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Working Paper

Does the explanatory power of the OLI approach differ among sectors and business functions: Evidence from firm-level data

Economics Discussion Papers, No. 2015-67

Provided in Cooperation with:

Kiel Institute for the World Economy – Leibniz Center for Research on Global Economic Challenges

Suggested Citation: Arvanitis, Spyros; Hollenstein, Heinz; Stucki, Tobias (2015) : Does the explanatory power of the OLI approach differ among sectors and business functions: Evidence from firm-level data, Economics Discussion Papers, No. 2015-67, Kiel Institute for the World Economy (IfW), Kiel

This Version is available at:

<https://hdl.handle.net/10419/124862>

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Discussion Paper

No. 2015-67 | December 08, 2015 | <http://www.economics-ejournal.org/economics/discussionpapers/2015-67>

Does the Explanatory Power of the OLI Approach Differ among Sectors and Business Functions: Evidence from Firm-level Data

Spyros Arvanitis, Heinz Hollenstein, and Tobias Stucki

Abstract

The relevance of services FDI strongly increased over the last two decades. As services and goods differ with respect to important characteristics, one may expect that the determinants of internationalisation are not identical in services and manufacturing. Surprisingly, there is practically no firm-level research contrasting the two sectors in this respect. In order to fill this gap, the authors aim at identifying for manufacturing and services, firstly, the determinants of a firm's propensity to engage in foreign activities (exports and/or FDI) and, secondly, the factors determining a firm's direct foreign presence in terms of (combinations of) business functions. The authors find that an OLI-based model is well suited for explaining not only the propensity to go international but also the differences between two specific forms of FDI in terms of business functions both for manufacturing and services. In all models, the explanatory power of the OLI approach is stronger for manufacturing than service activities. The results are consistent with the stages view of internationalisation in particular in manufacturing, but to a lesser extent also in services where the process of internationalization is less continuous.

Data available upon request (see the following link):

<http://www.economics-ejournal.org/data-availability-dp-2015-67/view>

JEL F23

Keywords Manufacturing vs. services internationalisation; offshoring vs. exports; internationalisation of business functions; multinational companies; international business strategy

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Citation Spyros Arvanitis, Heinz Hollenstein, and Tobias Stucki (2015). Does the Explanatory Power of the OLI Approach Differ among Sectors and Business Functions: Evidence from Firm-level Data. Economics Discussion Papers, No 2015-67, Kiel Institute for the World Economy. <http://www.economics-ejournal.org/economics/discussionpapers/2015-67>

1 Introduction

The long-term trend of an increasing share of service sector FDI has accelerated over the last twenty years (Dunning and Lundan 2008; Kundu and Merchant 2008). Nevertheless, empirical research on FDI is still concentrated on manufacturing. As the basic characteristics of services and goods differ – the main specifics of services are intangibility, inseparability of production and consumption, heterogeneity, perishability and restricted ownership (Buckley et al. 1992) – one would expect that the determinants of internationalisation are not the same in the two sectors (see, e.g., Boddewyn 1986; Dunning 1989; Contractor et al. 2003). This may hold true although the separation line between goods and services has become quite blurred (see, e.g., Grönroos 1999; Jack et al. 2008), reflecting the growing service content of manufacturing and a certain tendency towards the industrialisation of parts of the service sector (Miozzo and Miles 2002; Guerrieri and Meliciani 2005).

Against this background, it is surprising that firm-level econometric research dealing with the internationalisation of service firms by way of FDI is scarce. Particularly, only few studies cover the whole service sector, and there is hardly any empirical work investigating systematically the differences between manufacturing and services.

The analysis of the internationalisation of services companies is dominated until now by studies for *specific industries*. To mention are, in particular, financial services, ICT/software, the hotel industry, business services and retail trade (see the comprehensive review of Kundu and Merchant (2008)).¹ The majority of contributions are case studies or small-sample descriptive analyses focusing on one or very few service industries. *Econometric* studies dealing at firm level with specific service industries became available, with some exceptions, only in recent years: Lin (2010), Narayanan and Bhat (2010) for ICT/software; Contractor and Kundu (1998), Brown et al. (2003), León-Darder et al. (2010), Villar et al. (2012) for the hotel industry; Ursacki and Vertinsky (1992), Nachum and Wymbs (2005), Mariscal et al. (2012) for financial services; Terpstra and Yu (1988), Rodriguez and Nieto (2012) for knowledge-intensive service industries. The concentration on *industry-specific studies* may be due to the absence of (large scale) datasets covering the whole service sector (Castellacci 2010), as is already pointed out in some earlier review articles (see, e.g., Coviello and McAuley 1999). Another reason may be the presumption that the service sector is particularly heterogeneous as advocated, for example, by Dunning (1989) who argues that type and combination of O-, L- and I-advantages differ among service industries.

¹ For an earlier survey see Knight (1999).

At least, there are some econometric firm-level studies of internationalisation that cover the *entire service sector* (or large parts of it). These mostly deal with aspects of internationalisation not treated in the present paper, such as: foreign entry mode choice (Erramilli and Rao 1993; Brouthers and Brouthers 2003); outsourcing (Murray and Kotabe 1999; Jaklic et al. 2012); role of business services for manufacturing FDI (Nefussi and Schwellnus 2010); impact of internationalisation on firm performance (Contractor et al. 2003).² Only very few service sector studies focus on the issue we investigate in this study. To mention are Li and Guisinger (1992) and Kundu et al. (2008) which are dealing with the determinants of FDI as well as Wagner (2014) who applies the model of “firm heterogeneity” (productivity) for explaining the firms’ choice between exporting and FDI.

Rare are econometric studies of internationalisation that aim at identifying similarities and differences between *services and manufacturing* firms using the same empirical model for both sectors. Examples are the already mentioned studies of Brouthers and Brouthers (2003) and Jaklic et al. (2012). Furthermore, Py and Hatem (2009) estimate a model explaining the location of FDI projects differentiated by industry groups (within manufacturing and services) and business functions. Finally, Lejpras (2009) compares the two sectors in terms of the factors determining exports and FDI, respectively.³ All in all, the empirical knowledge with respect to the specifics of the internationalisation of manufacturing and services, respectively, is quite limited (Merchant and Gaur 2008).

The present study contributes to filling this research gap by identifying and comparing for the two sectors (a) the drivers of the internationalisation of firm activity in terms of exports and FDI, and (b) the determinants of the choice among specific forms of FDI in terms of business functions. As mentioned, there is little evidence from econometric studies with respect to the first topic, and the second one, to the best of our knowledge, has never been investigated at all.

In order to analyse these problems we formulate two empirical models using the well-known OLI paradigm (Dunning 2000) as theoretical framework. In *model I* (“*INT_propensity*”), we estimate the probability of a firm to belonging to one of the following (mutually exclusive) three categories: “selling on domestic markets only” (DOMESTIC), “serving, additionally, export markets (without any offshoring)” (EXPORT), and “offshoring” (FDI). In *Model II* (“*INT_function*”), we determine the likelihood of a firm to locating abroad specific (combinations of) business functions, that is (a) “offshoring distribution *and/or* production”

² We do not mention studies of internationalisation which only deal with *export* activities (for a review of such work, see Wagner 2012).

³ One could add the already mentioned study of Wagner (2014) who compares his results related to the service sector with the basic insights gained from the extensive research dealing with manufacturing.

(FDI_DP) and (b) “offshoring R&D activities, in addition to distribution *and/or* production” (FDI_RDP). The two groups of firms, which are sub-categories of FDI, again are mutually exclusive.

The present analysis is an extension of Hollenstein (2005), who estimated, using data for 1998, OLI-based models that are structurally similar to model I and II but did so only for the entire business sector. The present research also goes beyond Lejpras (2009) who disaggregated the business sector in manufacturing and services and estimated a model comparable to our model I which distinguishes between “exporting only” and “direct foreign presence”. However, this author did not further differentiate *within* the category of firms with FDI as we do in model II.

The paper is based on a large dataset containing information from 1921 companies of the Swiss business sector that responded to a comprehensive survey we conducted in 2010 among a random sample drawn from the official enterprise census of 2008 (response rate: 42%). The available data allow a rich specification of the explanatory part of the two models. By estimating model I and II we are able to significantly add to previous evidence on the differences between manufacturing and service companies with respect to the determinants of international activities – a topic strongly neglected in empirical research.

In line with our hypotheses, we find, for both sectors, that an OLI-based model is well suited not only for explaining the propensity of firms to go international by means of exports and/or FDI (model I) but also differences between specific forms of FDI in terms of business functions (model II). In all models, the explanatory power of the OLI approach is stronger for manufacturing than for services. The results for manufacturing are in line with the stages view of internationalisation, what is only partly the case for the services sector.

The structure of the paper is as follows: In the next section, we present the conceptual framework and the related hypotheses. In Section 3, we describe the database and give some information on the incidence of international activities of Swiss companies. Section 4 is devoted to model specification, and in Section 5 we present the empirical results and compare them with previous work. Finally, we summarise and draw some conclusions.

2 Conceptual framework and related hypotheses

2.1 Theoretical background

Since Hymer (1976), the theory of international investment is based on the assumption of imperfect markets. Under these conditions, firm-specific capabilities yield a competitive edge independent of the economic attractiveness of different locations (see Caves (1982) and, more

formalised, the “new trade theory” (see, e.g., Helpman 1984). Moreover, the “transaction cost theory” states that a firm engages in FDI whenever the costs of setting up and running a transnational organisation of activities are lower than those of external market transactions (Rugman 1981; Hennart 1982; Buckley and Casson 1985; Williamson 1985). In addition, there are many partial hypotheses explaining specific aspects of internationalisation that are rooted in different sub-disciplines of economics such as industrial organisation, management sciences, evolutionary economics, etc. (Dunning 2000).

As early as in the 1970s, Dunning argued that no single approach is able to explain a firm’s international activities (Dunning 1977, 1979). He proposed an eclectic theory of international production, the well-known OLI paradigm, which he further developed over the years to account for changing features of the international economy and new theoretical approaches. In the most recent version (Dunning and Lundan 2008) the OLI model applies not only to international production but also to other business functions. In addition, it emphasises the strategic aspects of internationalisation more explicitly by drawing on the “resource-based” (Wernerfelt, 1984) or “dynamic capability” (Teece et al. 1997) view of the firm, or the concept of the “knowledge-based company” (Kogut and Zander 1993).

We postulate that the OLI paradigm is an appropriate theoretical framework for specifying the explanatory part of the two models we estimate in this paper: the first one determines the propensity of firms to internationalise their activities (model I: *INT_propensity*), and the second one explains the likelihood of firms to locating abroad specific (combinations of) business functions (model II: *INT_function*).

The OLI model basically accounts for three groups of explanatory variables: 1) “*Ownership-specific (O) advantages*”, which arise mainly from the availability of firm-specific knowledge, human capital, managerial skills, property rights, marketing outlets, access to finance or international experience. 2) “*Location-specific (L) advantages*“, which root in differences between foreign and domestic locations with respect to factor costs, political stability, the regulatory framework, distance, etc. 3) “*Internalisation (I) advantages*”, which allow firms to reduce risks and costs of transactions in imperfect market for technology or key intermediate products. A company may realise I-advantages by setting-up foreign subsidiaries or by international M&A activities and also, but to a lesser extent, by engaging in joint ventures with foreign partners (Dunning and Lundan 2008).

We use some other explanatory variables that complement the key elements of the OLI model. First, depending on the *market environment* (degree of competition, market growth), it may be

beneficial (or necessary) for a firm to extend its activities to foreign locations (e.g., “first mover” or “follow the leader” strategy). Second, we presume that *industry affiliation* is an important control variable as the relevance of O-, L- and I-advantages are likely to differ among industries, in particular in the (heterogeneous) service sector (Dunning 1989).

The “model of the heterogeneous firms” (see the seminal papers of Melitz 2003 and Helpman et al. 2004) would be another approach one could use for analysing internationalisation strategies of firms. Recent empirical research largely supports the main proposition of this model, stating that only the most productive firms enter foreign markets by FDI, the less productive ones export and the least productive companies exclusively serve domestic markets (for a review see, e.g., Greenaway and Kneller 2007 or Wagner 2011). In the service sector, however, the “pecking order” with respect to productivity seems to be different. According to Wagner (2014) exporters are more productive than firms that enter foreign markets by means of FDI. Notwithstanding the evidence for this widely used approach, we prefer the OLI model as framework of analysis as it provides a more detailed view of the drivers of internationalisation than the “productivity approach”. In fact, the variable “productivity” is a black box representing a whole bundle of specific strengths and weaknesses of a firm that influence the choice among different internationalisation strategies.⁴ By using the OLI model (this holds true in particular for the OI-part) we are able to identify the relevance of the *individual* variables included in the “productivity black box”.⁵

2.2 Hypotheses

The OLI model implies that O- and I-advantages of firms and L-advantages of foreign locations positively affect the probability of a company to being directly present abroad (FDI), while O-advantages suffice to explain the choice of an exclusively export-based strategy of internationalisation (model I). We thus postulate:

H1: The OLI paradigm is well suited as theoretical concept for explaining why a firm internationalises its activities (a) by means of exports driven primarily by O-advantages and (b) by means of FDI driven by O-, L- and I-advantages.

⁴ For a similar view, see Castellani and Zanfei (2007) or Castellani and Giovannetti (2010). These authors show for the Italian manufacturing sector that the use of innovation and other knowledge-related variables significantly reduces the explanatory power of productivity. Falk and Hagsten (2015) get the same result for computer and business services based on Swedish data.

⁵ As labour productivity is highly correlated with the O- and I-variables of our model, we do not use it as an additional factor determining the strategy of internationalisation. Adding the variable “productivity” would lead to biased estimates due to multicollinearity.

Several scholars argue that the OLI approach is not only able to explain the internationalisation of manufacturing firms but, perhaps with some modifications, also the foreign activity of service companies (Boddewyn et al. 1986; Dunning 1989; Buckley et al. 1992). However, it is emphasised that service industries are heterogeneous in terms of the specific characteristics of services, in particular with respect to intangibility, inseparability, heterogeneity, perishability and ownership restrictions. As a consequence, each service industry may exhibit a distinct pattern in terms of OLI advantages. The heterogeneity of the service sector is a recurring topic in the internationalisation literature: capital-intensive vs. knowledge-intensive services (Contractor et al. 2003); equipment-based vs. people-based services (Thomas 1978), hard vs. soft services (Erramilli 1990). For example, Ekeledo and Sivakumar (1998) suggest that “hard services” (where production and consumption mostly are separable) are quite similar to manufacturing in terms of internationalisation, while “soft services” (production and consumption are inseparable) differ in this respect. Moreover, the literature (and intuition) posits that some explanatory factors are more relevant in manufacturing than in services. For example, technology-based O-advantages probably are more important in manufacturing, whereas in the service sector soft factors may be more relevant. Finally, several scholars refer to the importance of idiosyncratic and highly situation-specific determinants of the internationalisation of service provision. As a consequence, it may be more difficult to find evidence for a *general* explanatory model such as the OLI approach in case of services than manufacturing (Bell 1995; Lejpras 2009). Based on these considerations we state:

H2: The OLI model allows to identifying sector-specific patterns of explanation, which primarily differ with respect to the relative significance of the individual OLI variables (H2a). The explanatory power of the OLI model is lower in the case of services than for manufacturing (H2b).

Model II serves to determine whether, and to what extent, the OLI model can explain, in addition to domestic and export activities, not only FDI as a whole but the offshoring of specific combinations of *business functions*. We distinguish offshoring of (a) “distribution *and/or* production” (FDI_DP), and (b) “R&D activities, *in addition to* distribution *and/or* production” (FDI_RDP). We expect that the pattern of explanation differs between the internationalisation of type FDI_RDP and of type FDI_DP. Moreover, in line with some other studies (see, e.g., Basile et al. 2003), we presume that the degree of internationalisation increases with an increase of the number of business functions located abroad. As a

consequence, we expect that the explanatory power of the OLI model is higher for FDI_RDP than FDI_DP. We thus posit:

H3: The OLI model allows to identifying specific patterns of explanation for different forms of internationalisation in terms of number and type of business functions such as direct foreign presence in “distribution and/or production” and “R&D *and* distribution and/or production” (H3a). Besides, the explanatory power of the OLI model is higher in the case of the more far-reaching type of internationalisation that also includes R&D activities (H3b).

Furthermore, it is reasonable to hypothesise that H3 is valid not only for the business sector as a whole but for manufacturing and services as well. However, the literature provides some arguments (we referred to when discussing H2) which imply (a) that the relationship between the OLI variables and different types of foreign activity in terms of business functions is weaker in the service sector than in manufacturing, and (b) that the two sectors differ with respect to the relative significance of specific OLI variables. We thus postulate:

H4: The OLI model allows to identifying specific patterns of explanation for the internationalisation of different combinations of business functions not only for the entire business sector but also for manufacturing and services (H4a). In both sectors, the relationship between the OLI variables and the more far-reaching type of internationalisation which includes R&D activities is particularly strong (H4b). The explanatory power of the OLI variables with respect to the choice of internationalisation strategies in terms of business functions is lower in services than in manufacturing (H4c).

3 Data and incidence of foreign activities

3.1 Data

The data we use in this study almost exclusively stem from the “Swiss Survey on Internationalisation” conducted by the KOF Swiss Economic Institute in 2010 with the reference year 2008 (for some variables the period is 2006/08).⁶ The survey provides information on basic firm characteristics (sales, value added, exports, number and qualification of employees, firm age, industry affiliation, etc.); innovative activity (R&D, sales of innovative products, etc.); co-operation; obstacles to internationalisation; foreign

⁶ Only the indicators of market conditions (degree of competition, market growth) stem from another source (Swiss Innovation Survey 2008).

activities differentiated by business functions (distribution, production, R&D, etc.), target regions and mode of governance .

The survey was based on a random sample of 4533 firms (5 or more employees) drawn from the official enterprise census of 2008 which covers the entire business sector stratified by twenty nine industries and three industry-specific firm size classes (with full coverage of large firms). 1921 companies provided valid information. The response rate (42.4%) is satisfactory given the demanding questionnaire⁷ and does not much vary among industries. The size and sector composition of the final data set is shown in Table A.1 in the Appendix. The number of observations is large enough to separately estimate model I and II for services (N=757) and manufacturing (N=1000). The construction and the energy sector (N=164) are only included in estimates for the entire business sector (N=1921).

3.2 Incidence of foreign activities

Table 1 provides some information on the extent of the internationalisation of firms for the whole sample and the three sectors. The rows 2 and 3 show that the majority of firms are internationalised (56%). Half of them pursue an (exclusively) export-based strategy of internationalisation (category 2), the other half is directly active abroad by locating there at least one business function. The share of internationalised companies is much higher in manufacturing (it is particularly large in the high-tech subsector) than in services (above-average share in the case of knowledge-intensive services), and it is much lower in the construction/energy sector. The *relative* importance of the two basic ways of internationalisation (exporting vs. offshoring; row 2 vs. 3) is the same in services and manufacturing. The most remarkable result is the outstanding prevalence of companies directly engaged abroad in high-tech manufacturing. Information on the incidence of internationalisation by industry is presented in the appendix (Table A.2).

The rows 4 to 7 of Table 1 show for the firms with direct foreign presence (category 3) the share of firms having offshored specific combinations of business functions (subcategories 3a to 3d). It turns out that the category 3c (“distribution/other activities *and* production/sourcing”) is the most prevalent one in the business sector as well as in two of the three subsectors. In the third one (high-tech manufacturing), the largest group contains the firms that, additionally, locate abroad some R&D activities (category 3d). In all subsectors the share of firms that are active abroad with *at least* two business functions (sum of 3c and 3d) is higher than the share

⁷ The questionnaire is available in German, French and Italian and can be downloaded from <http://www.kof.ethz.ch/de/umfragen/strukturumfragen/andere-umfragen/internat2010/>.

of companies which are present in foreign locations with only one business function (sum of 3a and 3b).

Table 1 (about here)

4 Model specification and estimation procedure

4.1 Dependent variables and estimation procedure

Estimates of *model I* allow to evaluate the hypotheses H1 and H2. The model explains a firm's choice among the following strategies: "selling on domestic markets only" (DOMESTIC); "exporting goods/services (in addition to domestic sales) but no offshoring" (EXPORT); "being directly present abroad" (FDI). The three types of firms are *mutually exclusive unordered* categories which constitute the dependent variable "*INT_propensity*" with the values DOMESTIC, EXPORT and FDI (see Table 2, upper part).

Estimates of *model II* serve to assess the hypotheses H3 and H4. This model reflects a firm's choice among three alternative strategies of internationalisation (and the basic option of selling only on the domestic market (DOMESTIC)). The first one (EXPORT) is specified as in model I, whereas the category FDI of model I (direct presence in foreign locations) is replaced by two subgroups related to the offshoring of combinations of business functions, that is (a) "direct foreign presence in distribution *and/or* production" (FDI_DP) and (b) "direct foreign presence in distribution *and/or* production *and* R&D" (FDI_RDP). The different groups of firms again are *mutually exclusive unordered* categories representing the dependent variable "*INT_function*" with the values DOMESTIC, EXPORT, FDI_DP and FDI_RDP (see Table 2, lower part).

Table 2 (about here)

The *multinomial logit model* is an appropriate procedure for estimating the two models as the dependent variables are nominal measures of mutually exclusive categories of firms. We estimate model I as well as model II for the entire business sector and, what is at the core of our interest, separately for manufacturing and services. We use the same set of explanatory variables throughout, expecting that their impact differs depending on (a) the specific categories of firms taken into consideration in the dependent variable of model I and model II,

respectively, and (b) the sample underlying the estimates (entire business sector, manufacturing, services).⁸

The estimation of model I provides two parameter vectors, the first one referring to the category DOMESTIC, and the second one to FDI with EXPORT used as reference category (see Table 4). In the case of model II, we tabulate only the parameter vector for FDI_RDP as FDI_DP is used as reference category while the estimates for FDI and EXPORT, based on model I, are already reported in Table 4.

The econometric analysis is based on cross-section data. Consequently, all variables, in principle, could be endogenous, what would imply biased parameter estimates. The *endogeneity problem*, to some extent, is attenuated as a substantial number of the explanatory variables might be structural in nature, thus are only slightly changing over time (e.g., the share of employees with tertiary-level education or the existence of R&D activities). Nevertheless, we cannot evade the general endogeneity problem inherent in cross-section analyses. Therefore, rather than making causal claims we interpret the estimated coefficients as *conditional correlations* what, however, does not preclude an evaluation of our hypotheses.

4.2 Explanatory variables

The explanatory variables capture the most important aspects of O-, L- and I-advantages, the firms' market environment and some control variables capturing structural firm characteristics (industry affiliation, etc.). In Table 3 we present the exact definition, measurement and sign expectation of the variables, and the Tables A.4 and A5 in the appendix show the related descriptive statistics and correlation matrix.

O-advantages

We expect that this category of variables representing firm-specific capabilities and assets positively affects a firm's international activity. We consider, firstly, two indicators of the innovation capacity of firms, that is in-house R&D (*r&d*) and the sales share of new or significantly improved products (*inno_sales*).⁹ Moreover, we take into account the use of high-level human resources (*tertiary_academic*). We also insert a measure of the effectiveness of the protection of knowledge (*appropriability*), which covers patenting and

⁸ Although we presume that the degree of internationalisation is positively related to the number of business functions located abroad (see subsection 2.2), the multinomial logit procedure is more adequate than the ordered probit model used, for example, by Basile et al. (2003). Only in the former case, we get for each explanatory variable specific coefficients for the the different strategies of internationalisation.

⁹ Alternative (but conceptually less convincing) innovation indicators like "product innovations yes/no" or "process innovations yes/no" yield similar results.

other legal rights (brands, copyrights) as well as informal appropriability mechanisms (e.g., time lead or secrecy). Finally, we include two indicators of a firm's international experience, which is a core variable of the stages view of internationalisation (Johanson and Vahlne 1977). We measure experience by the age of a company (*firm_age*) and the relevance of experience-related obstacles to foreign activities (*obst_experience*). Firm age should be positively related to internationalisation, whereas we expect a negative sign for the obstacle variable as it is inversely related to foreign experience.

L-advantages

L-advantages are only relevant for a firm's decision on whether internationalisation should take place by means of exporting goods/services or offshoring. The model contains a set of dummy variables reflecting a firm's assessment of the relevance (high/low) of specific location-related obstacles to a firm's internationalisation. As these represent *disadvantages* of foreign locations compared to Switzerland, we expect a negative impact on direct foreign presence.¹⁰ The L-part of the empirical model is made up of eight measures of obstacles, which according to an exploratory analysis are (statistically) the most pertinent ones. In accordance with the gravity model of international trade and investment our model contains variables representing the geographical and cultural distance between Switzerland and foreign locations (*obst_distance*, *obst_culture*). Furthermore, we consider high costs of investing abroad (*obst_cost*). We also insert some measures depicting a set of regulation-related L-disadvantages of host countries: restrictive regulatory framework in general (*obst_regulation*); obligation to generate locally a large share of value added (*obst_value*); forced technology transfer to local firms/institutions (*obst_tech_transfer*); insufficient enforcement of IPRs in host countries (*obst_IPR_protection*). Finally, we include a measure of the relevance of political instability in foreign locations as an impediment to international activity (*obst_instability*).¹¹

¹⁰ We only compare the advantages of Switzerland with the rest of the world as our database does not allow to differentiate locational disadvantages by (groups of) host countries.

¹¹ Based on an exploratory analysis of the obstacles to be present in foreign locations, we do not include some other potential impediments for which the "Swiss Internationalisation Survey 2010" provides data. To mention are high coordination costs, high financial risks, insufficient finance, restrictions to the transfer of profits, legal uncertainties, lack of qualified manpower. For some of these obstacles it is quite surprising that they apparently are not relevant. This (partly) is due to correlations with obstacles we include in the model (e.g., correlation of *obst_instability* with "legal uncertainty", or *obst_cost* with "high financial risks" and "insufficient finance").

I-advantages, firm size

According to the transaction cost theory, I-advantages are relevant only for the choice among different *modes* of foreign engagements (e.g., wholly-owned affiliates vs. joint ventures). However, efficient control on foreign activities does not necessarily require an equity-based ownership; it even can be ensured in longstanding non-equity co-operations (Dunning and Lundan 2008). I-advantages may thus also influence the choice between offshoring and exporting (but are irrelevant for the basic decision to go international).

At the empirical level, it is difficult to capture I-advantages. We assume that large firms are in a better position than small ones to reduce transaction costs by internalising market relationships: economies of scale in the governance of foreign affiliates, joint ventures as well as international co-operations; higher power to bargain with foreign units; advantages in monitoring quality-standards to be met by affiliates; etc. Firm size is thus an overall indicator of I-advantages (although it also captures size-related O-advantages as far as they are not explicitly specified in our model). We measure firm size by the number of employees (*size*) and, to account for a possible nonlinear relationship, by its square ($size^2$). For the quadratic term we expect an insignificant or a negative coefficient, the latter meaning that firm size only matters up to a certain threshold. Finally, we presume that experience gained from co-operating with other companies (*cooperation*) enhances a firm's capability to internalise market relationships.¹²

Market environment

We expect that intensive competition on a firm's markets (*competition*) enforces a company to become active in foreign locations or is an incentive to do so ("follow the leader" or "first mover" strategy). Furthermore, strongly growing world markets in the field of a firm's activities (*demand_trend*) is another incentive for international engagements. We thus expect for both variables a positive sign.

Control variables

We control for the fact that foreign-owned companies (*foreign*) often are primarily oriented towards the Swiss market. Likewise, we take into account that some domestic companies do not aim at all to expand beyond the regional market (*regional_market*). We thus expect for both variables a negative sign. Finally, we insert industry dummies representing, for example, industry-specific macroeconomic conditions. These dummies also control for an "omitted

¹² As (long-lasting) co-operations with foreign partners are an element of the dependent variable, we may only account for *domestic* co-operation.

variable bias". They also should make sure that the explicitly specified variables effectively capture *behavioural* differences among firms rather than industry-specific characteristics.¹³

Table 3 (about here)

5 Results

5.1 Model I: *INT_propensity*

5.1.1 Business sector (H1)

To start with, we indicate how to read the results presented in Table 4 (columns 1 and 2). Remember that we evaluate the coefficients of the variables explaining DOMESTIC and FDI against those of the firms that are internationally active solely through domestic and export sales (EXPORT). Therefore, a statistically significant negative sign for the coefficient of DOMESTIC in combination with a significant positive sign of the coefficient for FDI (denoted as DOMESTIC<EXPORT<FDI) for O- and I-variables indicates a *monotonically* increasing positive effect of a certain variable on a firm's internationalisation, thus extending activities from only domestic activities to exports and further to FDI (see, e.g., variable *r&d*). This can be the case also *partially*, namely if the coefficient only increases *either* from DOMESTIC to EXPORT (DOMESTIC<EXPORT≅FDI), e.g., variable *appropriability*, or from EXPORT to FDI (DOMESTIC≅EXPORT<FDI), e.g., *inno_sales*. In case of the O-related obstacle "lack of foreign experience" ("*obst_experience*") it is the other way round as this variable represents a *disadvantage* of a *firm*; in this case, we expect an increasing positive effect on international activity if DOMESTIC>EXPORT>FDI. Moreover, as the L-related obstacles reflect *disadvantages* of *host* countries, offshoring is preferred to exporting if EXPORT>FDI. Notice that L-disadvantages are irrelevant for explaining a shift from DOMESTIC to EXPORT; we thus expect that the coefficients of the L-variables are statistically insignificant in case of DOMESTIC.

Table 4 (about here)

The columns 1 and 2 of Table 4 show that *O-advantages* are very important drivers of internationalisation as all coefficients of the O-variables are significantly positive (and, as expected, negative in case of *obst_experience*). Some coefficients monotonically increase (*r&d*, *tertiary_academic*), others increase partly (*inno_sales*, *appropriability*, *firm_age*), and

¹³ In a strict sense, this holds true only if the industry dummies are not correlated with the firm-specific explanatory variables.

the coefficients of the O-related obstacle *obst_experience* monotonically decrease. The estimates thus strongly support the O-part of the model.

The results for the variables representing *L-disadvantages* of foreign locations confirm the hypothesis that they are relevant only for the shift from EXPORT to FDI; none of the coefficients for DOMESTIC is significant. In contrast, we find statistically significant effects for the transition from EXPORT to FDI for practically all L-related obstacles. Only four of them show the postulated negative sign, meaning that they deter a firm from being directly active at foreign locations: (large) geographic distance (*obst_distance*), high costs of internationalisation (*obst_cost*), obligation to produce locally a substantial part of the value added (*obst_local_value*), and, finally, forced technology transfer (*obst_tech_transfer*). We do not find a significant effect for political instability in potential host countries (*obst_instability*).

Contrary to our expectations, we obtain for three L-related obstacle variables a *positive* sign: cultural difference (*obst_culture*), restrictive regulatory environment (*obst_regulation*) and insufficient protection of IPRs in host countries (*obst_IPR_protection*). In the case of these variables, we argue that a positive sign reflects the fact that firms get aware of the extent of hindrance not until they have already engaged in foreign activities other than exports. Cultural differences that make international transactions more difficult may manifest themselves only as the company has become directly present abroad; for example, FDI facilitate the adaptation of products to local tastes. Moreover, it often is difficult to enforce IPRs without knowledge of local conditions and without (personal) relationships to local actors; hence, if IPRs are important for penetrating foreign markets, a direct presence abroad is superior to exporting. Considerations along similar lines may apply in the case of regulatory obstacles, as knowledge of local conditions usually is necessary to optimally adapt to regulatory restrictions or to circumvent them.

All in all, we conclude that the results for the variables reflecting L-disadvantages of host countries are largely line with the OLI model.

I-advantages, as expected, are only relevant for the choice between exporting and offshoring. The results for *size* and *cooperation* are consistent with the hypothesis postulating that firms that profit from I-advantages prefer a direct foreign presence over an export strategy (FDI>EXPORT). The size effect (which, as already mentioned, also stands for some O-advantages that we cannot explicitly specify in the empirical model given our database) is positive only up to a certain threshold as indicated by the negative sign of *size*²).

The *market environment* also exerts a statistically significant influence on a firm's decision with respect to the type of internationalisation. Vigorous competition on (world) product markets (*competition*) induces or enforces a firm to be directly present at foreign locations rather than to serving foreign markets through exports (FDI>EXPORT). Rising product demand (*demand_trend*) also favours internationalisation over a home-market orientation but does not significantly discriminate between the two strategies of foreign activity (DOMESTIC<EXPORT \cong FDI).

Finally, we get the expected results for the control variables *foreign_subsidary* and *regional_market*. Interestingly, the overall industry effect is small although the industry dummies (*industry*) are jointly significant. This finding implies that *behavioural differences among firms* as well as location factors are the dominant drivers of foreign activities, whereas the literature strongly emphasises the role of *industry-specific* factors (see subsection 2.2).

To sum up, the empirical findings for the *entire business sector* confirm the basic propositions of the OLI model as there is strong evidence for the expected influence of all constituent parts of the model (and for most individual variable). The estimates are thus in line with *hypothesis H1*.

5.1.2 Manufacturing vs. services (H2)

The columns 3 and 4 of Table 4 show that the OLI model is also confirmed for *manufacturing*. Model fit and pattern of explanation are similar to that of the entire business sector. We thus abstain from commenting in detail the findings for manufacturing.

The results for the *service sector* are less convincing than those for manufacturing as they are only partly in line with the OLI model (columns 5 and 6). Nevertheless, the explanatory power (measured by the adjusted R^2) is still satisfactory. We get significant effects of O-advantages but these are not as stringent as in the case of manufacturing. Diverging from manufacturing, the evidence for L-variables to influencing a service firm's choice between offshoring and exporting rests on only one variable (although an important one), namely the high costs of going abroad which strongly deter foreign engagements. Moreover, the results confirm the I-part of the model only in the case of manufacturing. Remarkably, firm size, has no effect on the internationalisation of service companies. In contrast, the market environment is an important driver of internationalisation in both sectors; in this respect, the positive effects are stronger in services than in manufacturing.

A more in-depth inspection of the results yields some explanation for the differences between manufacturing and services. *First*, the *O-advantages* of manufacturing companies rest to a

higher extent than those of services on capabilities related to technology and innovation (*r&d*, *inno_sales*). In contrast, the firms' endowment with highly qualified personnel (*tertiary_academic*) plays a larger role for explaining the internationalisation of service companies. This difference may indicate that "soft" capabilities (for example, with respect to management and organisation) create competitive advantages more often in services than in manufacturing. We also notice that, in the case of manufacturing, international experience (*obst_experience*, *firm_age*) exclusively pertains to the shift from exporting to FDI, whereas for services experience is relevant only with respect to the transition from domestic to export activities. This difference might reflect the divergence between the two sectors with respect to the level of FDI which is much higher in manufacturing (see Table A.2 in the appendix).

Second, the differences between the two sectors with regard to the importance of *L-advantages* and *firm size* are not as surprising as it looks at first sight. They are partly due to the fact that several L-variables reflect technology-related problems, which obviously are more relevant in manufacturing. To mention are primarily the L-related obstacle variables "forced technology transfer to local actors" (*obst_tech_transfer*) and "insufficient protection of IPRs in host countries" (*obst_IPR_protection*). Other impediments presumably become relevant only if a firm is active abroad by *production*-oriented activities, which, as shown in Table 1, are more prevalent in the manufacturing sector. An example is the variable *obst_culture* (positive sign in the case of manufacturing but not for services) which, to some extent reflects the high costs of controlling foreign (production) activities in culturally different locations (see, e.g., Gassmann and von Zedtwitz 1999). The same argument may partly explain why *firm size* only matters for manufacturing companies; the higher monitoring and controlling costs in case of *production*-oriented foreign activities are easier to bear for large than for small firms.

All in all, the results for the two sectors are in line with *hypothesis H2a* ("plausible differences between the two sectors with respect to the pattern of explanation, i.e. the relative importance of the individual variables") as well as with *hypothesis H2b* ("support for the OLI model for both sectors but lower explanatory power of the OLI variables in the case of services").

To date, only Lejpras (2009) provides separate estimates for manufacturing and services dealing with the choice between exporting and FDI, respectively, and selling on domestic market only. Based on an OLI-like model this author finds for *manufacturing* that innovativeness, firm size and intensity of competition are the main factors determining why

firms, rather than solely serving domestic markets, also export goods/services. The same variables also explain, though to a lesser extent, why they are directly present at foreign locations rather than staying at home. In the *service* sector, the same three variables determine the firms' shift from domestic activities to exporting, but the model cannot explain why services firms engage in offshoring activities in addition to their presence on the home market. In contrast to our study, the author does not analyse the shift between an exporting and an FDI strategy.

We also compare our findings for the *service sector* (no estimates for manufacturing) with those of two papers whose approach may be interpreted, at least to some extent, in terms of the OLI model. First, Kundu et al. (2008), analysing FDI in Central/Eastern Europe, get some evidence only for L-advantages what partly may be due to the specific country coverage of the sample (low cost countries). Second, Li and Guisinger (1992), using data for MNEs based in developed countries, find that regulation in host countries (L-advantages), firm size and the market environment (demand prospects, competition) are the main drivers of outward FDI. The results with regard to the market environment are in line with our findings, and the same may apply with respect to L-advantages (in spite of a different specification). However, diverging from the results of the two authors we do not find a significant size effect in case of services. This difference may be due to the fact that their model does not account for O-advantages (which partly are captured by the size variable) and focuses on FDI in a narrow sense (neglect of non-equity foreign engagements).

5.2 Model II: *INT* function

5.2.1 Business sector (H3)

For the business sector as a whole (Table 5, column 1), we find some substantial divergences between the two forms of internationalisation we consider. The coefficients for FDI_RDP, evaluated against the less far-reaching strategy FDI_DP, are statistically significant for six out of the eighteen OLI-related variables.

The differences with respect to *O-advantages* refer to R&D activities (*r&d*), the share of innovative products (*inno_sales*) and *appropriability*, which are factors that are more important for FDI_RDP than for FDI_DP. The difference is primarily due to the fact that foreign investment in R&D, in addition to foreign distribution and/or production, is closely related to a high level of innovation activities and the need to seize the innovation-based revenues.

With respect to *L-advantages* there are differences only for the obstacles “insufficient protection of IPRs in host countries” (*obst_IPR_protection*) and “lack of political stability” (*obst_stability*), which obviously are more relevant for firms that invest abroad in R&D.

Firm size, which is a proxy for *I-advantages* (and also captures size-related O-advantages that are not explicitly specified in our model), is also more important for FDI_RDP than for FDI_DP. This result might reflect the superiority of large firms with regard to worldwide sourcing of knowledge that entails substantial co-ordination and monitoring costs. We do not find any differences for the variables representing the *market environment* as well as for the control variables *foreign_subsidary* and *regional_market*.

Taking account of the results for model I (shift from DOMESTIC to EXPORT and from EXPORT to FDI) according to which the two steps of internationalisation are substantial in terms of the explanatory variables, we interpret the findings as evidence for a gradual and continuous process of internationalisation (DOMESTIC<EXPORT<FDI_DP<FDI_RDP) as postulated by the stages view of internationalisation. The results shown in Table 5 do not differ much from those of a comparable OLI-based study for the Swiss business sector that used data for 1998 (Hollenstein 2005).

All in all, the findings are consistent with *hypothesis H3a* (“plausible differences between the two types of internationalisation with respect to the pattern of explanation, i.e. the relative importance of the individual variables”) as well as with *hypotheses H3b* (“higher explanatory power for the OLI model in the case of FDI_RDP than for FDI_DP”).

Table 5 (about here)

5.2.3 Manufacturing vs. services (H4)

In *manufacturing* (Table 5, column 2), we find differences between the two strategies of internationalisation FDI_RDP and FDI_DP for eight out of eighteen variables. The pattern of these divergences is practically the same as in the entire business sector. In manufacturing, the relevance of O-advantages seems to be somewhat stronger as we find significant effects for some further O-related factors, i.e. the “share of employees with tertiary-level education” (*tertiary_academic*) and “experience with foreign activities” (*obst_experience*). These additional effects are compatible with the specific character and the requirements of foreign R&D investments.

These findings, in combination with the results for model I (see Table 4), are a clear indication of a gradual and continuous process of internationalisation of manufacturing

companies as it is postulated by the stages view of internationalisation (DOMESTIC<EXPORT<FDI_DP<FDI_RDP). Our results are largely consistent with those of a study dealing with the manufacturing sector of the Italian economy (Castellani and Zanfei 2007).

The estimates for the *service sector* (Table 5, columns 3 and 4) suffer from multicollinearity problems. Due to the collinearity between *r&d* and *tertiary_academic*, the coefficient for the latter variable becomes significantly negative in the presence of *r&d* (column 3). In estimates without *r&d*, the variable *tertiary_academic* is insignificant (column 4). Also because of multicollinearity, the coefficient of the variable *obst_experience* is significantly positive in column 3 and becomes insignificant in column 4. We consider the estimates in column 4 as more valid in econometric terms. Therefore, our comments refer to these results.

A comparison between column 4 and column 2 of the table shows that the explanatory power of the OLI model with respect to the choice between the two types of FDI strategy is lower for services than for manufacturing (what is also indicated by the adjusted R^2). Moreover, the pattern of explanation substantially diverges between the two sectors. In the case of services, we find statistically significant coefficients for FDI_RDP (representing deviations from the reference strategy FDI_DP) for six of the seventeen variables covering all parts of the OLI model (with the exception of the market environment), as against eight in the case of manufacturing. However, the pattern of explanation in terms of the significant variables quite strongly differs between the two sectors.

In the *service sector*, the coefficients of three *O-variables* (share of employees with tertiary-level education, appropriability, foreign experience) are no longer significant; at least the results for the innovation variable “sales share of innovative products” remain the same as for manufacturing. These divergences primarily reflect specific innovation-related characteristics of services such as the intensive use of non-technological know-how which does not need to be strongly protected from competition (tacit knowledge). Among the *L-(dis)advantages*, geographical distance (*obst_distance*) and the obligation to produce locally (*obst_local_value*) exert a significant influence on the choice of the two strategies only in services, whereas – what is plausible – the variable “insufficient enforcement of IPRs” (*obst_IPR_protection*) is relevant only in manufacturing (where R&D activities are more prevalent than in services). The differences between the two sectors with respect to *I-advantages* are probably not so relevant as they pertain only to “*cooperation*“, whereas the firm size effect is practically identical. Finally, in accordance with manufacturing, the two strategies of internationalisation

do not differ with respect to the effect of the market environment (*competition, demand_trend*).

The “performance” of the OLI model is weaker for services not only with respect to model II (choice between the strategies FDI_RDP and FDI_DP) but, as shown in subsection 5.1, also for model I (in particular with respect to the shift from EXPORT to FDI; see Table 4). In services, the most relevant step of internationalisation that can be explained by the OLI approach is the shift from “exclusively domestic activities” to “foreign activities in general”. The specific differences between exporting and direct foreign presence (with or without R&D), although they exist, are clearly less pronounced than in manufacturing. We thus conclude that the pattern of internationalisation of services companies may be characterised by DOMESTIC<EXPORT \cong FDI_DP<FDI_RDP. The process of internationalisation, though gradual in both sectors, seems to be less continuous in services than in manufacturing where it is DOMESTIC<EXPORT<FDI_DP<FDI_RDP).

To sum up, the estimates are in line with *hypothesis H4a* (“manufacturing and services show specific patterns of explaining the choice between different strategies of internationalisation”). In both sectors, the OLI model is related to a far-reaching strategy of internationalisation (that includes foreign R&D) more strongly than a strategy that pertains only to distribution and/or production (*hypothesis H4b*). However, the explanatory power of the OLI model with respect to the choice between the two strategies is clearly lower in services than in manufacturing (*hypothesis H4c*). The process of internationalisation, though gradual in both sectors, is less continuous in the service sector.

The latter finding, which is based on estimates of model I and II, is not surprising in view of previous (mostly theoretical or interview-based) research, which shows that for some service companies exporting may be the best option for starting internationalisation whereas for others a direct presence abroad is optimal (see, e.g., Carman and Langeard 1980; Boddewyn et al. 1986; Bell 1995). Hence, there might be no strategy of internationalisation that is *generally* superior, what is consistent with our results which imply that $X\cong$ FDI. Econometric evidence provided by Wagner (2014) also supports the view of a less gradual and continuous process of internationalisation in services than in manufacturing. Applying the model of firm heterogeneity to the service sector, this author even finds that, in services, exporters are more productive than firms with FDI (implying that internationalisation follows the path D<FDI<X).

6 Summary and conclusions

Econometric research dealing with the internationalisation of firms still focuses on manufacturing. As the characteristics of services and goods differ in several respects, one may expect that the determinants of the firms' international activities are not the same for the two sectors. However, there is hardly any empirical firm-level evidence on whether this proposition is correct. Therefore, we *first* aimed at identifying econometrically the factors determining why firms internationalise their activities (exporting, offshoring) and asked (what is at the core of our interest) whether the determinants differ between manufacturing and services. *Second*, we analysed (possible) differences between specific forms of FDI in terms of combinations of business functions located abroad, again contrasting the two sectors. We used the well-known OLI model as theoretical background of the empirical analysis, which is based on a large firm-level dataset covering the Swiss business sector.

We specified two models which we estimated for the entire business sector and, separately, for manufacturing and services. The first one (“*INT_propensity*”) determines the probability of a company to belonging to one of the following categories of firms: a) “selling on domestic markets only”, b) “serving, additionally, export markets” and, c) “offshoring”. The second model (“*INT_function*”) focuses on internationalised companies and determines the probability of a firm to go international by means of a) “serving export markets”, b) “offshoring of distribution *and/or* production”, and c) “offshoring of R&D, in addition to distribution and/or production”. The estimates of the two models are largely in line with our hypotheses.

First, we find that the OLI model is well suited to explaining why firms internationalise their activities as exporters or, alternatively, by means of offshoring (*propensity* to internationalise). This holds true in particular for the business sector as a whole and for manufacturing, whereas, as hypothesised, the explanatory power of the OLI model is lower in case of the service sector. *Second*, the OLI model also allows to explaining differences between two specific forms of offshoring in terms of (combinations of) *business functions*, i.e. “offshoring of distribution and/or production” vs. “offshoring of R&D, in addition to distribution and/or production”. This primarily holds true for manufacturing but tends to be the case also for the service sector. *Third*, the estimates for both models seem to be consistent with the stages view of internationalisation, in particular in the manufacturing sector but, to a lesser extent, also in the service sector where the process of internationalisation, however, is less continuous than in manufacturing.

Considering the scope and findings of the analysis and given the lack of studies dealing with the topic of this paper, we substantially add to existing knowledge regarding the determinants of the internationalisation of firm activity. In particular, the paper yields new insights by systematically contrasting estimates for manufacturing and services firms, as well as by investigating the drivers of different forms of international activities in terms of (combinations of) business functions. The analysis shows that manufacturing and services companies substantially differ with respect to the factors determining the propensity of internationalisation as a whole as well as differentiated by business function. Although the explanatory power of the OLI model is lower for services than for manufacturing it remains an adequate framework of analysis for both sectors. Furthermore, it turns out that the drivers of internationalisation primarily reflect firm-specific behaviour whereas industry-specific factors (which are emphasised in previous work) are of minor importance.

The study has a number of limitations which primarily are due to the cross-section nature of the data. Therefore, the findings have to be interpreted as conditional correlations rather than as causal relationships; nevertheless, it is still possible to assess whether the results are consistent with the postulated hypotheses. As a consequence, econometric studies making use of longitudinal data would be highly welcome. Such work would be more adequate to analyse the dynamics of internationalisation (e.g. the stages view of internationalisation). Moreover, further research could help to improve the explanatory part of the OLI model. For example, it would be beneficial to extend the O-part of the model (e.g. by including financial variables) and to more explicitly specify the I-advantages which we could capture only in a summary way.

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Table 1: Share of firms by business functions as a percentage of all firms differentiated by sector ^a

Business functions	Manufacturing			Services			Construction/ Energy	TOTAL
	Total	High-tech	Low-tech	Total	Knowledge-intensive	Other		
1. Domestic sales only	25.2	13.0	37.2	58.9	53.0	63.1	83.0	43.4
2. Domestic sales and exports only	36.3	34.8	37.7	21.8	22.4	21.4	8.5	28.2
3. Direct foreign presence	38.5	52.2	25.1	19.3	24.6	15.5	8.5	28.4
3a Foreign distribution/similar service activities ^b	7.6	9.1	6.1	3.7	3.5	3.9	0.6	5.5
3b Foreign production sourcing	3.9	4.3	3.6	3.0	3.5	2.7	1.8	3.4
3c Foreign distribution/similar service activities and production/sourcing	13.7	17.3	10.1	9.3	11.6	7.5	4.3	11.1
3d Foreign R&D and distribution/similar services and/or production/sourcing)	13.3	21.5	5.3	3.3	6.0	1.4	1.8	8.4
TOTAL (Number of observations)	100 (1000)	100 (494)	100 (506)	100 (757)	100 (317)	100 (440)	100 (164)	100 (1921)

^a For the composition of the two subsectors of manufacturing and services respectively, see Table A.1.

^b The category “similar service activities” includes franchising, licensing and (long-lasting) management/consulting contracts.

Table 2: Specification of the dependent variables

Dependent variable	Definition
Modell I <i>INT_propensity</i>	<p>The firm belongs to one (<i>and only one</i>) of the following types of firms (yes/no):</p> <p>DOMESTIC: Firms with domestic sales</p> <p>EXPORT: Firms with domestic and export sales (but no offshoring)</p> <p>FDI: Firms with any kind of direct foreign presence (in addition to domestic and export sales)</p> <p><i>EXPORT is used as reference category</i></p>
Modell II <i>INT_function</i>	<p>The firm belongs to one (<i>and only one</i>) of the following types of firms (yes/no):</p> <p>DOMESTIC: Firms with domestic sales</p> <p>EXPORT: Firms with domestic and export sales (but no offshoring)</p> <p>FDI_DP: Firms having off-shored distribution <i>and/or</i> production</p> <p>FDI_RDP: Firms having off-shored research and development (R&D) in addition to distribution <i>and/or</i> production</p> <p><i>FDI_DP is used as reference category</i></p>

Table 3: Specification of the explanatory variables of model I to II

Explanatory variable	Description	Expected sign in explaining <i>INT_propensity</i> and <i>INT_function</i>
O-advantages		
<i>r&d</i>	R&D activities, 2006-2008 (<i>yes/no, dummy variable</i>)	+
<i>inno_sales</i>	Sales share of innovative products, logarithm, 2008	+
<i>tertiary_academic</i>	Share of employees with academic education, logarithm, 2008	+
<i>appropriability</i>	Effectiveness of knowledge protection <i>Dummy variable (high/low effectiveness) based on the average of firm assessments on a 5-point Likert scale of four means of protection (patents, trademarks, copyrights, informal mechanisms)</i>	+
<i>firm_age</i>	Age of the firm (years), logarithm	+
O-related obstacle to internationalisation (<i>Dummy variables based on firm assessments of the relevance on a 5-point Likert scale: value 1 (high) for scores 4 or 5, otherwise 0 (low)</i>)		
<i>obst_experience</i>	Lack of foreign experience	-
L-disadvantages of host locations: L-related obstacles to internationalisation (<i>dummy variables based on firm assessments of the relevance of specific obstacles on a 5-point Likert scale: value 1 (high) for scores 4 or 5, otherwise 0 (low)</i>)		
<i>obst_distance</i>	Large geographical distance	-
<i>obst_culture</i>	Large cultural difference	-
<i>obst_cost</i>	High costs of internationalisation	-
<i>obst_regulation</i>	Restrictive regulations in foreign locations	-
<i>obst_instability</i>	Political instability in target countries	-
<i>obst_local_value</i>	Obligation to generate locally a high share of value added	-
<i>obst_tech_transfer</i>	Obligation to transfer technology to local actors	-
<i>obst_IPR_protection</i>	Insufficient protection of IPRs in host countries	-
I-advantages, firm size		
<i>size, size²</i>	Number of employees (in 1000) and its square, 2008	+ / ?
<i>cooperation</i>	Co-operation with domestic firms (<i>yes/no; dummy variable</i>)	+
Market environment		
<i>competition</i>	Share of firms at the 3-digit industry level which are confronted with strong price competition, 2008 (<i>firms with an assessment of 4 or 5 on a five point Likert scale</i>)	+
<i>demand_trend</i>	Share of firms at the 3-digit industry level which benefit from strongly growing markets in the period 2006-2011 (<i>firms with an assessment of 4 or 5 on a five point Likert scale</i>)	+
Control variables		
<i>foreign</i>	The firm is a foreign-owned subsidiary with primarily local focus (<i>yes/no; dummy variable</i>)	-
<i>regional_market</i>	The local/regional market at home is sufficiently large (<i>dummy variable based on firm assessments on a five point Likert scale: value 1 (high) for scores 4 or 5, otherwise 0 (low)</i>)	-
<i>industry</i>	Industry dummies (2-digit) in manufacturing (16) and services (9)	

Table 4: Results for model I: INT_propensity

Firms with “domestic sales only” (DOMESTIC) and those with “direct foreign activity” (FDI), evaluated against the reference group of firms with “export and domestic sales only” (EXPORT); *multinomial logit estimates* ^{a, b}

Explanatory variable	Total business sector ^c		Manufacturing		Services	
	DOMESTIC	FDI	DOMESTIC	FDI	DOMESTIC	FDI
O-advantages						
<i>r&d</i>	-.708*** (.19)	.823*** (.18)	-.707*** (.26)	.883*** (.22)	-.508 (.35)	.868** (.39)
<i>inno_sales</i>	.050 (.06)	.177*** (.06)	.022 (.08)	.182** (.08)	.057 (.08)	.167 (.11)
<i>tertiary_academic</i>	-.257*** (.06)	.187*** (.07)	-.286** (.11)	.125 (.09)	-.274*** (.08)	.195* (.12)
<i>appropriability</i>	-.276*** (.08)	.015 (.09)	-.197* (.12)	-.004 (.11)	-.248* (.13)	.072 (.17)
<i>firm_age</i>	.074 (.09)	.350*** (.10)	.139 (.14)	.445*** (.13)	-.043 (.13)	.201 (.17)
O-related obstacles						
<i>obst_experience</i>	.449** (.20)	-.473** (.22)	.446 (.28)	-.643** (.29)	.740** (.31)	.044 (.43)
L-(dis)advantages (L-related obstacles)						
<i>obst_distance</i>	.044 (.19)	-.422** (.22)	-.252 (.28)	-.351 (.27)	.525* (.31)	-.501 (.46)
<i>obst_culture</i>	.138 (.24)	.842*** (.24)	.309 (.37)	1.26*** (.32)	-.176 (.34)	.175 (.43)
<i>obst_cost</i>	-.279 (.18)	-.565*** (.19)	-.077 (.24)	-.445* (.24)	-.858*** (.28)	-.846** (.38)
<i>obst_regulation</i>	.204 (.22)	.684*** (.22)	.087 (.37)	.806*** (.29)	.221 (.32)	.563 (.41)
<i>obst_instability</i>	-.160 (.25)	.345 (.23)	-.393 (.38)	.163 (.29)	.009 (.39)	.554 (.45)
<i>obst_local_value</i>	.024 (.27)	-.506** (.26)	.070 (.38)	-.476 (.33)	.043 (.41)	-.473 (.56)
<i>obst_tech_transfer</i>	-.180 (.37)	-.575** (.29)	-.120 (.50)	-.756** (.35)	.021 (.61)	-.447 (.75)
<i>obst_IPR_protection</i>	.248 (.34)	.510* (.28)	.176 (.46)	.925*** (.33)	-.247 (.51)	-1.04 (.73)
I-advantages, firm size						
<i>size</i>	2E-05 (2E-04)	6E-04*** (2E-04)	-6E-04 (9E-04)	1E-03*** (5E-04)	6E-05 (3E-04)	3E-04 (3E-04)
<i>size</i> ²	-1E-07 (4E-06)	-9E-06** (4E-06)	-7E-05 (2E-04)	-1E-04** (5E-05)	2E-06 (3E-05)	-1E-06 (3E-05)
<i>cooperation</i>	-.029 (.15)	.262* (.15)	.162 (.23)	.448** (.19)	-.315 (.21)	-.061 (.28)

Table 4 continued

Table 4 continued

Market environment						
<i>competition</i>	-.294 (.61)	1.25* (.70)	-.584 (1.1)	.989 (1.2)	-.020 (.74)	2.15** (.92)
<i>demand_trend</i>	-2.48*** (.65)	1.20 (.76)	-3.81*** (1.0)	1.43 (1.1)	-.862 (.91)	3.08** (1.3)
Control variables						
<i>foreign</i>	-.117 (.20)	-2.08*** (.28)	-.192 (.32)	-2.18*** (.37)	-.118 (.29)	-2.06*** (.48)
<i>regional_market</i>	1.26*** (.14)	-.979*** (.18)	1.53*** (.21)	-.704*** (.25)	1.05*** (.23)	-1.18*** (.30)
<i>industry</i>	Yes		Yes		Yes	
Statistics						
N	1'921		1'000		757	
Wald χ^2	3851.6***		1072.8***		1786***	
Pseudo R ²	.338		.332		.246	

^a The multinomial logit model estimates for each explanatory variable two slope parameters what allows to evaluate whether the responses DOMESTIC and FDI respectively significantly differ from the reference level EXPORT.

^b The estimates of the intercepts and the industry dummies have been throughout omitted. The significance of the parameters is indicated with ***, ** and * resp. representing the 1%, 5% and 10%-level with robust standard errors in brackets.

^c The construction/energy sector (N=164) is included in the estimates for the total business sector (N=1921) but excluded in case of manufacturing (N=1000) and services (N=757).

Table 5: Results for model II: INT_function

Firms with “direct foreign activity in R&D and distribution and/or production” (FDI_RDP), evaluated against the reference group of firms with “direct foreign distribution and/or production” (FDI_DP); *multinomial logit estimates*^{a, b, c}

	Total business sector	Manufacturing	Services	Services
Explanatory variable	FDI_RDP	FDI_RDP	FDI_RDP	FDI_RDP
O-advantages				
<i>r&d</i>	2.02*** (.46)	1.35** (.52)	3.77*** (1.1)	
<i>inno_sales</i>	.281*** (.11)	.301** (.13)	.435 (.36)	.444* (.24)
<i>tertiary_academic</i>	.050 (.11)	.238** (.12)	-.667*** (.27)	-.280 (.26)
<i>appropriability</i>	.464*** (.15)	.620*** (.17)	.286 (.40)	.288 (.34)
<i>firm_age</i>	.134 (.16)	.178 (.18)	-.304 (.48)	.241 (.35)
O-related obstacles				
<i>obst_experience</i>	-.504 (.42)	-.926* (.50)	1.44* (.81)	0.577 (.78)
L-(dis)advantages (L-related obstacles)				
<i>obst_distance</i>	-.493 (.36)	-.266 (.38)	-2.23** (1.0)	-1.59* (.90)
<i>obst_culture</i>	.249 (.34)	.213 (.37)	1.19 (0.81)	0.564 (.82)
<i>obst_cost</i>	-.243 (.31)	-.534 (.34)	1.04 (.82)	1.49 (.88)
<i>obst_regulation</i>	.024 (.29)	.224 (.31)	.410 (.75)	.080 (.66)
<i>obst_instability</i>	.918*** (.32)	.964*** (.35)	1.20 (.93)	1.24* (.66)
<i>obst_local_value</i>	-.420 (.37)	-.287 (.40)	-3.83*** (1.4)	-3.71*** (1.5)
<i>obst_tech_transfer</i>	.024 (.37)	-.219 (.38)	.684 (1.3)	1.63 (1.1)
<i>obst_IPR_protection</i>	.927*** (.33)	1.12*** (.37)	-.854 (1.11)	-.124 (1.0)

Table 5 continued

Table 5 continued

I-advantages, firm size				
<i>size</i>	9E-04*** (3E-04)	7E-04* (4E-04)	6E-04* (4-04)	6E-04** (3E-04)
<i>size</i> ²	-8E-05** (3E-05)	-4E-05 (4E-05)	-5E-05* (3E-05)	-4E-05* (2E-05)
<i>cooperation</i>	.301 (.23)	.162 (.27)	1.69** (0.82)	1.71** (.70)
Market environment				
<i>competition</i>	.094 (1.3)	.579 (1.5)	4.21 (3.1)	4.44 (2.6)
<i>demand_trend</i>	.337 (1.1)	.418 (1.2)	-2.84 (3.3)	-3.27 (2.7)
Control variables				
<i>foreign_subsidary</i>	-.083 (.55)	-.177 (.65)	0.068 (1.08)	-.092 (1.08)
<i>regional_market</i>	-.536 (.43)	-.446 (.52)	-1.00 (.77)	-0.894 (.75)
<i>industry dummies</i>	yes	yes	yes	Yes
Statistics				
N	1921	1000	757	757
Wald χ^2	12879.2***	3043.4***	5005.7***	4666.8***
Pseudo R ²	0.336	0.323	0.276	0.252

^a The multinomial logit model yields estimates for the categories DOMESTIC, EXPORT, FDI_DP and FDI_RDP, respectively. We present here only the estimates of the slope parameters for category FDI_RDP which are evaluated against the reference level FDI_DP.

^b The estimates of the intercepts and the industry dummies have been throughout omitted. The significance of the parameters is indicated with ***, ** and * resp. representing the 1%, 5% and 10%-level with robust standard errors in brackets.

^c The construction/energy sector (N=164) is included in the estimates for the total business sector (N=1921) but excluded in case of manufacturing (N=1000) and services (N=757).

APPENDIX

Table A.1: Composition of the final sample by sector and firm size

	Sector		Firm size (<i>number of employees</i>); (percentage of firms)			
	<i>Number of observations</i>	<i>Percentage of firms</i>	Small (5-49)	Medium (50-249)	Large (50 and more)	Total
Manufacturing	1000	52.0	37.4	42.0	20.6	100
- High-tech	494	25.7	35.4	42.9	21.7	100
- Low-tech	506	26.3	39.3	41.1	19.6	100
Energy, construction	164	8.5	21.3	54.3	24.4	100
Services	757	39.4	44.1	32.9	23.0	100
- Knowledge-intensive services	317	16.5	49.2	29.7	21.1	100
- Other services	440	22.9	40.5	35.2	24.3	100
Total business sector	1921	100	38.7	39.4	21.9	100

High-tech manufacturing: pharmaceuticals/chemicals, rubber/plastic products, non-electrical machinery, electrical machinery, electronics/instruments, vehicles; *Low-tech manufacturing*: food/beverages, textiles, clothing, wood products, paper, printing/publishing, non-metallic mineral products, metals, metal products, watches, other manufacturing; *Knowledge-intensive services*: banking/insurance, computer services/R&D, business services, telecommunication; *Other services*: wholesale trade, retail trade, hotels/restaurants, transport/logistics, real estate, personal services.

Table A.2: Type and degree of internationalisation by sector and industry

Industry / sectors	Domestic sales only	Domestic sales and exports only	Direct foreign presence	
Manufacturing	25.2	36.3	38.5	100
<i>High-tech manufacturing</i>	<i>13.0</i>	<i>34.8</i>	<i>52.2</i>	100
- Pharmaceuticals, chemicals	13.4	37.8	48.8	100
- Rubber/plastics products	7.0	48.8	44.2	100
- Non-electrical machinery	12.5	30.7	56.8	100
- Electrical machinery	13.6	35.6	50.8	100
- Electronics/instruments	15.9	30.1	54.0	100
- Vehicles	9.5	52.4	38.1	100
<i>Low-tech manufacturing</i>	<i>37.2</i>	<i>37.7</i>	<i>25.1</i>	100
- Food/beverages/tobacco	44.4	31.5	24.1	100
- Textiles	17.9	35.7	46.4	100
- Clothing	42.9	42.9	14.2	100
- Wood products	35.3	41.2	23.5	100
- Paper	15.4	38.4	46.2	100
- Printing/publishing	64.4	28.9	6.7	100
- Non-metallic mineral products	53.9	33.3	12.8	100
- Metals	12.9	51.6	35.5	100
- Metal products	30.8	43.9	25.3	100
- Watches	32.4	47.0	20.6	100
- Other manufacturing	36.8	26.3	36.9	100
Energy, construction	83.0	8.5	8.5	100
- Energy/water/recycling	37.5	0	62.5	100
- Construction	85.3	8.9	5.8	100
Services	58.9	21.8	19.3	100
<i>Knowledge-intensive services</i>	<i>53.0</i>	<i>22.4</i>	<i>21.4</i>	100
- Banking/insurance	49.4	29.5	21.1	100
- Computer services/R&D	40.0	24.0	36.0	100
- Business services	58.7	17.5	23.8	100
- Telecommunication	58.3	25.0	16.7	100
<i>Other services</i>	<i>63.1</i>	<i>21.4</i>	<i>15.5</i>	100
- Wholesale trade	62.6	19.7	17.7	100
- Retail trade	71.1	8.9	20.0	100
- Hotels/restaurants	43.5	43.5	13.0	100
- Transport/logistics	61.8	25.5	12.7	100
- Real estate	100	0	0	100
- Personal services	100	0	0	100
TOTAL	43.4 (N=834)	28.2 (N=542)	28.4 (N=545)	100 (N=1921)

Table A.3: Descriptive statistics

Variable	N	Mean	Standard deviation	Minimum	Maximum
INT_propensity	1921	1.848	0.833	1	3
INT_intensity	1921	2.214	1.266	1	4
r&d	1921	0.346	0.476	0	1
inno_sales	1921	1.355	1.338	0	4.61
tertiary_academic	1921	1.112	1.239	0	4.61
appropriability	1921	2.207	0.934	1	5
firm_age	1921	3.835	0.793	0	5.86
obst_experience	1921	0.175	0.380	0	1
obst_distance	1921	0.196	0.397	0	1
obst_culture	1921	0.153	0.360	0	1
obst_cost	1921	0.232	0.422	0	1
obst_regulation	1921	0.181	0.385	0	1
obst_instability	1921	0.146	0.353	0	1
obst_local_value	1921	0.103	0.303	0	1
obst_tech_trans	1921	0.084	0.277	0	1
obst_protection	1921	0.100	0.301	0	1
size	1921	0.358	2.148	0.001	62.4
cooperation	1921	0.394	0.489	0	1
competition	1921	0.682	0.148	0	1
demand_trend	1921	0.610	0.146	0	0.910
foreign_subsidary	1921	0.136	0.343	0	1
regional_market	1921	0.492	0.500	0	1

Table A.4: Correlation matrix (N = 1921)

	r&d	inno_ sales	tertiary_ academic	appro- priability	firm_age	obst_ experience	obst_ distance	obst_ culture	obst_ cost	obst_ regulation	obst_ instability	obst_ local_value
r&d	1											
inno_sales	0.437	1										
tertiary_academic	0.240	0.124	1									
appropriability	0.381	0.359	0.184	1								
firm_age	0.077	-0.034	-0.054	0.020	1							
obst_experience	-0.050	-0.023	-0.021	-0.018	0.007	1						
obst_distance	-0.005	0.001	-0.052	-0.010	0.058	0.245	1					
obst_culture	0.047	0.061	-0.000	0.062	0.009	0.283	0.454	1				
obst_cost	0.003	-0.029	-0.036	0.014	0.026	0.350	0.254	0.172	1			
obst_regulation	0.045	0.060	0.081	0.084	0.061	0.196	0.129	0.135	0.236	1		
obst_instability	0.126	0.121	0.071	0.156	-0.027	0.227	0.141	0.180	0.254	0.395	1	
obst_local_value	0.024	0.013	0.004	0.043	0.008	0.236	0.179	0.114	0.237	0.278	0.258	1
obst_tech_transfer	0.175	0.131	0.072	0.134	-0.000	0.166	0.082	0.117	0.199	0.277	0.422	0.269
obst_IPR_protection	0.179	0.118	0.043	0.146	0.037	0.187	0.066	0.099	0.210	0.297	0.415	0.304
size	0.076	0.035	0.051	0.068	0.045	0.032	-0.036	0.006	-0.019	0.074	0.065	0.022
size ²	0.040	0.015	0.004	0.037	0.014	0.049	-0.021	0.003	-0.005	0.027	0.032	0.009
cooperation	0.124	0.074	0.127	0.200	0.080	0.037	0.018	0.043	0.027	0.081	0.052	0.054
competition	-0.111	-0.070	-0.029	-0.067	0.096	0.017	0.039	0.016	0.035	-0.015	-0.036	0.036
demand_trend	0.194	0.143	0.136	0.149	-0.045	-0.035	-0.051	0.009	-0.008	0.012	0.062	-0.030
foreign	-0.027	0.023	0.077	0.099	-0.116	-0.083	-0.096	-0.084	-0.081	-0.032	-0.022	-0.044
regional_market	-0.382	-0.317	-0.178	-0.296	0.032	0.063	0.076	-0.029	-0.026	-0.072	-0.148	-0.010

Table A4 continued

Table A.4: Continued

	obst_ tech_transfer	obst_IPR_ protection	size	size ²	cooperation	competition	demand_ trend	foreign	regional_ market
obst_tech_transfer	1								
obst_IPR_protection	0.493	1							
size	0.000	0.006	1						
size ²	-0.011	-0.009	0.908	1					
cooperation	0.006	0.053	0.061	0.001	1				
competition	-0.025	-0.032	-0.051	-0.028	-0.031	1			
demand_trend	0.081	0.026	0.022	0.004	0.013	-0.305	1		
foreign	-0.027	-0.042	-0.006	-0.016	-0.007	0.065	0.024	1	
regional_market	-0.121	-0.124	-0.055	-0.030	-0.019	0.091	-0.205	-0.118	1

Data availability

The data used in this paper stem from the “Swiss Survey on Internationalisation” conducted by the KOF Swiss Economic Institute of the ETH Zurich in spring 2010. The survey was based on a random sample of 4533 companies (five or more employees) drawn from the official enterprise census of 2008. The sample covers the entire business sector stratified by twenty nine industries and three industry-specific firm size classes (with full coverage of large firms). 1921 companies provided valid information. The response rate (42.4%) that does not much vary among industries is satisfactory given the demanding questionnaire. The definition and measurement of the variables used in model estimations are listed in Table 2 (dependent variables) and Table 3 (explanatory variables). Based on these tables it is easy to identify the correspondence between the variables used in model estimation and the underlying questions of the questionnaire.

The firm-level data are highly confidential (as we promised the firms participating in the survey). However, they can be made available upon request, though only under the following conditions:

1. The user of the data must be a PhD student or a staff member of a research institution.
2. The user has to provide a short description of the planned research.
3. The analysis of the data has to take place at the author’s workplace, i.e. at the KOF Swiss Economic Institute, Zurich.

Applications for the use of data should be addressed to:

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