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Abstract

The paper presents the results of a new survey on the international activities of Norwegian enterprises in the service industries. The survey focuses on three main internationalization channels: international sales, international cooperation and R&D outsourcing. The empirical analysis studies the relevance of these channels, and investigates the related strategies, objectives and determinants. International sales and collaborations emerge as the two most relevant channels, whereas the scope for R&D outsourcing seems to be far more limited. The analysis of the determinants of international activities leads to three main results: (1) the innovative capability of firms matters for their international performance; (2) the various internationalization channels seem to be complement, rather than substitute, strategies to compete in foreign markets; (3) sectoral specificities greatly affect firms' internationalization strategies and performance.

Keywords: internationalization; international cooperations; R&D outsourcing; innovation; service industries; survey data

1. Introduction

One relevant aspect of the growing importance of the service sectors in modern economies refers to their internationalization patterns. The rapid diffusion of ICTs and the strong technological dynamics that characterizes the provision of new services in many industries of the economy have in recent decades increased the scope for service tradability and internationalization [1,2].

Most of the literature studying the relationships between innovation and international performance has so far focused on manufacturing industries and frequently neglected the service sectors [3]. One of the main factors hampering the progress of research on service internationalization has until recently been the lack of reliable data material and systematic empirical evidence to study patterns and determinants of the international activities of service providers [4].

This paper contributes by bringing new empirical evidence on this phenomenon. It presents the results of a new survey that was carried out among a relatively large sample of Norwegian enterprises in several service sectors during the year 2008. The survey gathers new information on the main channels of internationalization, and the related strategies, objectives and obstacles. This fresh empirical evidence enables us to investigate the main internationalization patterns, their determinants, and how these differ across the service sectors.

The Norwegian case provides a particularly interesting context to undertake this type of investigation. Norway is a small open economy whose industrial structure is characterized by an increasing share of the service sectors, many of which have experienced a remarkable dynamics in recent years. The growth of these service branches is highly dependent on overseas markets, since the latter provide the set of complementary assets (e.g. production and distribution networks, advanced human capital) when these cannot be found in the (relatively small) domestic market.

The empirical analysis of this novel survey dataset carries out three main tasks. The first is the study of the relevance of different internationalization channels. Our survey aims at obtaining a mapping of the relative importance, and underlying characteristics and strategies, of three main aspects: international sales (e.g. though trade and FDI), international cooperation and R&D outsourcing. These three channels correspond to the three categories of the well-known taxonomy of the *globalisation of innovation* [5,6]. Our survey adopts this useful typology as the main conceptual framework, and

makes it operational by asking Norwegian service enterprises a number of questions regarding their international activities and strategies with respect to each of these three aspects.

Secondly, the work explores the possible determinants of the observed internationalization patterns [7]. We investigate the relationships between the various internationalization channels and a set of firms' characteristics. Two possible determinants assume particular relevance for our study: (1) the innovative capability of an enterprise; (2) its simultaneous adoption of multiple internationalization channels. This latter factor explores whether the various internationalization strategies represent complementary or substitute strategies in the internationalization process of service firms.

Thirdly, the empirical analysis seeks to go beyond the identification of overall (average) patterns and relationships and aims at studying cross-sectoral differences in the international activities of service providers. The great variety of innovative modes that characterizes different service sectors has been extensively documented in the literature [8,9,10]. In particular, our sectoral comparison follows the taxonomy developed by Miozzo and Soete [11] for the service industries, which has recently been refined and empirically analysed by Castellacci [12] and Castaldi [13]. This sectoral taxonomy singles out four groups of service industries that differ in terms of their function in the economic system and innovative capability: advanced knowledge providers services, personal services, network infrastructure services and physical infrastructure services.

We argue that the industry-specific context has an important effect on firms' internationalization activities and patterns, since it contributes to shape the enterprises' propensity to compete in international markets as well as their capability to do so. Following this main idea, we analyse sectoral differences and point out the industry-specific international profile that may be associated to each sectoral group of Miozzo and Soete's taxonomy. The analysis clearly indicates that the capability to compete in overseas markets and the specific channels and strategies adopted by service providers greatly differ across the four sectoral groups.

The paper is organized as follows. Section 2 presents the methodology and descriptive results of the survey. Section 3 focuses on cross-industry differences by carrying out a set of ANOVA tests. Section 4 explores the determinants of international activities by

means of a set of logit and multinomial logit tests. Section 5 summarizes the results and highlights the main conclusions of the paper.

2. The survey: methodology and descriptive evidence

The survey data collected among Norwegian service enterprises aims at providing new empirical evidence on the main channels, strategies and patterns of internationalization followed by firms in different service industries. It is based on a questionnaire that was developed in 2007 and distributed to a relatively large sample of Norwegian firms during 2008. The questionnaire is composed of 25 questions, which ask service providers a number of information regarding their international activities in the period 2004-2006.[1]

There are six main parts in the questionnaire: (1) General information about the firm; (2) International sales; (3) International sales of new services; (4) International cooperation; (5) International cooperation in innovative projects; (6) R&D internationalization; (7) Barriers to internationalization. While parts 1 and 7 refer to firms' characteristics and international activities in more general terms, parts 2 to 6 specifically relate to different internationalization channels. These different channels reflect the various categories of the well-known *globalisation of innovation* taxonomy [5,6]. This taxonomy points out three distinct strategies adopted by firms to take advantage of the increasing economic globalization patterns: the international exploitation of foreign markets (reflected in parts 2 and 3 of our questionnaire), international cooperations (parts 4 and 5 of the survey), and the outsourcing of R&D activities (part 6 of the questionnaire).

Each part of the questionnaire comprises a number of questions regarding the different delivery modes in international markets, the type of clients and/or cooperation partners, the internationalization motives and objectives, and the geographical area to which international activities are directed. On the whole, the questionnaire is informative and tries to maintain an appropriate balance between the novel information to be gathered (quite substantial) and the number of questions to be asked (relatively small, compared to other similar surveys).

[1] The questionnaire is available on NUPI's website (www.nupi.no).

We organized the data collection in two subsequent phases. First, we carried out a pilot study by means of phone interviews structured along the questionnaire, in order to test its validity and to assess the preliminary set of firms' responses. We then revised the questionnaire by deleting or rephrasing those questions/items that did not work well during the phone interviews. Secondly, we carried out the main phase of data collection by means of a web-based survey. In total, the questionnaire was sent to a total number of 1290 enterprises in 12 service sectors.[2] After a series of reminders during the whole data collection period, a total number of 302 enterprises filled in the questionnaire, corresponding to a satisfactory response rate of 23,4%. However, 15 observations were deleted from this initial 302 firms sample (due to non-completed questionnaire and multiple missing values), so that the exact size of the sample on which our results are based is 287.

The sectoral coverage is broad, as 12 different service industries (defined at the two-digit level) have been considered. The rationale for considering enterprises in different service sectors is that an explicit purpose of our study is to investigate cross-sectoral differences in internationalization patterns and strategies, i.e. we want to examine how firms in various service industries differ when they adopt a given set of internationalization strategies.

The 12 selected industries represent a wide coverage of the service branch of the economy, and contain both sectors characterized by a high technological content as well as more traditional and lower-tech industries. We group these industries in four categories, following the sectoral taxonomy that was originally put forward by Miozzo and Soete [11] and later refined by Castellacci [12] and Castaldi [13]. This taxonomy points out four main groups of service industries, differing in terms of their innovative capability and the function they assume in the economic system.

The first is the bunch of *advanced knowledge provider services* (AKP-S), that are also frequently referred to as 'knowledge intensive business services'. The 2-digit level industries considered in this highly innovative group are software and other business services, and 102 of our respondents are classified in these service sectors. The second group is *personal services* (PGS-S), which comprises more traditional and supplier-dominated sectors. The two industries we considered in this group are retail trade and hotels and restaurants, and 44 firms in our survey sample belong to this

[2] Only firms with more than 20 employees were selected for the web-based survey.

group. Thirdly, *network infrastructure services* are those industries that constitute the supporting infrastructure of the economy and that, by their own nature, make an active use of information and communication technologies. From these sectors (post and telecommunication; financial intermediation; insurance; auxiliary financial services), 63 enterprises have responded to our questionnaire. Finally, the fourth sectoral group is constituted by *physical infrastructure services* (SIS-P), which, differently from the previous, represent more traditional industries whose main function is to provide a set of services related to the phyisical infrastructure of the economy (wholesale trade; land transport; water transport; auxiliary transport services). 78 of our respondents' sample are classified in this sectoral group.

On the whole, our total number of 287 enterprises provides a representative sample of different industries within the service branch of the economy: the share of respondents in each sectoral group (i.e. the percentage of respondent firms out of the total number of enterprises in that branch) is roughly equal to the corresponding shares for the other sectoral groups.

< Table 1 here >

The main results of the survey are summarized in table 1, which reports descriptive evidence for each of the seven parts of the questionnaire. The first part of the table refers to the general information about the firm. The average firm size is around 100 employees, indicating the medium-large size of the firms contained in our sample. 56% of these enterprises are part of a group, and most of them (79%) have their headquarter in Norway. Firms in the sample are also quite dynamic on average, as many of them report a high turnover growth in the period 2004-2006, and 45% of them have introduced at least one service innovation in the period (i.e. a new or significantly improved service).

Next, the table reports some evidence about the first and most traditional internationalization channel, i.e. the sales of services (and new services) in international markets. A relatively high percentage of enterprises in our sample have exported their services to foreign markets (37%). The most important delivery modes (for both existing services as well as new ones) appear to be the following four: exports, temporary presence abroad, permanent presence abroad (i.e. through subsidiaries), and foreign clients coming to Norway to purchase the services provided

by these firms. The most important types of client in international markets are production and distribution companies, which are considered important by more than 20% of the enterprises. Final consumers and the public sector are instead reported to be far less important overseas clients. In terms of the geographical area, international sales tend to be mostly directed towards other Nordic countries and Western EU economies, whereas North America and Asia are the most important markets outside of Europe.

The table then shifts the focus to a second important internationalization channel: international cooperations to provide existing services or to develop new services. On average, around 42% of firms in our sample collaborate with foreign partners to produce and deliver existing services, and 20% cooperate with overseas enterprises to develop innovative services. The most important types of partner are other firms in the same group, suppliers and customers, whereas foreign competitors, consultants and research organizations are reported to be less relevant collaboration partners. For nearly 30% of the enterprises, the most important motives for engaging in international cooperation are the access to foreign know-how, sales, the proximity to customers and the access to distribution networks. The second, third and fourth of these motives suggest that international collaborations may represent a vehicle to get closer access to foreign markets and to enable the overseas commercialization of services designed and produced in Norway. Regarding the geographical areas in which international partners are located, the pattern is quite similar to what previously pointed out for service exports: other Nordic and Western EU economies are the most important collaboration regions, and North America and Asia are the most relevant ones outside of Europe.

The third main internationalization channel investigated in the survey is R&D outsourcing. The table shows that this channel is far less important than the previous two, as only around 6% of enterprises in our sample have made use of it in the period 2004-2006. Among these firms, most of them have moved their R&D labs to North America, the most important geographical area for R&D outsourcing. Regarding the motives for R&D outsourcing, the most important one is the access to highly qualified workers abroad, which is obviously an important precondition for moving R&D facilities to foreign countries. The other important motive is instead the attempt to locate R&D labs in close proximity to foreign customers, suppliers and Universities.

By contrast, law and regulatory factors (e.g. legislation in Norway and abroad) are reported to be less important motives.

Last, the table reports the results of the survey question on the barriers to internationalization, which does not refer to any specific internationalization channel but is more general. 40% of firms consider the cost of building up a network abroad an important barrier. 30% of enterprises do instead point out obstacles such as the lack of infrastructure in foreign markets (communication, transport or distribution channels), language and cultural barriers, and the lack of qualified workers. On the other hand, geographical distance and regulatory factors (employment and business regulations, policy discrimination, IPRs) are considered important factors by a smaller percentage of enterprises (between 10 and 20%).

Let us summarize this descriptive evidence by highlighting the three main patterns emerging from our survey results. First, considering the relevance of the various internationalization channels, while R&D outosurcing has only been carried out by a limited number of firms in our sample, international cooperations (with suppliers and distribution partners) and international sales emerge as the most important channels. Regarding the various delivery modes of services in international markets, the relevance of exports confirms the increasing scope for service tradeability and internationalization [14], although the importance of permanent and temporary presence of Norwegian enterprises abroad and of the presence of foreign clients in Norway indicate that physical proximity and the co-location of service providers and customers is still an important aspect of service commercialization (so-called *co-terminality*, [8,10]).

Secondly, all the questions of the survey that refer to the geographical area to which international activities are directed (not reported in table 1) point to the same pattern for the various internationalization channels. Other Nordic countries and Western EU economies are the most important regions for Norwegian service providers, and North America and Asia are the most relevant outside of Europe. One reason for this observed pattern may of course be that proximity matters for service internationalization, both in the sense of geographical proximity as well as cultural proximity (i.e. interacting with countries where language and cultural barriers do not constitute a substantial obstacle in commercial relations). To the extent that Norwegian service providers overcome this geographical distance and commercialize their services outside of Europe, they mostly interact with well-developed markets in

North America and Asia, whereas less developed economies in Latin America and Africa do not seem to present significant opportunities for the commercialization of advanced services produced in Norway.

Thirdly, the various questions regarding the internationalization motives, type of foreign partners and clients, and barriers to internationalization provide some interesting indications on the strategies of the enterprises in our sample and their vertical linkages with overseas firms. In short, the survey results indicate that when Norwegian service providers internationalize their activities, they mostly do it in order to achieve two distinct objectives: (1) to be closer to production and distribution partners (both for sales and cooperation activities) and the related sales and distribution networks; (2) to get access to foreign human capital. Relatedly, social capital and cultural differences turn out to be important factors for service internationalization, whereas regulatory and policy related factors do not seem to constitute relevant barriers to the internationalization process of Norwegian service enterprises.

3. Sectoral differences in internationalization patterns

The empirical patterns described above characterize the whole sample of firms under investigation. As previously pointed out, however, these enterprises represent different branches of the service sectors, and we now seek to investigate cross-sectoral differences in the internationalization patterns of Norwegian service providers. The rationale of the empirical exercise and our main hypothesis are presented as follows.

In line with previous taxonomic exercises in the innovation literature [11,12,13], we argue that service industries differ in terms of two main dimensions: (1) the function they play in the economic system as providers (recipients) of goods, services and advanced knowledge to (from) the rest of the economy; (2) their innovative capability.[3] Differences along these two dimensions lead to the identification of four distinct groups of service industries: advanced knowledge provider services (AKP-S),

[3] As previously pointed out by these taxonomic exercises and other contributions in the innovation literature, it is important to emphasize that this second dimension – the innovative capability of a sector – is a highly simplified and aggregate conceptual construct. Many different aspects contribute to shape each industry's ability to produce new technologies and to imitate external advanced knowledge.

personal services (PGS-S), network infrastructure services (SIS-N) and physical infrastructure services (SIS-P).

These two dimensions are not only relevant to identify the existence of different trajectories and innovative modes within services. They are also important – we argue here – because they provide useful insights to analyse the different internationalization strategies and patterns followed by firms in different service industries. In particular, we argue that the first dimension (the function of a sector in the economic system) shapes each industry's propensity to internationalize; for instance, personal services by their own nature provide final services that are mostly intended to be commercialized in the local (domestic) market, so that their propensity (and interest) to internationalize is arguably low. By contrast, the second dimension (sectoral innovative capability) affects each industry's ability to internationalize by enhancing its technological competitiveness in overseas markets. In short, we expect firms in these four sectoral groups to differ substantially in terms of their internationalization patterns and strategies, since these service industries assume distinct functions in the economic system and have different innovative capabilities [1,2].

Our survey data enables an investigation of these cross-sectoral differences, as the enterprises in our sample are more or less equally distributed among the four sectoral groups of Miozzo and Soete's taxonomy [11]. We thus carry out a simple empirical exercise, and compare the mean of each sectoral group to the sample average by means of a set of ANOVA tests. We focus on a selected number of variables, i.e. those that appear to be more relevant in our sample of firms in the light of the descriptive evidence presented in the previous section. Table 2 reports the results of these ANOVA tests for each sectoral group (columns) and each variable (rows).

< Table 2 here >

The first column presents the results for *advanced knowledge provider services* (AKP-S). These industries are characterized by a lower than average firm size and an above average innovativeness (as measured by the share of firms that have introduced new or improved services in the period 2004-2006). The sectoral group is very international in scope, and firms in these industries make on average active use of all the three internationalization channels considered in the survey. International sales are

higher than in other sectoral groups, and they are carried out mostly through the exports of new services, FDI and temporary presence abroad (and less so in terms of the mobility of foreign clients). International cooperations for the production and delivery of existing services are equal to the sample average (42%), while international collaborations for developing new services are more frequent than average. The third channel, R&D outsourcing, is far greater in this group than in the others (12% *vis-a-vis* 6%), and the main motives for the internationalization of R&D activities are the desire to achieve a closer proximity to foreign cutomers, suppliers and Universities, as well as to benefit from foreign human capital. In more general terms, the barriers to internationalization question singles out language and culture, network building costs and lack of human capital as the most important obstacles for these service providers.

The ANOVA results for the group of *personal services* (PGS-S) are shown in the second column. The internationalization patterns of this sectoral group are remarkably different from those in the previous one. Firms are on average much less innovative than the sample mean, and they have a much lower propensity to internationalize and capability to do so. All three internationalization channels show a below-average performance. International sales are much lower than in the other groups, and the only delivery mode that appears to be more relevant than average is the mobility of foreign clients (which is comprehensibly a typical delivery mode in the two sectors considered in this survey, retail trade and hotels and restaurants). International cooperations are lower than average, also with respect to the production and delivery of existing services, and R&D outsourcing is virtually absent and not at all relevant for these service sectors.

The third column of table 2 refers to the group of *network infrastructure services* (SIS-N). Firms in these industries are quite different from those in the previous two groups. They are more frequently part of a group (60%), and they are also significantly more innovative than average. This pattern is in line with the characteristics pointed out in previous taxonomic exercises [11,12], and it reflects the high innovative capability of industries like telecommunications and financial services. The innovativeness of these industries may lead to the expectation that these service sectors may be characterized by high international competitiveness and, hence, positive commercial performance in foreign markets. However, our ANOVA results indicate that this is not the case in our sample of Norwegian firms.

International sales are much lower than average (including the sales of new services), and this is the case with respect to all different delivery modes considered in our survey. International cooperations (for producing existing as well as new services) are equal to the sample average, and foreign suppliers are reported to be the most important type of collaboration partner. The third internationalization channel, R&D outsourcing, does also score below average. Referring to the barriers to internationalization question, all of the four variables considered in the ANOVA exercise seem to be less relevant for this sectoral group than for the others. The low relevance assigned to these factors by the respondent firms may simply be interpreted as lack of interest and scarce knowledge with respect to the process of internationalization, and it may thus confirm the relatively low international performance of enterprises in this sectoral group.

Finally, the fourth column reports the results for the group of *physical infrastructure services* (SIS-P). Similarly to the previous sectoral group, firms in these industries are also frequently part of a group. They are however less innovative than the sample average (38 against 45%). Despite their relatively low innovative capability, these enterprises show a remarkable international performance in two of the three internationalization channels considered by the survey. International sales show the highest performance in the sample (45% of firms have made use of this channel), and the main delivery modes in international markets are through exports, presence of subsidiaries abroad as well as the mobility of foreign clients (these delivery modes are however not significantly different from the sample average if we consider the international sales of new, rather than existing, services). International cooperations for producing and delivering existing services are also much more frequent than average (52 *versus* 42%), whereas collaborations with foreign firms to develop new services are not significantly different from the sample mean. Last, the major barrier to internationalization for this type of service producers is reported to be the lack of infrastructures in foreign markets (e.g. communication, transport or distribution channels), and this may of course be explained in terms of the function these sectors assume in the economic system as providers of physical infrastructure services, which requires close ties to the infrastructure facilities available in the foreign markets towards which Norwegian enterprises direct their international activities.

Summing up, the empirical exercise presented in this section points to the existence of a substantial variety of internationalization patterns across the service sectors. Figure

1 presents a summary view of the results, and points out the relative position of the various sectoral groups along two main dimensions, their ability to introduce new services (X-axis) and their international sales performance (Y-axis). Industries in the group of personal services are located in the bottom-left quadrant of the diagram. These sectors, by their own nature, have a low propensity to internationalize as they mostly provide services for the final consumers in the domestic market. Besides, their innovative capability and international competitiveness are limited.

By contrast, advanced knowledge providers are located on the top-right quadrant of figure 1. Their function in the economic system as providers of advanced knowledge to downstream industries makes it natural for these sectors to search for profitable opportunities in foreign markets. International expansion is an even more relevant strategy in the Norwegian context, since the domestic market in high-tech manufacturing branches in Norway is not sufficiently developed as to sustain the growth of advanced knowledge provider service industries. Besides, their high innovative capability enables and fosters this internationalization process, which is in fact, as pointed out above, not only strong in terms of international sales but also with respect to overseas cooperations and R&D outsourcing.

Finally, the two groups of infrastructure services provide an interesting contrast. Network (physical) infrastructure providers are characterized by high (low) innovative capability but weak (strong) international sales performance. This contrast would seem to contradict the common expectation of a close link between innovative ability and international competitiveness. Arguably, this pattern may be explained in terms of the traditional specialization pattern of the Norwegian economy, where industries providing physical infrastructure services have for a long time constituted a stronghold of the economic system whereas network infrastructure service industries are not as competitive as their counterparts in international markets.

Specifically, an important characteristic of the Norwegian economy's industrial structure that may have played a relevant role to affect the competitiveness of these groups of infrastructural service industries is the lack of a large and well-developed cluster of technologically advanced manufacturing industries (e.g. science-based industries in the electronics and hardware producing branches; see [15]). High-tech manufacturing typically provides an important boost to sustain the growth and internationalization process of network infrastructure services [11,12]. So, the relative small size of these manufacturing branches in Norway may be one important factor to

explain why network infrastructure services have a lower international propensity than the corresponding industries in other advanced countries.

< Figure 1 here >

4. The determinants of internationalization patterns

After describing the main patterns emerging from the survey and studying sectoral differences across service industries, we now consider one concluding relevant aspect: the possible determinants of these internationalization patterns. The literature studying the determinants of international sales and export activities at the firm level is substantial [7,16]. However, we know much less about the factors explaining the other two channels of internationalization that have been considered by our survey, i.e. international cooperations and R&D outsourcing [1,2, 17].

This lack of knowledge reflects in part the scarcity of empirical evidence on these phenomena, and in part the still limited theoretical understanding of them. Our new survey data contributes to the first of these problems and, by bringing fresh empirical evidence on these various internationalization channels, enables an exploration of some of the factors that may explain their dynamics. The usefulness of considering these various channels together, rather than just focusing on some of them, is that we may thus explore whether they represent substitutes or complementary channels in the internationalization process of service enterprises.

Table 3 shows the correlation among the main internationalization variables in our survey. The table indicates that most of these variables are positively correlated, and some of the correlation coefficients are quite high. In particular, international sales are strictly related to overseas cooperations, and the latter to R&D outsourcing. In other words, the enterprises in our sample that have used an internationalization channel have frequently used some of the others as well. These correlation patterns would therefore suggest that these various internationalization channels may be closely related to each other and possibly represent *complementary* strategies followed by service providers to compete in international markets.

< Table 3 here >

We now explore these correlation patterns in a more systematic way by means of a regression analysis exercise. The rationale of the exercise is to explore the relationships between the three internationalization channels (our dependent variables) and a set of explanatory factors that are measured by means of the information that we have available in our survey data sample. We consider five groups of explanatory factors in the regression model:

- *Firm-specific information*: as customary, we first of all control for some main firm-specific factors: the size of the firm (employment); whether the enterprise is part of a group; its labour productivity. In line with previous results in the internationalization literature, we expect these variables to be positively related to the international performance of enterprises.

- *Innovation*: the innovation variable is measured through question 9 of the survey. This asks each firm whether it has introduced new or significantly improved services in the period. Given previous results in the literature on the importance of innovation for international competitiveness [3], we expect this variable to be positively related to the international performance of enterprises.

- *Other internationalization channels*: international sales and international cooperations are included in the regression model in order to investigate the complementarities between different internationalization channels.[4] As suggested by the correlation patterns in table 3 above, we expect these variables to be positively related to the dependent variable.

- *Barriers to internationalization*: some important obstacles highlighted by our survey results are the following: lack of infrastructures; policy discrimination *vis-à-vis* national enterprises; network building cost; lack of qualified workers; geographical distance. Our expectation is that those enterprises that consider these barriers very relevant are also those that are more highly engaged in international

[4] The R&D outsourcing indicator has also been initially included in the model as additional explanatory variable, but it has not been retained in the final specification because of multicollinearity problems.

activities. We therefore expect a positive relationship between the relevance of these obstacles and the internationalization outcome (dependent variable).[5]

- *Sectoral dummies*: we add these dummies in order to take into account industry-specific effects. In the regressions reported in columns 1, 3 and 5 (see table 4 below), we have included dummies for all 2-digit sectors represented in the survey, whereas in columns 2, 4 and 6 we have included one dummy for each of the four industry group of the sectoral taxonomy used throughout the paper: advanced knowledge providers (AKP-S), personal services (PGS-S), network infrastructure services (SIS-N) and physical infrastructure services (SIS-P) (see taxonomic exercises of Miozzo and Soete [11], Castellacci [12] and Castaldi [13]).

The regression model is estimated through logit estimations, and the results are reported in table 4. Before presenting these econometric results, it is important to acknowledge the (usual) limitation of this type of empirical exercise. Since our survey dataset refers to the same period (2004-2006), the cross-sectional nature of the data does not enable a proper investigation of causality issues. The possible endogeneity of some of the explanatory variables is well-known to be a common problem in this type of one-shot (non-repeated) survey, as it is frequently pointed out in the numerous econometric studies using data from one of the waves of the *Community Innovation Survey*. Our results should therefore be interpreted as an analysis of multiple correlations among the variables of interest, rather than an attempt to uncover causal relationships and identify the long-run determinants of the international activities of firms.

In table 4, columns 1 and 2 focus on the international sales channel, columns 3 and 4 on international cooperations, while the regressions reported in columns 5 and 6 have the R&D internationalization indicator as dependent variable. On the whole, the regression model works well for nearly all of the considered internationalization channels, and it has a quite satisfactory explanatory (classificatory) power as indicated by the pseudo R-squared at the bottom of the table. However, if we consider the statistical precision of the individual regressors, the model works substantially better

[5] Notice that this expectation would imply a *negative* coefficient in our estimations, since these barriers variables are measured on a 1-4 scale where 1 indicates 'very important' and 4 indicates 'not relevant at all'.

for the international sales and international cooperations dependent variables (columns 1 to 4), and much less so for R&D outsourcing (columns 5 and 6), where significance levels for many of the explanatory variables are in general lower.

The firm size (employment) variable and the part of a group indicator turn out to be positively and more statistically significant for the regressions where international cooperation is the dependent variable (columns 3 and 4). By contrast, these two indicators do not appear to be significantly related to the international sales and R&D internationalization dependent variables (in columns 1, 2 and 5, 6 respectively). This result provides an interesting indication about the relevance of firm size and group ownership as two important factors that do not only affect the export performance of firms, as previous literature has suggested, but also their decision to undertake cooperations with foreign enterprises.

Labour productivity is positively and significantly related to the international cooperation (columns 3 and 4) and R&D outsourcing (columns 5 and 6) dependent variables, and the estimated coefficient is particularly high for the latter. On the other hand, the productivity effect on international sales does not turn out to be significant at conventional levels. The innovation indicator (introduction of new services) is instead positively related to the international sales channel (see columns 1 and 2).

The variables measuring other internationalization channels (included among the set of explanatory factors) are positively related to the dependent variable and turn out to have high estimated coefficients in the regressions presented in table 10, indicating the existence of possible complementarities between the various internationalization channels. In particular, the international cooperation indicator is highly correlated to the international sales dependent variable (columns 1 and 2); whereas the international sales variable is significantly related to the overseas cooperation dependent variable (columns 3 and 4). A possible interpretation of these patterns may be that if an enterprise seeks to compete in foreign markets, it may be an advantage to use different internationalization channels rather than focusing on just one of them. We explore this idea in further details in the second part of this section.

Last, we look at the effects of the barriers to internationalization variables. Many of them turn out with the expected negative sign in the regressions (given the scale by which these indicators are measured, this negative sign should be read as a positive relationship between the relevance of each obstacle and the internationalization outcome). However, the effect of these barrier indicators on the three dependent

variables differs considerably. For the international sales dependent variable (columns 1 and 2), the most important obstacles turn out to be the lack of infrastructure, policy discrimination faced in foreign markets, and the lack of qualified workers. The overseas cooperation dependent variable (columns 3 and 4) is highly correlated with the lack of infrastructure and the network building cost indicators; by contrast, the respondent firms do not consider geographical distance to represent an important barrier to their internationalization process through overseas cooperation. For the R&D outsourcing dependent variable (columns 5 and 6), the lack of qualified workers turn out to be the most important internationalization barrier for Norwegian service providers (and the only one that is statistically significant in the regressions).

< Table 4 here >

As observed above, an interesting pattern that emerges from these regression results is that there seems to be a high degree of complementarity between the various internationalization channels, and particular between international sales and overseas cooperation. The diagram in figure 2 shows clearly such a complementarity pattern.[6] Considering all firms that have had some type of international activities in the period (51% of firms in our sample), the great majority of them has made use of both international sales and overseas cooperation (58% of international firms), whereas a much smaller share have made use of only international sales (16%) or only international cooperation (26%).

Table 5 reports the corresponding shares for different sectoral branches of the economy. The table clearly indicates that, despite some important differences across industries, the overall complementarity pattern holds for all of the sectoral groups considered in this paper: between 52% and 64% of international firms in our sample have made use of a mixed type of strategy, i.e. they have both cooperated with foreign firms and commercialised their services overseas.

< Figure 2 and table 5 here >

[6] The descriptive analysis presented in figure 2 and in the remaining of this section follows the empirical methodology of the seminal paper of Veugelers and Cassiman [18], which analysed the complementarity between *make* and *buy* innovative strategies of firms.

In order to explore the factors that may explain firms' decision to adopt a mixed strategy (sales & cooperation), we have estimated a multinomial logit model, whose results are presented in table 6. In the multinomial logit test, the dependent variable is a categorical variable that reports the internationalization strategy of the firm. The four categories of this variable are: (1) no international activity; (2) only international sales; (3) only international cooperation; (4) both sales and cooperation. The three columns in table 6 report estimation results of this MNL test for the fourth category only (i.e. the mixed strategy sales & cooperation), which is compared to different reference categories in order to highlight the factors explaining the firms' choice of a mixed (combined) internationalization strategy rather than a simple (one-channel only) mode. The set of explanatory variables is the same used for the regressions previously reported in table 4.

The employment variable turns out to be important in the regressions reported in table 6. Firm size is in fact positively related to the enterprise's choice to adopt a mixed (sales & cooperation) strategy rather than just commercialising services in foreign markets (see columns 1 and 2). By contrast, the part of a group indicator is not precise in the MNL estimations. The labour productivity variable is an important factor to explain the joint internationalization strategy (the coefficient is high and significant in column 1, but not in the other two columns).

The innovation (introduction of new services) indicator does also turn out to be an important factor to explain the mixed internationalization strategy of firms, and its coefficient is particularly high (and more significant in columns 1 and 3). Regarding the barriers to internationalization variables, the lack of infrastructure, network building costs and the lack of qualified workers appear to be important obstacles for firms adopting a mixed (sales & cooperation) strategy. On the other hand, enterprises do not consider policy discrimination in foreign markets and geographical distance as relevant factors hampering their sales and cooperation activities in international markets.

In summary, the firms in our sample that have been able to adopt a mixed internationalization strategy (i.e. to both sell and cooperate in overseas markets) are characterized by a greater size, higher labour productivity and better innovative performance. The lack of infrastructure, the costs of building a network abroad and the lack of qualified workers represent important obstacles that they need to overcome in their internationalization process.

< Table 6 here >

5. Conclusions

Theoretical and empirical knowledge about the patterns and determinants of internationalization activities in the service sector is still limited. This paper contributes to the literature in this field by bringing new empirical evidence on the process of internationalization of firms in the service sectors, based on the collection of new survey data among a sample of Norwegian service enterprises. The main patterns emerging from the survey may be summarized as follows.

First, the survey has considered three different internationalization channels. Two of them, international sales and international cooperations, are used by a substantial share of firms in the sample, whereas the third one, R&D outsourcing, is much more limited in scope (and mostly used by enterprises in knowledge intensive business services). For all of these three channels, firms that seek to expand their activities overseas seem to be motivated by two major objectives: to get access to foreign production and distribution networks and to search for advanced human capital. Exporting is one of the main delivery modes in international markets. However, the relevance of other delivery modes (e.g. temporary and permanent presence abroad, mobility of foreign clients) suggests that the co-terminality of production and consumption of services is still an important issue, and that geographical and cultural proximity still matter substantially in the internationalization process of service providers.

Secondly, this new survey data enables an investigation of the possible determinants of the various internationalization channels. Despite the obvious limitations of this type of empirical analysis in a cross-sectional setting, some interesting indications (correlations) emerge from our regression exercise. The international performance of service firms is related to the following main factors: (1) the sectoral group to which the enterprise belongs, because the function of each sectoral group affects the propensity to engage in international activities; (2) the innovative capability of the enterprise, which determines its technological competitiveness in foreign markets; (3) the availability of infrastructures (e.g. transport and distribution channels), networks

and skilled labour in overseas markets; (4) other internationalization channels. This latter factor turns out to be particularly important in the regression model, and its relevance suggests that the various channels of internationalization may be complementary, rather than substitute, strategies that service firms adopt in order to compete in international markets. The analysis has in particular shown the close complementarities existing between the international sales and overseas cooperation channels, since a great majority of firms have adopted both strategies to compete in international markets.

Thirdly, it is important to emphasize that the overall patterns and determinants pointed out above here refer to the whole sample of firms under investigation, whereas significant differences emerge in internationalization patterns, strategies and performance across service sectors. The ANOVA exercise carried out in section 3 indicates in fact the existence of important sectoral specificities in the internationalization process. In particular, the four sectoral groups that have been considered throughout this paper differ substantially in terms of their innovative capability and international performance. The bunch of firms in the advanced knowledge providers sectoral group emerge as the most active in foreign markets, and make active use of all three channels, sales, cooperations and R&D outsourcing. Physical infrastructure services do also perform well in overseas markets, although, differently from the previous group, they seem to base their dynamics on existing rather than innovative services. On the other hand, Norwegian enterprises in the sectoral groups of network infrastructure and personal services are characterized by a more limited scope and ability to compete in international markets.

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Table 1: Results of the new survey on service internationalisation: descriptive statistics for the main questions in the survey.

		Variable	Mean	St. deviation
General information		Employment	103.9	218.8
		Part of a group[a]	56%	0.49
		Introduction of new services[a]	45%	0.49
International sales		International sales[a]	37.3%	0.48
	Delivery mode[b]	Exports	18.1%	1.04
		Temporary presence	17.0%	0.96
		Subsidiary	13.9%	0.97
		Foreign clients	11.0%	0.84
		Licenses	9.3%	0.72
		Joint ventures	7.2%	0.65
	Type of client[b]	Production	21.9%	1.15
		Distribution	20.1%	1.10
		Consumers	6.8%	0.69
		Public sector	8.4%	0.70
International sales of new services	Delivery mode[b]	Exports	9.9%	0.82
		Temporary presence	11.8%	0.83
		Subsidiary	12.5%	0.91
		Foreign clients	7.7%	0.77
		Licenses	6.7%	0.63
		Joint ventures	5.9%	0.59
International cooperation		International cooperation[a]	42.3%	0.49
	Type of partner[b]	Group	25.1%	1.21
		Suppliers	30.1%	1.18
		Customers	32.8%	1.27
		Competitors	17.1%	0.90
		Consultant	16.6%	0.88
		R&D lab	4.6%	0.58
		University	6.5%	0.64
		Public research institute	3.1%	0.47
	Cooperation motives[b]	Access to know-how	28.0%	1.13
		Sales	30.6%	1.24
		Distribution network	29.8%	1.19
		Proximity to customers	29.8%	1.24
		Production	14.1%	0.87
		R&D	13.3%	0.83
		Public funding	4.7%	0.58
		Workforce qualification	19.9%	0.97
		Internat. innovation cooper.[a]	19.6%	0.39
		Group	13.2%	0.94
		Suppliers	12.8%	0.87

Internat. innovation cooperation	Type of partner[b]	Customers	14.0%	0.90
		Competitors	4.7%	0.55
		Consultant	5.9%	0.57
		R&D lab	5.1%	0.53
		University	4.7%	0.52
		Public research institute	1.6%	0.36
R&D internationalization		R&D outsourcing[a]	6.3%	0.24
	Outsourcing motives[b]	Proximity to customers	3.6%	0.55
		Proximity to suppliers	3.2%	0.44
		Proximity to Universities	3.2%	0.47
		Access to qualified workers	4.4%	0.59
		Proximity to clusters	2.8%	0.48
		Unfavourable legislation	0.8%	0.25
		Favourable legislation abroad	0.8%	0.28
		Low labour costs	1.6%	0.41
Barriers to internationalization[b]		Employment regulation	15.6%	0.91
		Business activity regulation	21.2%	0.98
		Infrastructure	30.2%	1.08
		Language and culture	29.4%	1.12
		Policy discrimination	17.7%	0.88
		IPRs protection	10.2%	0.76
		Network building cost	40.1%	1.19
		Lack of qualified workers	30.8%	1.07
		Lack of risk capital	21.9%	0.95
		Geographical distance	20.7%	0.96

Measurement of variables: **[a]**: dummy variables (1= yes; 0 = no); **[b]**: variables measured on a 1-4 scale (1 indicates the item is *very important* and 4 indicates the item is *not relevant*)

Mean values: For the variables measured as dummy indicators, the percentage values reported in the table represent the share of firms in the sample that have answered "yes" to a given question. For the variables measured on a 1-4 scale, the percentage values reported in the table represent the share of firms in the sample that have answered that a given item is "very important" or "quite important".

Table 2: Sectoral differences in internationalization strategies and patterns: results of ANOVA tests for each sectoral group.

	Variable	AKP-S	PGS-S	SIS-N	SIS-P
General information	Employment	85.6 (1.05)	154.3 (1.62)*	108.7 (0.20)	96.9 (0.33)
	Part of a group[a]	0.52 (1.15)	0.49 (1.07)	0.60 (0.69)	0.63 (1.43)*
	Introduction of new services[a]	0.49 (1.02)	0.32 (1.76)**	0.55 (1.86)**	0.38 (1.43)*
International sales	International sales[a]	0.40 (0.76)	0.31 (0.91)	0.26 (2.02)**	0.45 (1.79)**
	Mode: Exports[b]	3.38 (0.72)	3.81 (2.55)**	3.65 (1.87)**	3.13 (3.03)***
	Mode: Temporary presence[b]	3.37 (1.95)**	3.76 (1.76)**	3.72 (1.83)**	3.43 (1.02)
	Mode: Subsidiary[b]	3.55 (0.50)	3.78 (1.42)*	3.63 (0.42)	3.49 (0.99)
	Mode: Foreign clients[b]	3.60 (0.06)	3.51 (0.79)	3.84 (2.52)***	3.47 (1.64)*
	Client: Production[b]	3.27 (0.76)	3.70 (2.12)**	3.46 (0.91)	3.15 (1.71)**
	Client: Distribution[b]	3.33 (0.74)	3.62 (1.44)*	3.49 (0.82)	3.27 (1.10)
International sales of new services	Mode: Exports[b]	3.50 (2.59)***	3.84 (1.38)*	3.76 (0.86)	3.75 (0.84)
	Mode: Temporary presence[b]	3.46 (3.04)***	3.92 (2.09)**	3.75 (0.92)	3.72 (0.69)
	Mode: Subsidiary[b]	3.57 (0.96)	3.87 (1.69)**	3.68 (0.33)	3.59 (0.61)
	Mode: Foreign clients[b]	3.76 (0.32)	3.61 (1.22)**	3.79 (0.54)	3.75 (0.09)
International cooperation	International cooperation[a]	0.42 (0.09)	0.25 (2.28)**	0.42 (0.06)	0.52 (1.94)**
	Partner: Group[b]	3.29 (0.16)	3.64 (1.96)**	3.31 (0.27)	3.03 (1.97)***
	Partner: Suppliers[b]	3.31 (1.32)*	3.64 (2.52)***	3.03 (1.14)	2.89 (2.32)**
	Partner: Customers[b]	3.05 (0.40)	3.47 (1.92)**	3.15 (0.35)	2.91 (1.40)*
	Motive: Access to know-how[b]	3.26 (0.08)	3.61 (2.06)**	3.18 (0.60)	3.12 (1.12)
	Motive: Sales[b]	3.25 (1.36)*	3.40 (1.49)*	3.06 (0.33)	2.80 (2.37)***
	Motive: Access to distribution network[b]	3.30 (1.05)	3.57 (1.99)**	3.26 (0.46)	2.80 (3.21)***
	Motive: Proximity to customers[b]	3.20 (0.63)	3.57 (2.23)**	3.09 (0.31)	2.86 (2.13)**
Internat. innovation cooperation	Internat. innovation cooper.[a]	0.25 (1.77)**	0.03 (2.77)***	0.19 (0.05)	0.21 (0.30)
	Partner: Group[b]	3.51 (1.28)*	3.89 (1.86)**	3.73 (1.08)	3.51 (1.12)
	Partner: Suppliers[b]	3.64	3.92	3.46	3.62

		(0.09)	(2.14)**	(1.79)**	(0.04)
	Partner: Customers[b]	3.46	3.94	3.66	3.62
		(2.13)**	(2.33)**	(0.44)	(0.04)
	R&D outsourcing[a]	0.121	0.028	0.033	0.030
		(2.86)***	(0.91)	(1.12)	(1.28)
	Motive: Proximity to customers[b]	3.74	4.00	3.97	3.91
		(2.85)***	(1.39)*	(1.47)*	(0.55)
R&D internationalization	Motive: Proximity to suppliers[b]	3.84	3.94	3.95	3.91
		(1.49)*	(0.59)	(1.00)	(0.17)
	Motive: Proximity to Universities[b]	3.79	4.00	3.97	3.92
		(2.74)***	(1.38)*	(1.35)*	(0.56)
	Motive: Access to highly qualified workers[b]	3.70	4.00	3.93	3.95
		(3.36)***	(1.44)*	(1.06)	(1.44)*
	Infrastructure[b]	3.15	3.06	3.45	2.83
		(0.33)	(0.34)	(2.70)***	(2.67)***
Barriers to internationalization	Language and culture[b]	2.69	3.27	3.55	3.12
		(4.34)***	(0.99)	(3.70)***	(0.32)
	Network building cost[b]	2.55	3.09	3.23	2.90
		(3.33)***	(1.09)	(2.65)***	(0.19)
	Lack of qualified workers[b]	2.74	3.21	3.52	3.21
		(4.30)***	(0.56)	(3.38)***	(0.90)

The table reports the average for each sectoral group, and it shows between parentheses the significance levels of ANOVA tests that investigate the mean difference between each sectoral group and the overall sample average (the latter have previously been reported in table 1).

Sectoral groups: AKP-S: Advanced knowledge providers services; PGS-S: Personal services (supplier dominated); SIS-N: Supporting infrastructure services – Network; SIS-P: Supporting infrastructure services – Physical

Measurement of variables: **[a]**: dummy variables (1= yes; 0 = no); **[b]**: variables measured on a 1-4 scale (1 indicates the item is *very important* and 4 indicates the item is *not relevant*)

Significance levels: *** 1%; ** 5%; * 10%.

Figure 1: Sectoral patterns of innovation and internationalization in services: share of firms with international sales and service innovation for each sectoral group.

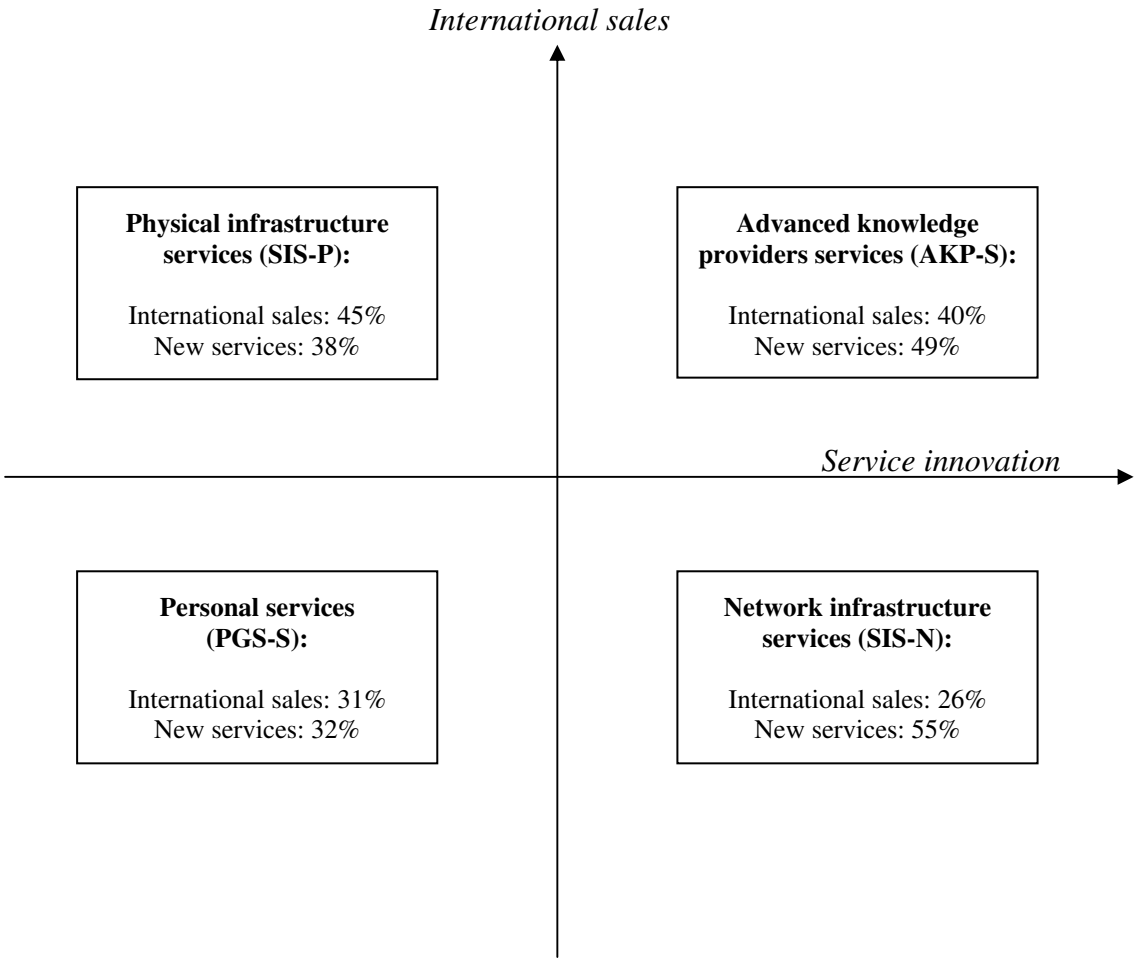

Table 3: Coefficients of correlation between the main internationalization variables.

	International sales	**International cooperation**	**International innovation cooper.**	**R&D internationalization**
International sales	1.000			
International cooperation	0.560	1.000		
International innovation cooper.	0.351	0.545	1.000	
R&D internationalization	0.234	0.310	0.489	1.000

Table 4: The determinants of internationalization patterns: Results of logit regressions.

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent variable	**International sales**		**International cooperation**		**R&D internationalization**	
Employment (log)	0.285 (1.09)	0.193 (0.81)	0.851 (3.05)***	0.725 (2.98)***	0.163 (0.51)	-0.045 (0.16)
Part of a group	-0.423 (0.82)	-0.244 (0.51)	0.575 (1.18)	0.701 (1.55)	0.896 (0.72)	1.259 (1.04)
Labour productivity	0.362 (1.04)	0.351 (1.06)	0.632 (1.79)*	0.605 (1.93)*	1.702 (1.69)*	1.608 (1.85)*
Introduction of new services	0.853 (1.79)*	0.976 (2.27)**	0.158 (0.33)	0.559 (1.34)	0.727 (0.69)	0.942 (0.99)
International sales			2.112 (4.23)***	2.288 (4.93)***	0.938 (0.98)	1.165 (1.23)
International cooperation	2.28 (4.66)***	2.38 (5.10)***				
Barrier: Lack of infrastructure	-0.382 (1.61)	-0.317 (1.42)	-0.636 (2.34)**	-0.579 (2.33)**	-0.110 (0.29)	-0.107 (0.29)
Barrier: Policy discrimination	-0.551 (1.53)	-0.545 (1.66)*	0.346 (0.95)	0.589 (1.74)*	0.195 (0.46)	0.256 (0.68)
Barrier: Network building cost	-0.005 (0.02)	-0.046 (0.18)	-0.546 (2.04)**	-0.641 (2.49)**	-0.193 (0.44)	-0.265 (0.62)
Barrier: Lack of qualified workers	-0.520 (1.73)*	-0.592 (2.09)**	0.081 (0.26)	-0.017 (0.06)	-0.840 (1.71)*	-0.848 (1.94)*
Barrier: Geographical distance	0.151 (0.50)	0.153 (0.53)	0.659 (2.12)**	0.709 (2.38)**	0.359 (0.72)	0.572 (1.22)
Industry dummies	All 2-digit industries	Four sectoral groups	All 2-digit industries	Four sectoral groups	All 2-digit industries	Four sectoral groups
Pseudo R^2	0.474	0.455	0.470	0.441	0.385	0.402
Observations	224	224	224	224	224	224

All regressions include a constant. *Significance levels*: *** 1%; ** 5%; * 10%.

Figure 2: Complementarity between different internationalization strategies: international sales versus overseas cooperations.

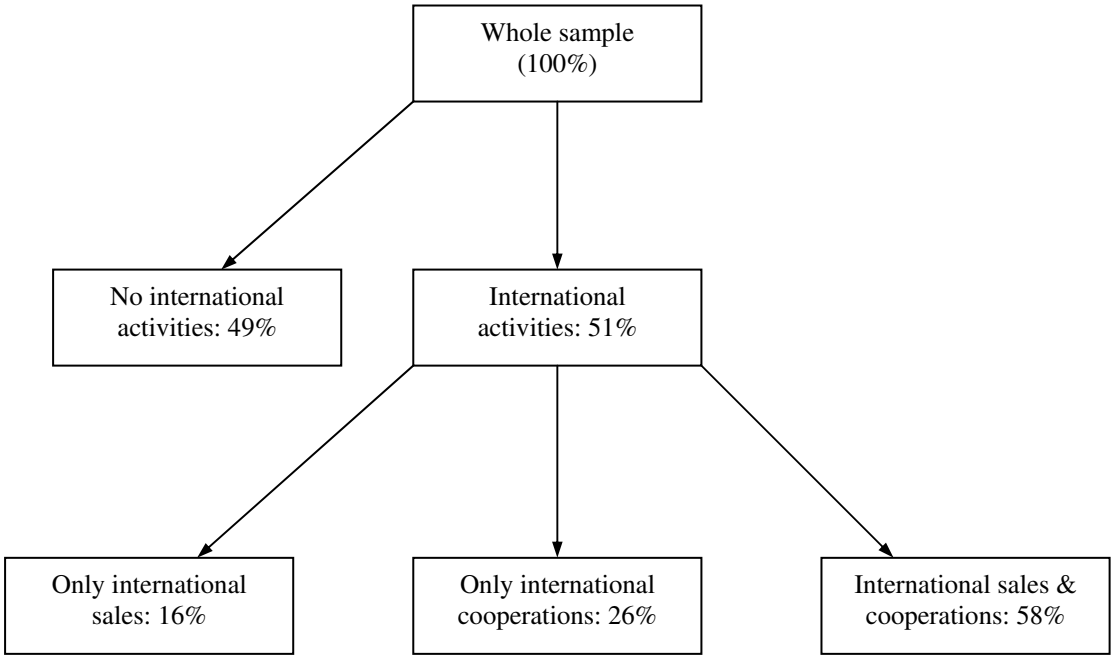

Table 5: Complementarity between international sales and overseas cooperations: differences across sectoral branches.

	AKP-S	**PGS-S**	**SIS-N**	**SIS-P**
No international activities	49%	63%	56%	41%
International activities	51%	37%	44%	59%
Only international sales	18%	32%	5%	12%
Only international cooperations	21%	16%	41%	24%
International sales & cooperations	61%	52%	54%	64%

Table 6: The complementarity between international sales and overseas cooperations: Results of multinomial logit regressions.

	(1)	**(2)**	**(3)**
Dependent variable	International sales & cooperations	International sales & cooperations	International sales & cooperations
Reference category	No international activity	Only international sales	Only international cooperation
Employment (log)	1.021 (3.68)***	0.989 (2.40)**	0.285 (1.00)
Part of a group	0.417 (0.82)	-0.073 (0.09)	-0.647 (1.00)
Labour productivity	0.832 (2.18)**	0.393 (0.76)	0.101 (0.22)
Introduction of new services	1.644 (3.43)***	0.924 (1.36)	1.087 (2.01)**
Barrier: Lack of infrastructure	-1.017 (3.81)***	-0.559 (1.53)	-0.268 (0.99)
Barrier: Policy discrimination	0.113 (0.32)	0.873 (1.94)*	-0.323 (0.71)
Barrier: Network building cost	-0.649 (2.42)**	-1.318 (2.65)***	-0.287 (0.91)
Barrier: Lack of qualified workers	-0.566 (1.86)*	-0.119 (0.28)	-0.820 (2.07)**
Barrier: Geographical distance	0.805 (2.53)**	1.018 (2.32)**	0.303 (0.75)
Pseudo R^2	0.319	0.319	0.319
Observations	224	224	224

All regressions include a constant and a dummy for each of the four sectoral groups. Wald statistics between parentheses; significance levels: *** 1%; ** 5%; * 10%.