays in the industry or country level of the analysis[2], since the theory explicitly emphasizes the importance of firm level determinants. Interestingly, firm level data, once available, have been used to study MNEs' export behaviour (see, among others, Tybout 2003; Mayer and Ottaviano 2007; Bernard and Jensen 1995, 1999; Bernard et al. 2005; Eaton at al. 2004; Helpman et al. 2004; Clerides et al. 1998; Aw et al. 2000; Delgado et al. 2002; Baldwin and Gu 2003; Head and Ries 2003) while the internalisation decision has remained surprisingly unexplored.

The purpose of the present paper is precisely to fill this gap, contributing to the existing empirical literature, both in terms of the data employed and the estimation setting.

As far as the data are concerned, two important novelties are worth mentioning: first, we make use of *firm level* information instead of sticking to industry or country analysis; second, we provide fresh evidence of *Italian* FDIs worldwide, differently from a literature very much focused on the US. Firm level data is gathered from three distinct sources: information about MNEs' international business is derived from the eighth and

[2] An exeption is due to Gattai and Molteni (2007) and Corcos et al. (2008).

ninth waves of the Capitalia Survey on Manufacturing Firms, while additional balance sheet details come from AIDA and Centrale dei Bilanci, for more than 4000 parent companies overall.

With regard to the estimation setting, we contribute to the existing literature in three aspects. First, to the best of our knowledge, this is the first attempt at testing DIA and CI arguments in a unitary framework. Second, within the DIA approach, Intangible Assets are usually proxied only by technological variables while human capital indicators are also employed here, offering a more complete characterization of the links between firms' critical resources and multinational activity. Third, within the CI approach, this paper explicitly constructs a measure of contractual incompleteness to see whether it positively affects FDI establishments.

Our estimates support the main theoretical predictions of the DIA hypothesis: firms, endowed with superior technology and better human capital, tend to operate abroad via FDI to avoid IA dispersion. However, we do not find conclusive evidence that higher contractual incompleteness increases the likelihood of the integrated solution to reduce hold-up concerns.

The rest of the paper is organized as follows. Section 2 provides a literature review on the boundaries of the Multinational Enterprise, with a particular focus on the Dissipation of Intangible Assets and Contractual Incompleteness arguments; both theoretical and empirical contributions are discussed. Section 3 is entirely devoted to the empirical analysis: data description, specification and empirical estimates. Section 4 concludes and sets future lines of research.

2. Literature review

Theories on the boundaries of the Multinational Enterprise can be grouped according to three strands, namely: a) *Dissipation of Intangible Assets* (Horstmann and Markusen 1987b; Ethier and Markusen 1996; Fosfuri 2000; Mattoo et al. 2001; Markusen 2001; Fosfuri at al. 2001; Saggi 1996, 1999; Glass and Saggi 2002b; Gattai and Molteni 2007)*;* b) *Theory of the firm-based contributions* (Grossman and Helpman 2002, 2003, 2005; Antras and Helpman 2004, 2008; Antras 2003; Feenstra and Hanson 2004; Ottaviano and

Turrini 2007; Marin and Verdier 2003, 2008); c) *Agency Costs* (Horstmann and Markusen 1996)[3].

This paper investigates MNEs' internalisation decision based on the first two approaches, which are briefly discussed below.

2.1 Dissipation of Intangible Assets

The threat of Dissipation of Intangible Assets (DIA) provides a first rationale for keeping production activities within firm's boundaries, when expanding abroad.

Intangible resources can be classified along the two broad categories of *reputation* for product quality and *knowledge* of production processes or managerial techniques. Theoretical models cover both types of assets to investigate multinational's choice of Foreign Direct Investment versus arm's length agreements such as licensing or joint-venture. In deciding about their boundaries, MNEs trade off the efficiency losses involved by FDI – because a local company would be more efficient in input supply and more familiar with the host market - with the risk of IA dispersion which is always inherent in a licensing or a joint-venture arrangement.

Notice that the term "dissipation" entails different meanings, across the DIA literature, depending on the asset under consideration: in the case of knowledge, a spillover mechanism may enable the local counterpart in taking over production secrets, copy final goods and eventually start a rival firm on the basis of the "stolen" asset (see, for instance: Ethier and Markusen 1996; Markusen 2001; Saggi 1996, 1999; Fosfuri 2000; Mattoo et al. 2001; Fosfuri et al. 2001; Glass and Saggi 2002b; Gattai and Molteni 2007); in the case of reputation, dissipation comes because the local counterpart benefits from the MNE's brand image, but may not put adequate effort in maintaining and enhancing it (Horstmann and Markusen 1987b).

As a result, whatever the intangible resource, the risk of DIA provides a theoretical justification for operating abroad via Foreign Direct Investment instead of partnering with an external agent.

For the purpose of the present work, when referring to Intangible Assets, our focus primarily falls on knowledge. Knowledge is quite a particular good: in some senses, it is hardly transferable outside the boundaries of the firm in which it originates, but in others

[3] For extensive surveys, see Markusen (1995), Barba Navaretti and Venables (2004), Saggi (2000).

it easily becomes available to third parties, once revealed. The first case refers to several forms of know-how that are embedded in the *human capital* of the employees so that they cannot be transferred[4] without direct personal contacts, lengthy demonstrations and constant involvement; the second case relates specifically to *technology*, as an asset covered by Intellectual Property Rights (IPR) to exclude agents other than the owner from using and circulating it. In this paper knowledge is interpreted both in the sense of human capital and technology.

To the best of our knowledge, studies on the boundaries of the Multinational Enterprise, inspired by the *Dissipation of Intangible Assets*, basically cover theoretical contributions. The reason for that is perhaps the difficulty in finding firm level datasets to test the theoretical priors. A few exceptions are given by Mansfield et al. (1979), Mansfield and Romeo (1980), Smith (2001) and Gattai and Molteni (2007) where entry mode and technology transfer decisions by US and Japanese multinationals are analysed.

Finally, there is a class of purely empirical papers that investigate the Internalisation issue in discrete dependent variable-models (see, among others: Tse and Pan 2000; Tse et al. 1997; Filatotchev et al. 2007; Tihanyi et al. 2005; Zhao et al. 2004; Gomes Casseres 1989; Mutinelli and Piscitello 1998; Hennart 1991; Agarwal and Ramaswami 1992; Erramilli 1996; Smarzynska Javorcik 2006; Desai et al. 2002). Although these contributions do not explicitly ground on DIA theoretical studies, they often include technological variables among firm level regressors and document a positive impact of intangible resources on the choice of Foreign Direct Investment (Pan 2002; Chen and Hu 2002; Smarzynska Javorcik 2006; Desai et al. 2002).

Based on the previous discussion, Hypothesis 1 summarizes the main insight from the Dissipation of Intangible Asset framework, as tested in the empirical parte of the paper.

Hypothesis 1: based on the DIA framework, the more a firm is endowed with IAs - technology and human capital - the more prone to establish FDI, to avoid knowledge spillover.

2.2 Theory of the firm-based contributions

[4] The intrinsic costs of knowledge transfer by MNEs have been empirically investigated in Caves (1974), Teece (1977), and further discussed and documented in Teece (1986), Davidson and Mc Fetridge (1984), Ramachandran (1993), Glass and Saggi (2002a).

A second explanation of FDI stems from already established theories of the firm. Under this view, the MNE's make-or-buy decision, at an international level, is assessed through the opening up of the "black box" - traditionally explored by the theorists of the firm – and the simultaneous endogenization of the market environment – as in the International Economics tradition. In particular, three paradigms – the Grossman-Hart-Moore (G-H-M) treatment of hold-up and contractual incompleteness (Grossman and Hart 1986; Hart and Moore 1990), the Holmstrom-Milgrom view of the firm as an incentive system (Holmstrom and Milgrom 1994) and the Aghion-Tirole conceptualisation of formal and real authority (Aghion and Tirole 1997) – have been embedded in industry and general equilibrium models, offering a complete characterisation of the Internalisation issue[5].

For the purpose of the present research, we are particularly interested in the G-H-M paradigm, because it is the most mature, both in terms of the numerousness of the applications to FDI and the complexity of the models provided.

The notion of Contractual Incompleteness (CI) is at the heart of this view, and it applies to contracts that are vague or silent on a number of key features and have gaps, missing provisions or ambiguities (Salaniè 1997; Tirole 1999)[6]. It is clear that CI becomes a particularly serious problem when the contracting parties, although independent, are linked by some *relation-specific investment*, which is valuable only inside that specific exchange. In this case, each party may fear that, after making the relation-specific investment, the other party denies the due payment, claiming that some contingencies, uncovered by the contract, have occurred. Given that their investment is already sunk, at the renegotiation stage, firms fear to be *held up*, and they tend to under-invest. Grout (1984), Grossman and Hart (1986), Hart and Moore (1990) formalize the hold-up mechanism described above and show that vertical integration is a possible solution against sub-optimal investment.

This intuition is extended to the international context in (Grossman and Helpman, 2003; Antras and Helpman 2004, 2008; Antras 2003; Feenstra and Hanson 2004; Ottaviano and Turrini 2007) where the boundaries of the Multinational Enterprise originate from the

[5] For a survey see Antras (2004), Helpman (2006) and Gattai (2006).

[6] In particular, the microeconomic literature identifies several dimensions of CI, from unforeseen contingencies to the cost of writing and enforcing contracts, from rigidity to discretion (for more details see Battigalli and Maggi, 2002; Tirole, 1999).

trade-off between governance and transaction costs: a vertically integrated firm is less efficient in intermediate good production and it entails higher costs of entry, product design, and management while a pair of specialized producers suffers from transaction costs whenever contractual incompleteness is assumed and relation-specific investment is needed to manufacture components[7].

To the best of our knowledge, applications of the G-H-M view to FDI consist primarily of theoretical contributions: this is probably due to the lack of firm level data and the intrinsic difficulty to test complex models and find good proxies for CI (Helpman 2006).

Nunn and Trefler (2008) represents the main exception: using US custom data, the authors find moderate support that an increase in contractibility of inputs raises the share of intra firm imports, in high headquarter intensity industries. Further empirical contributions are due to Antras (2003), Feenstra and Hanson (2004), Yeaple (2006), Corcos et al. (2008), Defever and Toubal (2007). Notice, however, that most of these studies provide only indirect tests of the CI argument because no measure of contractual incompleteness is included in the econometric estimates; moreover, results are not clear cut, and support to the theoretical models is rather weak.

Based on the previous discussion, Hypothesis 2 summarizes the main insight from the Contractual Incompleteness explanation of Foreign Direct Investment, as tested in Section 3.

Hypothesis 2: based on the CI framework, the higher the extent of contractual incompleteness, the more likely the FDI solution to reduce hold-up problems.

3. Empirical Analysis

In this Section we explore Italian firms' choice of Foreign Direct Investment, through a large dataset at the micro level. The discussion is organized as follows: first we present the data (3.1), then we discuss the econometric specification and the empirical findings

[7] Notice that, in Antras and Helpman (2008), a decrease in contractual incompleteness affects the relative prevalence of the four organizational forms (see Figure 1) differently, depending on the country (North or South) and on the party (final good producer or input supplier). In particular, an increase in the contractibility of an input provided by the final good producer pushes towards outsourcing, while an increase in the contractibility of an input provided by the input supplier encourages integration. Moreover, better contractibility in the South increases the likelihood of offshoring, while better contractibility in the North decreases it. As far as the make-or buy decision is concerned, the net effect of CI on FDI is positive, while there is an ambiguous impact on Outsourcing.

for the main DIA (3.2) and CI (3.3) arguments. Keeping into consideration Hypothesis 1 and 2, particular attention is devoted to the matching between the theory and the data.

3.1 Data

For the purpose of the present research, three data sources are worth mentioning: the Capitalia Survey on Manufacturing Firms (Indagine sulle Imprese Manifatturiere), AIDA (Analisi Informatizzata Delle Aziende) and Centrale dei Bilanci.

The Capitalia survey provides micro evidence about MNEs' international business. Capitalia is one of the largest Italian banks and it periodically submits a questionnaire to client companies with more than 10 employees. The panel design is stratified and rotating. The result is a very detailed survey that covers a number of topics such as business, employment, innovation, internationalization and management. Our dataset relies on the two most recent waves (the eighth and the ninth), so our time span goes from 1998 to 2003. It should be mentioned that most of Capitalia questions refer to the entire three-year period, rather than to each year, therefore our panel only includes one observation for firms surveyed in one wave, and two for those surveyed in both.

Additional balance sheet information is derived from AIDA and Centrale dei Bilanci and it covers yearly data between 1998 and 2003.

Notice that the sample is further restricted through a trimming procedure that drops observations with extreme growth rate for value added, capital, number of white collars and number of blue collars. As a result, the dataset employed here covers 4364 firms appearing in at least one wave, and 1424 firms appearing in both. Table 2 presents basic summary statistics of the 2000 and 2003 values of the firm level variables of interest, for the two groups of enterprises. A complete description of regressors and regressand is provided in Table 1.

Table 1: Variables description

Variable	**Description**
FDI	Dummy variable, 1 if FDI, 0 otherwise.

	Type: regressand. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from question D2.6.1 (*Has the firm set up FDI during the period 2001-2003?*)[8]
R&D	Dummy variable, 1 if the firm has invested in R&D, 0 otherwise. Type: firm-level *core* regressor; it is a proxy for the parent firm's technological endowment. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from question C2.2.1 (*Has the firm invested in R&D during the period 2001-2003?*)
R&D_EMPL	Percentage of employees engaged in R&D activity over total firm's employment. Type: firm-level *core* regressor; it is a proxy for the parent firm's technological endowment. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from questions B1.1.6 (*Total number of employees in 2001, 2002, 2003*) and B4.1 (*Number of employees engaged in R&D activities in 2001, 2002, 2003*)
DEGREE_EMPL	Percentage of employees holding a degree over total firm's employment. Type: firm-level *core* regressor; it is an indicator of the parent firm's human capital. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from questions B1.1.6 (*Total number of employees in 2001, 2002, 2003*) and B1.2.3 (*Number of employees holding a degree in 2001, 2002, 2003*)
WHITEC_EMPL	Percentage of white collars over total firm's employment. Type: firm-level *core* regressor; it is an indicator of the parent firm's human capital. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from questions B1.1.6 (*Total number of employees in 2001, 2002, 2003*) and B1.1.3 (*Number of white collars in 2001, 2002, 2003*)
SIZE	Number of employees of the parent firm (thousands of units). Type: firm-level *control* regressor. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from question B1.1.6 (*Total number of employees in 2001, 2002, 2003*)
TFP	Natural logarithm of total factor productivity (Levinsohn-Petrin estimate). Type: firm-level *control* regressor. Source: Authors' elaborations from AIDA and Centrale dei Bilanci
AGE	Firm's age, as the difference between 2003 and the year of firm's establishment. Type: firm-level *control* regressor. Source: personal elaborations from ISTAT data.
GROUP	Dummy variable, 1 if the parent firm belongs to a group, 0 otherwise. Type: firm-level *control* regressor. Source: Capitalia Survey on Manufacturing Firms (8th and 9th wave). Authors' elaboration from question A8.1 (*Does the firm belong to a group?*)
CI	Measure of upstream contractual intensity at industry (2-3 digit NACE) level. Type. Core regressor Source: Authors' elaborations from UK Input-Output Use tables and Rauch's liberal industry

[8] Questions from the Capitalia survey are displayed as in the 9th wave, but the same items appear in the 8th wave questionnaire.

	classification by differentiation (1999)

Based on Table 2, it is possible to see whether firms surveyed in one wave tend to differ from those surveyed in both.

As far as the eighth wave is concerned (columns 1-3), evidence suggests that, in 2000, firms appearing in both waves tend to be larger (*SIZE*), more productive (*TFP*), more likely to engage in Foreign Direct Investment (*FDI*), to belong to a group (*GROUP*), and to invest in Research and Development (*R&D*) compared to those appearing only in the eighth wave; moreover, they have a lower share of employees holding a degree (*DEGREE_EMPL*) or pursuing R&D activities (*R&D_EMPL*), and a higher percentage of white collars (*WHITEC_EMPL*).

Table 2: Baseline summary statistics of firm level variables[9]

Variable	**(1) 2000: Firms surveyed in one wave Average (s.d.) [obs]**	**(2) 2000: Firms surveyed in both waves Average (s.d.) [obs]**	**(3) Difference (2)-(1) (s.e.)**	**(4) 2003: Firms surveyed in one wave Average (s.d.) [obs]**	**(5) 2003: Firms surveyed in both waves Average (s.d.) [obs]**	**(6) Difference (5)-(4) (s.e.)**
FDI	0.02 (0.050) [1561]	0.009 (0.095) [2151]	0.06** (0.002)	.045 (.208)[1699]	.020 (.143)[1620]	-0.24*** (0.006)
R&D	.335 (.472)[1554]	0.408 (0.491) [2161]	.072*** (0.013)	.509 (.500)[1725]	.419 (.493)[1632]	-.089*** (.017)
SIZE	.049 (.161)[1579]	.101 (.331)[2194]	.051*** (.009)	.169 (.368)[1775]	.090 (.400)[1644]	-.078*** (.013)
R&D_EMPL	.084 (.092)[572]	.069 (.076)[970]	-.014*** (.004)	.033 (.067)[1688]	.039 (.076)[1622]	.005** (.002)
DEGREE_EMPL	.074 (.070)[699]	.063 (.072)[1111]	-.010*** (.003)	.059 (.073)[1521]	.041 (.063)[1470]	-.018*** (.002)
WHITEC_EMPL	.014 (.034)[1579]	.016 (.038)[2194]	.002* (.001)	.023 (.036)[1775]	.012 (.035)[1644]	-.010*** (.001)
TFP	4.637 (.615)[1577]	4.779 (.655)[2188]	.141*** (.021)	5.131 (.671)[1756]	4.708 (.630)[1637]	-.423*** (.022)
GROUP	.159 (.365)[1577]	.218 (.413)[2187]	.058*** (.013)	.407 (.491)[1772]	.193 (.395)[1640]	-.213*** (.015)

[9] * means significant at 10%, ** significant at 5%, *** significant at 1%.

Variable	(1) 2000: Firms surveyed in one wave Average (s.d.) [obs]	(2) 2000: Firms surveyed in both waves Average (s.d.) [obs]	(3) Difference (2)-(1) (s.e.)	(4) 2000: Firms surveyed in one wave Average (s.d.) [obs]	(5) 2000: Firms surveyed in both waves Average (s.d.) [obs]	(6) Difference (5)-(4) (s.e.)
FDI	0.02 (0.050) [1561]	0.009 (0.095) [2151]	0.06** (0.002)	.045 (.208)[1699]	.020 (.143)[1620]	-0.24*** (0.006)
R&D expenditure	.335 (.472)[1554]	0.408 (0.491) [2161]	.072*** (0.013)	.509 (.500)[1725]	.419 (.493)[1632]	-.089*** (.017)
SIZE (thousand of workers)	.049 (.161)[1579]	.101 (.331)[2194]	.051*** (.009)	.169 (.368)[1775]	.090 (.400)[1644]	-.078*** (.013)
Workers in R&D/Total workers	.084 (.092)[572]	.069 (.076)[970]	-.014*** (.004)	.033 (.067)[1688]	.039 (.076)[1622]	.005** (.002)
Workers with graduate degree/Total Workers	.074 (.070)[699]	.063 (.072)[1111]	-.010*** (.003)	.059 (.073)[1521]	.041 (.063)[1470]	-.018*** (.002)
White Collars/Total Workers	.014 (.034)[1579]	.016 (.038)[2194]	.002* (.001)	.023 (.036)[1775]	.012 (.035)[1644]	-.010*** (.001)
Log TFP	4.637 (.615)[1577]	4.779 (.655)[2188]	.141*** (.021)	5.131 (.671)[1756]	4.708 (.630)[1637]	-.423*** (.022)
GROUP (dummy)	.159 (.365)[1577]	.218 (.413)[2187]	.058*** (.013)	.407 (.491)[1772]	.193 (.395)[1640]	-.213*** (.015)
(Revenue-Value Added)/Revenue	.709 (.129)[1579]	.701 (.129)[2194]	-.007* (.004)	.739 (.123)[1775]	.703 (.131)[1644]	-.035*** (.004)

As far as the ninth wave is concerned (columns 4-6), notice that, in 2003, firms surveyed in both waves look smaller, less productive, less likely to engage in FDI and R&D activities, and less likely to belong to a group, compared to those surveyed only in the ninth wave; moreover, they are characterized by less graduates and white collars and more employees pursuing R&D activities.

Given the statistically significant differences between the two groups of enterprises, in the DIA section, we run regressions looking at each wave individually; since we get similar results, in what follows, we present estimates from the entire sample. This is consistent with the CI section; indeed, we cannot analyse the influence of contractual

incompleteness on FDI for each individual wave, since our estimator exploits the temporal variation in the industry level CI measure, to distinguish the impact of contractual incompleteness from industry fixed effects.

Finally, we combine UK Input-Output tables (I-O) and Rauch (1999) classification of SITC industries into differentiated, reference priced and homogeneous in order to construct measures of CI, as described in Section 3.3.

3.2 DIA equation: specification and results

Based on Hypothesis 1, the more a firm is endowed with Intangible Assets, the more likely the FDI solution. Our DIA equation is set accordingly. In particular, we move from parsimonious specifications in which only firm level regressors are included to richer ones that allow for a number of robustness checks at the industry and province level; lagged variables are also employed to correct for possible endogeneity.

Our unit of analysis is the parent company. The basic specification is based on a probit model, however results are robust when using a simple linear probability model or a logit specification[10]. The basic equation is defined as follows:

$$PR(FDI_{ijt} = 1) = \Phi(IA_{it} \cdot \alpha + F\_CONTROL_{it} \cdot \beta + \varepsilon_{it}) \quad (1)$$

where the dependent variable refers to firm *i*, industry *j*, year *t* and it takes value 1 in case of wholly-owned subsidiary, 0 otherwise. Explanatory variables are of two types: *IA* is a matrix of Intangible Assets; *CONTROL* includes other firm level characteristics that may play a role in shaping the Internalisation decision, but over which we not have theoretic expectations; α and β are the parametric vectors associated to Intangible Assets and control variables and ε denotes the error term.

According to our previous discussion (see Section 2.1), equation (1) can be further specified, distinguishing between the *human capital* and the *technological* aspect of knowledge. This is an important novelty, compared to previous empirical studies:

[10] Due to data constraints, although merging two waves of the Capitalia survey, we do not provide panel regressions, but rather stick to cross section analysis. The reason is that, as we mentioned before, most of the Capitalia questions refer to the entire three years period, therefore variables do not show a within wave variation, but only a between wave variation. Put another way, our regressand and some of the regressors take different values in the 1998-2000 and 2001-2003 period, but not on a yearly base. When yearly data are available, the 2003 or 2000 values are included in the econometric specification specification, apart from the lagged one, which employs the 2001 or 1998 data.

although human capital is often mentioned as a key asset, likely to orient multinational activity, it is rarely included in econometric tests, due to the lack of firm level information. Here, as a proxy for *human capital*, two different indicators are adopted, such as the percentage of employees holding a degree (*DEGREE_EMPL*) and the percentage of white collars over the total number of employees (*WHITEC_EMPL*). As far as *technology* is concerned, our measures include: Research & Development expenditure (*R&D*) as in (Desai et al. 2002; Smarzynska Javorcik 2006) and the percentage of employees been engaged in R&D activities (*R&D_EMPL*). These variables strictly refer to the MNE's Intangible Assets and therefore, based on Hypothesis 1, we expect an overall positive sign: full ownership, induced by the threat of knowledge dissipation, is more likely to emerge when know-how easily spills over, i.e. when firms are endowed with superior technology and better human capital.

Firm level controls include: size, approximated through the number of employees (*SIZE*), firms' age (*AGE*), the affiliation to a group (*GROUP*) and a measure of total factor productivity (*TFP*). Following closely Levinsohn and Petrin (2003), the production function for a generic category *j* can be written as in (2), where all variables are in logarithm:

$$Y_{ijt} = \alpha_i + \beta_1 W_{ijt} + \beta_2 B_{ijt} + \beta_3 K_{ijt} + \omega_{it} + \varepsilon_{ijt} \quad (2)$$

Y_{ijt} is value added by firm *i* in category *j* in year *t*, deflated by the Producer Price Index for the appropriate two-digit NACE industry; K_{ijt} denotes fixed assets, deflated by the simple average of the deflators for all NACE sectors, as in Smarzynska Javorcik (2004); W_{ijt} indicates the number of white collars; B_{ijt} the number of blue collars and ω_{it} is the productivity component. Based on equation (2), productivity residuals are estimated under the semi-parametric approach proposed by by Levinsohn and Petrin (2003), to control for simultaneity and selection problems.[11]

Table 1 summarizes all relevant information about the variables mentioned for econometric purposes.

Estimates from the basic specification are shown in left hand panel of Table 3. We report marginal effects and p-values in parenthesis.

[11] See also Olley and Pakes (1996).

Table 3: Probit estimates of the DIA equation[12]

	Basic specification				**Robustness check 1**			
	FDI	*FDI*	*FDI*	*FDI*	*FDI*	*FDI*	*FDI*	*FDI*
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
R&D	0.021				0.023			
	(0.000)***				(0.000)***			
R&D_EMPL		0.059				0.078		
		(0.005)**				(0.002)**		
DEGREE_EMPL			0.017				0.061	
			(0.504)				(0.065)*	
WHITEC_EMPL				0.035				0.085
				(0.294)				(0.030)**
SIZE	0.007	0.011	0.013	0.010	0.006	0.010	0.011	0.008
	(0.003)***	(0.009)**	(0.003)**	(0.001)	(0.041)**	(0.048)**	(0.041)**	(0.021)**
TFP	0.002	0.004	0.004	0.004	0.006	0.012	0.009	0.009
	(0.247)	(0.206)	(0.218)	(0.023)**	(0.034)**	(0.021)**	(0.065)*	(0.003)**
GROUP	0.018	0.030	0.024	0.024	0.019	0.032	0.026	0.024
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Industry fixed effect	No	No	No	No	Yes	Yes	Yes	Yes
Province fixed effect	No	No	No	No	Yes	Yes	Yes	Yes
Obs.	6902	4714	4686	6959	5121	3452	3279	5165
*p-value^*	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***	0.000***	(0.000)***
Pseudo R^2	0.104	0.054	0.044	0.068	0.158	0.120	0.113	0.126

Notice that Intangible Assets turn out to be relevant drivers of multinationals' outsourcing decision. Indeed, technology and human capital indicators show the expected positive sign, meaning that the probability of FDI establishments increase in IAs endowment. Technological measures, such as *R&D* and *R&D_EMPL*, seem to be more relevant than human capital ones at this stage.

Our basic equation is then completed through a number of robustness checks, to see whether Intangible Assets are robust to richer specifications including industry and province fixed effects. The estimated equation is as follows:

$$PR(FDI_{ijpt} = 1) = \Phi(IA_{it} \cdot \alpha + F\_CONTROL_{it} \cdot \beta + \eta_j + \eta_p + \varepsilon_{it}) \qquad (3)$$

[12] * means significant at 10%, ** significant at 5%, *** significant at 1%. Marginal effects and p-values (in parenthesis) are shown. Standard errors are clustered at the industry level. A measure of firms' *AGE* (not shown) is also included, as a control.

where η_j is the industry fixed effect (according to NACE 3 digits) and η_p is the province fixed effect. Unfortunately, the Capitalia survey provides no information about the host market; therefore no country variable can be included in the econometric analysis.

Table 4: Probit estimates of the DIA equation, robustness check 2

	Robustness check 2			
	FDI	*FDI*	*FDI*	*FDI*
	(1)	*(2)*	(3)	(4)
R&D_1	0.044			
	(0.000)***			
R&D_EMPL_1		0.141		
		(0.000)***		
DEGREE_EMPL_1			0.118	
			(0.016)**	
WHITEC_EMPL_1				0.242
				(0.011)**
SIZE_1	0.010	0.015	0.020	0.016
	(0.228)	(0.057)*	(0.051)*	(0.054)*
TFP_1	0.007	0.014	0.011	0.013
	(0.346)	(0.077)*	(0.201)	(0.101)
GROUP_1	0.043	0.043	0.040	0.041
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Industry fixed effect	Yes	Yes	Yes	Yes
Province fixed effect	Yes	Yes	Yes	Yes
Obs.	1814	2053	1753	2078
*p-value^*	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Pseudo R^2	0.189	0.158	0.151	0.150

Probit estimates are shown in the right hand panel of Table 2. Technology and human capital variables are significant, with the expected positive sign: in lines with DIA theoretical models, Italian firms characterized by higher level of intangible resources tend to operate abroad via FDI to reduce knowledge spillovers. Finally, the same equation as in (3) is estimated with lagged variables: firm level values are those of 1998 and 2001, while no change occurs at the industry and space level because sectors and provinces are time invariant.

Table 4 contains the main empirical findings with lagged variables.

Notice that results do not change compared to previous specifications: the lagged variables that concern 1998 and 2001, still affect the probability of FDI establishment at

the end of the three year period (2000 and 2003), as a further confirm of the DIA argument for Italian MNEs.

3.3 CI equation: specification and results

In this section we present an empirical test of Hypothesis 2: the higher the contractual intensity, the higher the likelihood of FDI establishments. To the best of our knowledge, this is the first attempt to include an explicit measure of CI in the firm level choice of Foreign Direct Investment. A probit model serves as a starting point for the empirical analysis, however results are consistent when using a simple linear probability model or a logit specification. The basic equation is defined as follows:

$$PR(FDI_{ijt} = 1) = \Phi(CI_{jt} \cdot \alpha + F\_CONTROL_{it} \cdot \beta + \varepsilon_{it}) \quad (4)$$

The dependent variable is the same binary indicator employed in Section 3.2: it takes value 1 if the firm owns a foreign subsidiary, 0 otherwise. *CI* is a measure of contractual intensity for sector *j* in period *t,* as described below. *CONTROL* is a vector of firm level characteristics, including size, total factor productivity, age and an indicator for group affiliation, while ε denotes the error term.

Following closely Nunn (2007), our index of CI measures the industry level degree of contractual intensity that characterizes transactions among firms belonging to a given industry and their suppliers. The rationale for focusing on such a measure is that the relevant contractual intensity firms take into account in making FDI is the one concerning input provision. Therefore our proxy is set as follows.

First, we identify CI with relation specificity, making use of Rauch (1999)'s classification of the 1,189 4-digit SITC Rev. 2 industries in three groups, based on the way products are sold: on a standardized exchange market, with a reference price or neither of the two. Relation specificity, in particular, is assumed to increase when moving from the first to the second and third case, and so do hold up concerns.

Second, we combine this information with data coming from the UK 2000 and 2003 Input-Output tables, covering 77 manufacturing industries, aggregated at an intermediate level between 2-digit and 3-digit NACE[13]. A new concordance between the SITC

[13] The reason why we employ UK tables is that the Italian ones are available only at 2-digit level, therefore data are too aggregated for our purposes. Yet, being the UK a European country, we believe that its Input-

classification and the UK one is developed to match Rauch's taxonomy of relation specificity with Input-Output description of intermediate components employed for final good production. As a result, for each of the 77 industries, we define a measure R_{kt} that captures the share of *non-homogeneous* goods produced in industry *k* at time *t*, namely the fraction of goods that is not sold on a standardized exchange market. Adding to this, Nunn (2007) also constructs an index of *differentiated* goods that are neither sold on a standardized exchange market nor have a reference price. The first measure is called *liberal*, while the second is labelled as *conservative*. Our results do not change when switching from one definition to the other one therefore in what follows we stick to the liberal interpretation.

Third, according to the Input-Output information, for each of the 77 industries, we provide a measure of upstream contractual intensity, with values on the zero-one interval:

$$CI_{jt} = \sum_{k} \frac{u_{jkt}}{u_{jt}} R_{kt} \tag{5}$$

In equation (5), u_{jkt} is the value of input *k* used in industry *j* at time *t*, and the u_{jt} the value of all inputs used in industry *j* at time *t*. Therefore, $\frac{u_{jkt}}{u_{jt}}$ denotes the relative importance of every input used for production of final good *j*, based on UK I-O data, and R_{kt} measures its relation specificity, based on Rauch (1999).

Loosely speaking, on the one hand we construct weights for all inputs used in a given sector $\left(\frac{u_{jkt}}{u_{jt}}\right)$, and on the other hand we look at their relation specificity (R_{kt}): if contractual incompleteness can be defined in terms of (increasing) relation specificity, when summing across intermediate components, for every sector, we end up with a measure of CI. At this stage, it is worth mentioning that such a measure is time varying, therefore it can be employed in regression models including also industry fixed effects.

Output statistics better suit the Italian economy compared to the US ones. Unfortunately no other table from Southern European nations was available at the same (or higher) level of disaggregation, by the time this paper was written.

Table 5 summarizes the output of our computations: columns 1 and 2 contain the values of CI in 2000 and 2003; columns 3 and 4 provide a decreasing order rank of every sector in terms of contractual incompleteness.

Table 5: Industry level degree of contractual incompleteness and rank in 2000 and 2003

Industry	CI 2000	CI 2003	Rank 2000	Rank 2003
Other transport equipment	0.899	0.903	2	1
Office machinery and computers	0.931	0.894	1	2
Television and radio receivers, sound or video recording or reproducing apparatus and associated goods	0.889	0.859	3	3
Footwear	0.852	0.836	5	4
Medical, precision and optical instruments, watches and clocks	0.842	0.829	6	5
Building and repairing of ships and boats	0.853	0.810	4	6
Agricultural and forestry machinery	0.794	0.806	10	7
Motor vehicles, trailers and semi-trailers	0.759	0.785	13	8
Electric motors, generators and transformers; manufacture of electricity distribution and control apparatus	0.792	0.776	11	9
Electronic valves and tubes and other electronic components	0.818	0.772	7	10
Aircraft and spacecraft	0.809	0.771	8	11
Wearing apparel; dressing and dyeing of fur	0.768	0.769	12	12
Television and radio transmitters and apparatus for line telephony and line telegraphy	0.800	0.749	9	13
Glass and glass products	0.725	0.727	17	14
Miscellaneous manufacturing not elsewhere classified; recycling	0.714	0.720	18	15
Publishing, printing and reproduction of recorded media	0.679	0.713	24	16
Soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations	0.745	0.711	16	17
Mining of coal and lignite; extraction of peat	0.755	0.694	14	18
Other general purpose machinery	0.708	0.689	20	19
Pharmaceuticals, medicinal chemicals and botanical products	0.670	0.683	25	20
Machine tools	0.713	0.679	19	21
Machinery for the production and use of mechanical power, except aircraft, vehicle and cycle engines	0.689	0.678	22	22
Ceramic goods	0.687	0.677	23	23
Electrical equipment not elsewhere classified	0.694	0.664	21	24
Furniture	0.610	0.654	28	25
Other special purpose machinery	0.644	0.654	26	26
Sports goods, games and toys	0.747	0.654	15	27
Tanks, reservoirs and containers of metal; central heating radiators and boilers; steam generators	0.573	0.649	33	28
Made-up textile articles, except apparel	0.587	0.638	31	29
Rubber products	0.587	0.629	32	30
Plastic products	0.604	0.602	29	31
Production of mineral waters and soft drinks	0.599	0.584	30	32
Domestic appliances not elsewhere classified	0.567	0.583	35	33
Bricks, tiles and construction products in baked clay	0.625	0.574	27	34
Basic iron and steel and of ferro-alloys; manufacture of tubes and other first processing of iron and steel	0.491	0.554	42	35
Wood and wood products, except furniture	0.549	0.547	36	36
Alcoholic beverages - alcohol and malt	0.506	0.515	40	37
Dairy products	0.510	0.509	39	38
Casting of metals	0.516	0.502	37	39
Cement, lime and plaster	0.572	0.495	34	40
Cutlery, tools and general hardware	0.473	0.490	43	41
Other food products	0.511	0.483	38	42

Insulated wire and cable	0.447	0.475	45	43
Grain mill products, starches and starch products	0.499	0.463	41	44
Structural metal products	0.467	0.446	44	45
Other textiles	0.421	0.433	47	46
Knitted and crocheted fabrics and articles	0.335	0.417	58	47
Cocoa; chocolate and sugar confectionery	0.413	0.409	48	48
Bread, rusks and biscuits; pastry goods and cakes	0.383	0.400	52	49
Processing and preserving of fish and fish products; fruit and vegetables	0.407	0.397	49	50
Articles of concrete, plaster and cement; cutting, shaping and finishing of stone; manufacture of other non-metallic mineral products	0.392	0.387	51	51
Paints, varnishes and similar coatings, printing ink and mastics	0.396	0.363	50	52
Prepared animal feeds	0.437	0.355	46	53
Production, processing and preserving of meat and meat products	0.361	0.346	53	54
Other fabricated metal products	0.361	0.345	54	55
Sugar	0.338	0.342	56	56
Textile weaving	0.284	0.322	65	57
Forging, pressing, stamping and roll forming of metal; powder metallurgy; treatment and coating of metals	0.342	0.318	55	58
Carpets and rugs	0.338	0.315	57	59
Other chemical products	0.262	0.295	67	60
Articles of paper and paperboard	0.292	0.286	62	61
Jewellery and related articles; musical instruments	0.179	0.279	72	62
Tanning and dressing of leather; luggage, handbags, saddlery and harness	0.309	0.278	60	63
Pesticides and other agro-chemical products	0.194	0.269	71	64
Pulp, paper and paperboard	0.293	0.263	61	65
Fertilisers and nitrogen compounds	0.289	0.253	64	66
Other inorganic basic chemicals	0.276	0.224	66	67
Preparation and spinning of textile fibres	0.220	0.221	69	68
Vegetable and animal oils and fats	0.290	0.217	63	69
Man-made fibres	0.326	0.197	59	70
Plastics and synthetic rubber in primary forms	0.201	0.162	70	71
Basic precious and non-ferrous metals	0.170	0.155	73	72
Industrial gases, dyes and pigments	0.221	0.155	68	73
Other organic basic chemicals	0.145	0.103	74	74
Coke, refined petroleum products and nuclear fuel	0.035	0.040	75	75

Among the most relation specific, we find industries such as transport equipment, computers, television, radio, telecommunication and footwear: according to the previous discussion, CI is extremely high for all these goods, given their non homogeneous nature. Among the least relation specific, it is possible to mention sectors like chemicals, coke, industrial gases, fertilizers and nitrogen where the degree of differentiation is lower and contractual incompleteness is less severe. When comparing the eighth and ninth waves, no neat difference appears in terms of CI: although this measure is time varying, the 2000 and 2003 values are highly correlated. At this stage, it is worth noticing that our proxy, even if based on different I-O tables, is strongly consistent with the one provided by Nunn (2007), and results in a similar ranking across sectors. This is an important robustness check for what follows.

As far as the econometric analysis is concerned, the left panel of Table 6 reports a few estimates of the CI equation set in (4).

Table 6: Probit estimates of the CI Equation[14]

	Basic specification		**Robustness check 1**	
	FDI	*FDI*	*FDI*	*FDI*
	(1)	(2)	(3)	(4)
CI	0.019	0.008	0.019	0.034
	(0.019)**	(0.156)	(0.018)**	(0.686)
SIZE		0.008		0.009
		(0.000)***		(0.000)***
TFP		-0.001		-0.001
		(0.521)		(0.521)
GROUP		0.006		0.007
		(0.044)**		(0.023)**
Industry fixed effect	No	No	Yes	Yes
Province fixed effect	No	No	Yes	Yes
Obs.	6909	6770	6909	6770
*p-value^*	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Pseudo R^2	0.051	0.064	0.123	0.154

According to Hypothesis 2, *CI* is expected to have a positive sign, because contractual incompleteness encourages FDI establishments to reduce hold up concerns. However, our data provide weak empirical support to the theoretical prediction: the coefficient of the upstream measure of CI is significant only in the basic specification, but this effect vanishes when adding firm level controls. Results are similar if we allow for richer specifications, that include also industry (η_j) and province (η_p) fixed effects, as in (6):

$$PR(FDI_{ijpt} = 1) = \Phi(CI_{jt} \cdot \alpha + F\_CONTROL_{it} \cdot \beta + \eta_j + \eta_p + \varepsilon_{it}) \qquad (6)$$

Estimates are shown in the right hand panel of Table 6: contractual incompleteness is significant, with the expected positive sign, only in column (3), but this effect disappears when controlling for firm's characteristics.

At this stage it is worth mentioning that several interactions between CI and firm level variables – such as *SIZE*, *TFP* and a measure of the importance of inputs for the production process (sales-value added)/sales - were also tried, with no conclusive result.

Given the unavailability of information about host markets, no proxy for contractual incompleteness at the country level - such as judicial quality - was introduced, however an indicator of provincial CI – defined in terms of the length of first degree trials in local courts – turned out to be not significant in any specification.

To conclude, based on Table 6, we do not find any strong evidence that the industrial degree of contractual incompleteness affects the FDI choice of Italian firms, in lines with previous empirical studies (see, for instance: Nunn and Trefler 2008; Corcos et al. 2008). Given these results, we do not push the analysis further to include lagged variables.

4. Conclusion

This paper makes an empirical assessment over the boundaries of multinational firms. Based on Italian micro level data, we test the main predictions of the *Dissipation of Intangible Asset* and *Contractual Incompleteness* hypothesis, contributing to the existing literature in several aspects.

First, this is an empirical study, while the bulk of the International Economics treatment of the internalisation issue has been theoretical so far.

Second, we depart from the few empirical contributions by using *firm level* (not industry or country level) information and provide fresh evidence about *Italian* FDI worldwide, differently from a literature very much focused on the US.

Third, our empirical setting itself comprises a few novelties, since we test DIA and CI propositions in a unitary framework and we include direct measures of human capital and relation specificity, taking advantage of an extremely detailed dataset.

Estimates confirm that Italian MNEs, endowed with superior technology and better human capital, tend to operate abroad via FDI, to mitigate spillover effects. In line with the DIA explanation of Foreign Direct Investment, this result is robust to several specifications with industry and province fixed effects and lagged variables.

By contrast, our data provide only weak support to the CI argument, because no strong correlation emerges between MNEs' make-or-buy decision and the extent of contractual incompleteness, at the industry level.

Some caveats still apply to our results and may help interpret the empirical findings. First, we compute CI using UK data. Though we believe that this is a good enough

measure for the Italian case, the two countries might still present relevant differences in their contractual intensity structure in the provision of inputs and therefore the use of UK table might turn out to be misleading. Second, we do not have data on the destination country. Therefore we cannot see whether the role of contractual intensity varies by geographical areas. Third, data constraints do not allow us to measure CI at firm level, which would add precious information regarding investors' behaviour: as mentioned before, relation specificity in our sample varies from the eighth to the ninth survey, but values are highly correlated, which may distort empirical findings. Last but not least, due to the Capitalia survey, our dependent variable captures the three years flow of Foreign Direct Investment, rather than the overall stock. This might generate a downward bias because MNEs not opening subsidiaries during the three year period are treated as not having FDI. While this bias does not affect the positive results found in the DIA Section, because intangible resources are shown to play a role, at least for those companies engaged in FDI between 1998 and 2003[14], it might potentially explain the weak performance of the *CI* measure.

According to the previous discussion, we believe that further research should be encouraged to go deeper into the boundaries of multinational enterprises and critically assess the Contractual Incompleteness argument.

[14] Put another way, the problem arising from our binary measure of *FDI* is that we might consider as "0", observations that are actually "1", in the sense that firms having established foreign subsidiaries before 1998, but not between 1998 and 2003, answered "no" to the D2.6.1 question of the Capitalia survey (see Table 1). More problematic would be the opposite situation, namely the case in which firms having no FDI are considered as having a few subsidiaries abroad. While our measure of Foreign Direct Investment is likely to under-estimate the overall picture of Italian operations worldwide, we can be sure that significant effects, if any, capture the impact of firm, industry or province regressors on the FDI choice.

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