Determinants of the choice between different innovation regimes amongst firms in the enlarged European Union

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Determinants of the Choice between Different Innovation Regimes amongst Firms in the Enlarged European Union

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Abstract

A substantial degree of heterogeneity in the performance and competitiveness of firms can be attributed to their choice between different innovation regimes. These range from small incremental improvements in everyday activities to completely new products or processes; the acquisition of knowledge from external sources to in house innovation activities; and the choice between occasional and continuous innovation. This study focuses on two important questions: what factors and forces influence the decision to pursue a particular innovation regime and how different innovation regimes affect the productivity of firms. The research is based on the 2006 wave of Community Innovation Survey (CIS) for several mature (EU15) and new members of the EU (EU10). Using multinomial logit regression the investigation shows that market orientation, organisational and marketing innovations as well as the presence of demand-driven incentives for innovation have important role in explaining the choice of firms between different innovation regimes. Furthermore, the findings indicate that firms in the new EU members are more inclined towards incremental and internal innovation activities than open innovation regime.

Keywords: firm behaviour, innovation regime, CEEC

1. Introduction

The recent work on innovations has revealed substantial heterogeneity in the performance and competitiveness of firms which can be attributed to the variety of internal and external factors such as institutions, competitive pressure or the choice between different innovation regimes. With respect to the last factor, the literature contends that the firms behave very differently when they want to make decisions on their innovation strategy. Some firms engage only in small incremental improvements in their activities while others choose to aim for visible new or improved products and processes; some decide to acquire new knowledge through cooperation with external actors while others rely solely on their own efforts and resources; some focus on producing products which are new to the firm while others aim to develop products and processes which are new to the market. However, while both Schumpeterian and endogenous growth literature discuss the relevance of both internal and external sources of innovations the empirical studies examining these issues were until recently scarce and are just beginning to emerge. Hence, we are still far from the point of complete understanding about the mechanisms that underlie the firms' choice of different innovation regimes.

Firms in the new EU member states are generally considered to be technologically inferior and less innovation intensive than their counterparts in mature West European economies. In addition, the low innovativeness of firms in the former group can be attributed to limitations in their internal capabilities and competencies as well as the institutional factors and policies pursued by their governments over past two decades. The acquisition of external knowledge and technology may have helped these firms to overcome barriers to their innovation activities. Bearing in mind how low innovativeness may constrain the quality-driven competitiveness of firms and thus limit the potential of their economies for growth, it is important to shed some light on factors influencing the choice of these firms between different innovation regimes. The results of this investigation may help to develop policies that could narrow the gap in the behaviour of two groups of firms.

The prevalent approach in recent studies on innovation behaviour of firms is based on a multi-stage model that establishes a link from decision to innovate to innovation expenditure and from innovation output to improvements in firm performance or

competitiveness (Crepon, et al., 1998). In one version of this model the authors consider as innovators only firms which report positive level of innovation expenditure and/or innovation output (Loof, et al., 2002; Loof and Hesmati, 2006; Masso and Vahter, 2007; Hashi and Stojcic, 2010) while another version adopts a wider interpretation of innovations to include all improvements in a firm's activities no matter how small (Griffith, et al., 2006; Halpern, et al., 2009). This literature maintains that all firms are engaged in some innovations as their employees spend some part of their working time thinking about ways to improve their everyday activities. It is further argued that in many cases these efforts are so negligible or unmeasurable that firms do not report them as innovation activities. Yet, none of these studies pays any attention to the choice of firms between different innovation regimes.

In order to fill this gap in the literature this study makes a distinction between three types of innovation regimes, namely, small incremental innovation activities not reported by firms, the acquisition of knowledge and technology through external sources and development of innovations solely through internal capabilities, and examines which factors and forces influence the decision of firms to pursue each of these patterns of behaviour. To our knowledge, this issue has not been investigated in the context of transition and for the new EU members. While doing this, we compare the differences between the behaviour of firms in mature and new EU members searching for answers that can help us to identify potential challenges for innovation-oriented policies.

The paper is structured as follows. The next section establishes the theoretical framework of research by combining insights from the Schumpeterian and endogenous growth literature. In this context, we make a distinction between different types of innovation regimes and point to their relationship with the performance of firms. In section three we review relevant findings from the literature on determinants and outcomes of different innovation regimes. The main characteristics of the firms in our sample with respect to their choice of innovation regime are discussed in section four. The determinants of the firm's choice between different innovation regimes is analysed in section five. Finally, the section six concludes.

2. Theoretical framework

Many models of firm behaviour rest on the thesis that innovations lead to improvements in the performance and the competitiveness of firms. From the work of Schumpeter (1934) to developments in evolutionary economics (Nelson and Winter 1982) and the more recent contributions of endogenous growth literature (Romer, 1990; Aghion and Howitt, 1992; Grossman and Helpman, 1994; Aghion and Howitt, 1998) scholars have argued that the generation of new knowledge creates an opportunity for its holder to differentiate itself from other rivals by charging lower prices or by offering products of better quality and thus appropriate above-average returns based on some degree of monopoly power. However, such benefits can last only for a limited period of time since innovation-based competitive advantages diminish with the introduction of new discoveries, diffusion of the previously developed knowledge and imitation.

Under the Schumpeterian thesis of creative destruction, the creation of new knowledge takes place as firms search for new profit opportunities. This process encompasses improvements in the characteristics of products and the way they are produced (Schumpeter, 1934). As with each new discovery the superiority of early innovators diminishes in favour of new ones, it is said that the innovation process destroys the existing economic structures and gives rise to new ones. Later, the literature evolutionary economics has compared this with process of biological evolution (Alchian, 1950; Winter, 2005). The survival of firms and their relative ranking within an industry is determined on the basis of their characteristics analogous to the process of natural selection. To this end, innovations are recognised as the path through which firms can align their behaviour with the requirements of economic system. Building on these foundations the models of endogenous growth contend that firms can remain superior to their rivals and continuously grow by investing in technology and knowledge (Aghion and Howitt, 1992; Grossman and Helpman, 1994).

While emphasising the importance of innovations for the growth of firms, industries and nations, the existing literature is less clear on the question of whether some innovation regimes are better than others. Schumpeter (1934) is more concerned with the innovation process, different types of innovation outputs and distinction between innovators and

inventors, thus not dealing explicitly with the issue of innovation regimes. However, the emphasis in both his early (1934) and later (1942) work is on the internal capabilities of firms, regardless of their size, which are highlighted as the key determinants of the success of innovations. Yet, he does acknowledge that in some instances innovations can emerge from cooperation between firms and their environment. In some instances innovators have to search for incumbent firms or for entrepreneurs looking to start up their business in order to implement their innovations (Schumpeter, 1934). Also, entrepreneurial skills may reside in individuals which are part of larger organisational structures and develop joint innovation efforts with other parts of their organisation.

The evolutionary and resource-based literature favours a closed concept of innovations under which the entire innovation process takes place within the boundaries of the firm (Nelson and Winter, 1982; Barney, 1991). The behaviour of firms is governed by routines which encompass all the skills and knowledge necessary to undertake the firm's activities (Alchian, 1950; Nelson and Winter, 1982). The stock of these routines is developed through the life of a firm and forms its organisational memory which consists of two parts the formal knowledge of the firm and the tacit routines that reside in the minds of its employees. Since innovations emerge through the combination of existing and new routines, it is postulated that the survival of firms and their relative ranking within the industry will be determined through the quality of their own routines.

Even though the evolutionary literature favours closed concept of innovations it did not go unnoticed by its scholars that the creation of new knowledge may be the outcome of close cooperation between firms and their environment. Nelson and Winter (1982) note that sometimes firms develop innovations which will be used by their customers. To this end, it is underlined that vertically integrated networks of suppliers, producers and distributors may be important channels through which innovations are transferred between firms. In explaining the decision of firms between internal and external innovation activities this literature contends that firms may follow divergent patterns when pursuing product or process innovations. It is postulated that product innovations are more likely to be built with internal capabilities of firms while process innovations may be purchased from suppliers. The logic behind such reasoning is that firms care about perceptions of customers about their products but are less concerned about the customers' reaction to their decisions

affecting costs. However, while such reasoning may hold in quality-competitive firms, the opposite may be true for firms which compete in terms of prices.

Notwithstanding the importance of internal innovation capacities the models of endogenous growth have extended the evolutionary framework by offering a clearer view of the external sources of innovations. In this context, knowledge is defined as a partially exclusive good, meaning that its diffusion across firms cannot be completely prevented (Romer, 1990). The inability to prevent the diffusion of knowledge and the fact that in some instances innovations may result in discoveries of general nature means that there are positive externalities for other firms who benefit from the efforts of initial innovator. Grossman and Helpman (1994) point to the another type of externality by contending that in successive waves of innovation innovators can take advantage of previously accumulated knowledge on which they can build their own work instead of investing efforts and resources in the development of all earlier stages of a particular innovation process.

Recently, the emphasis of the literature on innovation regimes has moved to the concept of open innovation (Chesbrough, 2006). Under the open innovation paradigm knowledge is no longer treated as the proprietary of a firm but it is assumed to be widely distributed across the market. The availability of knowledge reduces the need for all firms to develop all stages of innovation process within their own capacities. Instead, they establish links with the external environment and benefit from the knowledge developed by others. From here it follows that under open an innovation regime both internal and external sources of knowledge act as means of accelerating internal innovation processes and making them more efficient. Hence, while the role of internal innovation efforts is diminished it is not completely abandoned.

In an open innovation regime, knowledge can enter any stage of the innovation process and can be released to the market at any time. The flow of innovation between firms and their environment can take place through various channels including competition, interactions with suppliers and customers, cooperation with universities, research laboratories, relevant government institutions and the international trade (Von Hippel, 1988; Cohen, et al., 2002; Chesbrough, 2006; Perkmann and Walsh, 2007). However, the interplay between internal and external knowledge would depend on the absorptive capacities of

firms (Cohen and Levinthal, 1990). To this end, the formal networks of firms (Chesbrough, 2006) and localised knowledge spillovers resulting from the concentration of firms in geographical proximity or in areas with distinct competitive advantages (Cooke, 2005) may be of crucial importance for the success of the innovation process.

There is little doubt that the choice between different innovation regimes will depend on a number of firm's characteristics. For instance, firms operating in high technology intensive industries which traditionally have a higher demand for outputs of research institutions are likely to be more inclined towards open innovation regime than their counterparts in low technologically intensive industries (Chesbrough, 2006; Perkman and Walsh, 2007). Moreover, the lack of vertical technological differentiation among rivals and stronger competitive pressure of non-innovating firms may lead to stronger reliance on own innovation efforts just as the ability to imitate more sophisticated foreign rivals may act in opposite direction (Lelarge and Nefussi, 2007). Finally, the choice between innovation regimes may be determined with the size of firm. The recent Schumpeterian work implies that large firms have more means to undertake costly innovation activities (Schumpeter, 1942). From there it follows that larger firms will be more inclined to undertake own innovation activities while small and medium-sized firms will search for external sources of knowledge and attempt to bring together their skills and knowledge in order to overcome barriers to innovation.

3. Literature review

In the light of the rapid technological change in the past few decades and the growing importance of the knowledge based economy, innovation and innovative activities have become some of the most widely investigated areas of firm behaviour. The development of the so-called 'multi-stage' models has been an important aspect of this heightened interest. These models capture the multidimensional and complex nature of the innovation process, tracing it from the decision of firms to innovate to their investment in innovations and transformation of invested resources into innovation output and to the impact of this output on firm's performance and competitiveness (Crepon et al., 1998). In addition, the research has been facilitated by the availability of surveys such as the Community Innovation Survey

(CIS) which specifically targets the innovation activities of firms. Two main lines of research have been pursued by in this literature.

One version of the multi-stage model divides firms into innovating and non-innovating firms on the basis of a question asking firms whether they have introduced new or significantly improved products or processes over some predefined recent period of time, with only the former group entering the subsequent stages of the analysis (Loof et al., 2002; Loof and Hesmati, 2006; Hashi and Stojcic, 2010). Thus, these models first focus on a set of two equations estimated jointly, identifying the factors influencing the decision of firms to innovate and their decision on the amount of expenditure on innovation activities (defined either in narrow terms as spending on research and development or in broader terms as the expenditure on R&D and the acquisition of external knowledge and technology). Using only the group of innovating firms, the third stage investigates how innovation inputs together with other factors influence the innovation output of firms, usually defined in terms of revenues from sales of new products. The fourth stage involves the estimation of the impact of innovation output on the performance of firms measured in terms of their productivity.

Another version of the multi-stage model contends that firms are always engaged in some degree of innovations, no matter how incremental (Griffith et al., 2006; Masso and Vahter, 2007; Halpern and Murakozy, 2009). This literature postulates that innovations are distributed across firms with different intensities since a part of working time is always spent on thinking about ways of improving the production process or products. However, below a minimum threshold the intensity of innovation efforts is so incremental that firms do not report it. The models in this tradition, therefore, differ from those described earlier in three ways. First, the starting point in empirical investigation is the answer to the question whether firms have reported any positive amount of innovation expenditure, as opposed to whether they have developed a new product or process. Second, a distinction is being made in the measurement of innovation output. This literature separates innovation output into product and process innovations – unlike the previous models which focused on the sale of new products as the indicator of innovation output. Third, these models consider that causality is only in one direction - from the decision to innovate to the decision on innovation inputs, and on to innovation outputs and to the performance of firms while

earlier models also assumed that there is a feedback effect from firm performance to the innovation output.

Both groups of models have been applied to samples of firms from both old (EU15) and new (EU10) members of the EU. The evidence obtained has confirmed that innovations play an important role in explaining the ability of firms to compete. However, curiously enough, the question of different innovation regimes has not been treated explicitly in this literature although the variables reflecting different types of innovation regimes have been included as independent variables in different stages of the innovation process. To this end, a distinction is made between the within-firm and within-group sources of knowledge on the one hand and vertical and horizontal knowledge coming from external sources (such as domestic and foreign suppliers, customers, rivals, universities, government institutions and exchange of ideas within employees through their participation in fairs, exhibitions, etc.) on the other.

The evidence confirm that both internal and external sources of innovation are important in explaining the ability of firms to compete. Furthermore, the propensity to innovate increases if firms are exposed to knowledge spillovers arising from international competition (Loof et al., 2002; Griffith et al., 2006; Halpern and Murakozy, 2009; Hashi and Stojcic, 2010). In making innovation expenditure firms rely mainly on information obtained from clients and other firms and vertical channels of cooperation with both suppliers and customers. However, cooperation with competitors has an adverse impact on the innovation expenditure (Loof et al., 2002; Loof and Hesmati, 2006; Masso and Vahter, 2007). The knowledge acquired through cooperation with customers, suppliers and competitors has a positive impact on the transformation of innovation inputs into innovation outputs (Griffith et al., 2006; Masso and Vahter, 2007; Hashi and Stojcic, 2010).

Outside of multi-stage framework, a variety of other approaches have been developed to examine the relationship between innovation regimes and the competitiveness and performance of firms. This literature has mainly investigated how different types of externally acquired knowledge affect the innovation output of firms. Freel (2003) examined the relationship between R&D intensity and measures of product and process innovation including five different types of external cooperation, with customers, suppliers,

competitors, universities and public agencies. The results show that in the development of product innovations firms rely on cooperation and information coming from customers and public sector while the information from suppliers and links with universities are significant for process innovations. Zaheer and Bell (2005) observed how the innovativeness of focal firms within networks impacts their market share. Their findings indicate that only the internal R&D efforts are significant in determining the relative position of a firm within its industry. This finding is in line with Sampson (2007) who investigated the relationship between the creation of firms' alliances and the generation of patents. In addition, this study pointed out that the technological diversity of firms within an alliance may at first facilitate the generation of patents but after some stage it becomes a barrier to innovation.

Laursen and Salter (2006) examined the breadth and depth of collaboration with sixteen types of external partners and established that external innovation activities have a nonlinear relationship with the introduction of radical and incremental innovations, increasing firm's innovation output until some point and diminishing it afterwards. In a similar manner, Nieto and Santamaria (2007) found that the probability of firms engaging in both radical and incremental innovations increases if they cooperate with universities, clients and suppliers. These results were confirmed by Criscuolo et al. (2005) and Clausen (2008) who showed that the information obtained through different horizontal and vertical sources of cooperation as well as those from internal sources positively influence the innovation output (measured by several indicators ranging from patent counts to the sales of new products). Finally, Clausen et al. (2009) examined how the choice between different innovation regimes affects the export intensity and propensity of firms. While externally acquired R&D and cooperation with foreign partners enter the model as significant and positive variables, cooperation with domestic actors has a negative impact on both choices of firms.

The above literature, though contributing to the knowledge on the variety of channels facilitating or hampering the innovation process, also suffers from two major weaknesses. First, the choice of firms between different innovation regimes is scarcely treated in this literature. Second, those studies that do examine the impact of these regimes on the innovation output and firm performance do not take into account the complexity of the innovation process, i.e., the fact that there are a number of separate and distinct stages

in this process. These issues will be addressed in continuation of our paper. But before we do that we present briefly characteristics of our dataset.

4. Data

The empirical work in this paper is based on the dataset extracted from the Fifth Community Innovation Survey (CIS) conducted in the period between 2004 and 2005. This dataset contains information on innovation activities of firms in the EU, candidate countries and Norway, their performance and general characteristics such as size, industry, whether they are part of a group, whether they export, etc. The firm level data (with the information on all questions) is not available publicly on the grounds of confidentiality and can be accessed only at the Eurostat Safe Center in Luxembourg. In total we had access toThe empirical analysis is based on the information available on 32446 firms engaged in manufacturing, trade and service sectors of 12 countries.[1] Of these, 7530 (23%) had declared that they were involved in actual product or process innovation (the remaining 24916 belonging to category of incremental innovators, i.e., not reporting any innovative activity). Furthermore, in the first group, 6884 (21% of the total) had either cooperated with others or relied solely on external partners in the development of their innovation activities (externally oriented innovators) while 646 (2% of the total) relied only on their own internal capacities for the development of new products or processes (internally oriented innovators).

Table 1 presents some of the main characteristics of firms in the sample divided by their choice between different innovation regimes - incremental, internally oriented and externally oriented. The definition of 'innovation regimes' here is similar to the one employed in the recent literature, particularly Griffith et al. (2006) and Halpern and Murakozy (2009). We consider that all firms invest some efforts and resources in the development of new products and processes though for many of them this effort is so incremental that it is not reported. In practical terms, we classify those firms that do not report any positive level of innovation expenditure as incremental innovators. Similarly, we define as internally oriented innovators those firms who have reported that they have

[1] They include Bulgaria and Romania, the candidate countries at the time of the survey, six new EU members (Czech Republic, Estonia, Hungary, Latvia, Lithuania and Slovak Republic), three old EU members ((Greece, Spain and Portugal) and Norway (a country with institutional developments very similar to the mature EU members. Although the Survey has been conducted in all EU member states and some candidate countries, the raw data is not available for all countries.

engaged in intramural (in-house) innovation activities without any cooperation with external partners. Firms which had acquired new products and processes developed by other enterprises and research institutes or in cooperation with them are classified as externally oriented or 'open' innovators. The detailed descriptive statistics of the dataset can be found in the Appendix.

Table 1: Characteristics of firms in different innovation regimes

	Incremental Innovators	Internally oriented Innovators	Externally oriented Innovators
Number of firms (and %)	24916 (77%)	*646 (2%)*	*6884 (21%)*
Firm Characteristics			
Average Size (no of employees)	36	74	72
% of firms being exporters	26%	45%	41%
% of firms being part of a Group	9%	22%	26%
Industry			
Manufacturing	56%	61%	66%
Services	19%	28%	20%
Trade	25%	11%	14%
Location			
CEECs	97%	99%	94%
Barriers to innovation (% of firms who considered the following factors as important barrier to innovation):			
Costs	60%	72%	70%
Knowledge	51%	60%	60%
Market Factors	46%	59%	53%
Other Factors	30%	24%	21%

It can be seen from the table that the sample consists mainly of small and medium sized enterprises. While the small firms are predominant among incremental innovators, the medium sized firms dominate the two groups of innovating firms. Further analysis reveals that the share of exporters is substantially lower in the first group than in the other two, implying that participation in international market requires firms to invest higher efforts and greater resources in innovation activities, whether alone or through external cooperation. Not surprisingly, the proportion of firms which are part of an enterprise group is much higher among firms which develop innovation either through cooperation or by relying solely on external sources. Most of the firms in all three innovation regimes are in the

manufacturing sector (above 60%) and the bulk of them are located in the new EU member states and candidate countries.

The firms' choice of innovation regimes may be related to barriers to innovation. In CIS questionnaire firms are asked about the importance of four types of barriers (costs, knowledge, market factors and other factors) for their innovation activity. As shown in Table 1, over 60% of firms in all three samples have declared that they consider cost factors, which include the cost of access to finance, as a highly important barrier to its innovation activities. The knowledge factor, which consists of the lack of qualified personnel, information on technology, information on markets and obstacles in organising partners for cooperation, are considered important for a majority of firms in all three groups, though higher in the innovating firms groups. Market factors, consisting of elements such as dominance of some firms in the market and uncertain demand, are considered important by about half of the firms in each group.

5. Determinants of the choice between different innovation regimes

As already mentioned the main objective of this paper is to investigate the factors influencing the firms' choice of the innovation regime. The dependent variable of the model is the probability of a firm falling into one of the three innovation regimes (incremental innovators, internally oriented innovators and open innovators).

As with most firm-level studies, the choice of explanatory variables is constrained by the limitations of the dataset. The Community Innovation Survey consists of two main groups of questions, one containing questions answered by all enterprises and another which contains questions answered only by those firms that are labelled as innovators (spend a positive amount on innovation expenditure). Since the answers to the second set of questions are missing for the sub-sample of incremental innovators (constituting some 77% of the sample), they cannot be used in the investigation (even though they contain very useful and relevant information). The variables used in the analysis have to be limited to those that can be extracted from the information contained in the first group of questions. The dataset, therefore, includes several firm-specific characteristics such as size, market orientation (whether a firm is oriented towards foreign/EU markets or local/national markets) and whether it belongs to a group of enterprises. We expect that larger firms and

those participating in international market will have a higher probability of belonging to innovating firms group than smaller firms and those that sell only on domestic market. Similarly, being part of a larger group may facilitate spillovers, ease access to knowledge created by other group members, and enable the firm to utilise networks established by these members. Therefore, we expect this group of firms to have a higher probability of engagement in open innovations than being in the other two groups.

In addition to the general characteristics, all firms are required to answer questions about their involvement in the development of organisational and marketing innovations. Hence we also include several binary variable to capture the effect of such innovations: one to indicate whether a firm has introduced a new or significantly improved knowledge management systems to better use or exchange information, knowledge and skills within the enterprise; another, indicating if firm introduced major change in the organisation of work; another, indicating if changes have been made in the firm's relations with other firms or public institutions (including alliances, partnerships, outsourcing and sub-contracting). To capture the effect of any marketing innovations, we introduce binary variables for firms which introduced significant changes to the design and packaging of their products, and for firms which have introduced new or significantly changed sales or distribution methods.

As we mentioned in the previous section, the firms' choice the innovation regime may also depend on their perception of barriers to innovations. For this reason we include four variables, already defined, to capture cost, knowledge, market and other types of barriers to innovation. Accordingly, we would expect that firms which perceive these factors as highly important impediments to their innovation activities have higher probability of being incremental innovators than engaging in either internally oriented or open innovations. Lastly, the model includes two dummy variables for firms belonging to service and trade sectors respectively and one variable to identify the new EU members from CEECs.

On the basis of the above discussion, the following model will be estimated:

$$InnovReg_{i\,(1\text{-}3)} = f(Size, ExpStatus, Group, Orgsys, Orgstr, Orgrel, Mktdes, Mktmed, HCosts, Hknow, Hmkt, Hoth, Service, Trade, CEEC)$$

The description of variables is presented in Table 2.

Table 2: Description of variables

Dependent variable	
$InnovReg_{i\ (i)}$	The probability of the firm belonging to one of the three innovation regimes (i=1-3)
Independent variables	
Size	Number of Employees in 2006 (natural logarithm)
Exporting status	Dummy – 1 if firm sells some of its products abroad
Group	Dummy – 1 if firm is part of a group
Orgsys	Dummy – 1 if firm introduced new or significantly improved knowledge management system
Orgstr	Dummy – 1 if firm introduced changes in organisation of work
Orgrel	Dummy – 1 if firm introduced changes in relations with other firms or public institutions
Mktdes	Dummy -1 if firm introduced changes to design or packaging of good and service
Mktmet	Dummy -1 if firm introduced changes in sales or distribution method
HCosts	Dummy – 1 if firm considers cost factors as highly important barrier to innovation
HKnow	Dummy – 1 if firm considers knowledge factors as highly important barrier to innovation
HMkt	Dummy – 1 if firm considers market factors as highly important barrier to innovation
HOth	Dummy – 1 if firm considers other factors as highly important barrier to innovation
Serv	Dummy – 1 if firm belongs to service sector
Trade	Dummy – 1 if firm belongs to trade sector
CEEC	Dummy – 1 if firm is located in Central and East European countries which are EU members (EU10)

The model is estimated using the multinomial logit technique which is a generalisation of logistic regression to the situation to two or more unordered outcomes. Hence, it estimates the relative probability that the firm will make a choice from a set of two or more offered alternatives on the basis of their characteristics using maximum likelihood procedure. For a set of *n* alternatives the multinomial logit estimates only *n-1* equations thus contrasting *n-1* alternatives with base category *n*. In multinomial logit it is assumed that odds of one category being selected over another are independent of other alternatives which are considered as irrelevant for this purpose. This assumption arises from properties of logistic regression about independently distributed and homoscedastic disturbances (Greene, 2002). To take the issue of potential heteroscedasticity into account we use robust standard errors. Table 3 shows the estimation results.

Table 3: Multinomial logistic regression on the choice between innovation regimes (base category incremental innovators)

Internally oriented Innovators			
Variable	Relative Risk Ratio	Standard Error	P-value
Size (empl)	1.27	0.045	0.000
Group	1.57	0.173	0.000
Exporter status	1.60	0.138	0.000
Orgsys	2.65	0.294	0.000
Orgstr	1.68	0.198	0.000
Orgrel	1.01	0.127	0.958
Mktdes	3.20	0.381	0.000
Mktmet	1.57	0.196	0.000
HCosts	1.65	0.182	0.000
HKnow	0.97	0.102	0.786
HMkt	1.37	0.136	0.002
HOth	0.58	0.057	0.000
Serv	1.76	0.171	0.000
Trade	0.52	0.071	0.000
CEEC	16.22	16.34	0.006
Externally oriented (Open) Innovators			
Variable	Relative Risk Ratio	Standard Error	P-value
Size (empl)	1.25	0.018	0.000
Group	1.88	0.082	0.000
Exporter status	1.24	0.043	0.000
Orgsys	2.62	0.116	0.000
Orgstr	1.89	0.086	0.000
Orgrel	1.41	0.075	0.000
Mktdes	2.65	0.141	0.000
Mktmet	1.92	0.106	0.000
HCosts	1.62	0.069	0.000
HKnow	1.11	0.046	0.017
HMkt	1.05	0.041	0.204
HOth	0.54	0.021	0.000
Serv	1.02	0.042	0.579
Trade	0.53	0.025	0.000
CEEC	0.44	0.03	0.000
Number of observations	32446	McFadden's R2	0.202
Wald Chi2 (30)	5385.81	Prob>chi2	0.000
Log-Lik Intercept Only	-19782.37	Log-Lik Full Model	-15788.823
LR (30)	7987.095	Prob>LR	0.000

The incremental innovators group, the group of firms with the largest number of observations, is taken as the reference category. The coefficients in Table 3 refer to the relative risk ratios which can be defined as ratios of the probability that individual chooses one outcome category (in our example either internally or externally oriented innovator) over the probability that it will belong to the reference category (incremental innovator). Starting with general characteristics of firms, we can say that a one percent change in the size of firm measured in terms of number of employees the odds of falling in the category of internal innovators and external innovators will be 1.27 and 1.25 times higher respectively.

Moreover, firms belonging to a group have 1.57 times higher odds of being internally oriented innovators and nearly 2 times higher odds of being open innovators than falling in the base category. Finally, firms that participate on international markets have somewhat higher odds of being internal innovators than of being external innovators compared to the firms that only engage in incremental innovations.

All three variables representing organisational innovations are significant in sub-sample of open innovators while improvements in relationships with other firms and research institutions are insignificant for firms that engage only in internal innovation activities. In this group we obtain particularly high coefficient for improvements in the knowledge management system within firms which implies that firms participating in this kind of activities have nearly three times higher odds of being internally oriented innovators than being in the incremental innovator group. For both internal and open innovators we obtain positive and statistically significant coefficient on variables representing marketing innovations. The magnitude of coefficients suggests that these kinds of innovations have somewhat stronger role in the choice of firms between incremental and internally oriented innovations than in its decision on pursuing open innovation strategy relative to the base group.

Among barriers to innovations knowledge factors are statistically insignificant for internally oriented innovators while market factors do not affect the choice of firms between incremental and open innovation regimes. The strongest impact on the decision of firms between incremental and internally oriented innovations comes from cost factors. Ceteris paribus, the odds of firm undertaking innovation activities solely within its own capacities relative to the reference group are about 1.65 times higher if it considers access to finance as a highly important barrier to its innovation activities. The same variable has the largest magnitude in the choice between open innovation regime and the base category. Overall, the positive coefficients on variables representing barriers to innovation suggest that such impediments motivate firms to invest further efforts in the development of new products and processes whether alone or in cooperation with external partners. A likely explanation for this somewhat surprising finding is that firms which are incremental innovators have less contact with barriers to innovation and therefore do not attach great significance to them. Yet, the magnitude of coefficient on other barriers to innovation which

comprise the absence of demand-pull factors suggests that firms experiencing such barriers are more likely to be incremental innovators.

The last set of variables control for industry and location of firms. The relative risk that firms will be internal innovators instead of incremental innovators is higher by 1.75 times if they are in the service sector and 0.52 times if they are in the trade sector relative to their counterparts from manufacturing. With respect to choice of firms between incremental and open innovation there appears to be no significant difference between firms in manufacturing and service sector while the odds of firms engaging in open innovation increase if they operate in trade activities. Finally, the coefficient on the location of firms in CEECs is positive and statistically significant suggesting that firms in this group of countries have higher probability of being internal innovators than limiting their activities to incremental innovations but they are less inclined towards open innovation activities.

We are also interested in the determinants of firm's choice between internally oriented and open innovations. For this purpose we have reestimated the model with internal innovators as the base category. Table 4 shows the relative risk ratios for the choice of firms between these two alternatives while the detailed printouts of estimations can be found in the Appendix.

Table 4: Multinomial logistic regression on the choice between open and internally oriented innovation regimes (base category: internally oriented innovators)

External (Open) Innovators			
Variable	Relative Risk Ratio	Standard Error	P-value
Size (empl)	0.99	0.035	0.687
Group	1.19	0.131	0.106
Exporter status	0.78	0.068	0.004
Orgsys	0.99	0.111	0.942
Orgstr	1.12	0.134	0.328
Orgrel	1.39	0.173	0.007
Mktdes	0.83	0.097	0.102
Mktmet	1.22	0.150	0.099
HCosts	0.98	0.110	0.861
HKnow	1.14	0.121	0.230
HMkt	0.77	0.077	0.009
HOth	0.93	0.093	0.451
Serv	0.58	0.058	0.000
Trade	1.03	0.143	0.838
CEEC	0.03	0.027	0.000

The results from Table 4 suggest that from three variables representing general characteristics of firms only their market orientation is statistically significant. Ceteris paribus, the relative risk that a firm will be open innovator instead of doing all of its innovation activities in-house will be lower if they participate in international markets. We also obtain statistically significant coefficient on the variable representing organisational innovations in terms of relationships with other firms and research institutions. Hence, firms that have introduced improvements or significant changes in their relationships with other firms or research institutions have about 1.4 times higher odds of being open innovators than those which have not done so. Similarly, the introduction of new sales and distribution methods increases odds of a firm being an open innovator by about 1.2 times.

Among barriers to innovation we obtain statistically significant coefficient only on variable representing market factors. Ceteris paribus, firms that face uncertain demand for innovations or operate on markets dominated by other enterprises have about 0.20 times lower odds to be open innovators compared to those firms that do not regard such barriers as very important. Finally, we obtain statistically significant and positive coefficients on dummy variables representing firms in the service sector and firms operating in CEEC group of countries. Compared to firms from manufacturing sector the relative risk that firms from service sector will be open innovators instead of being internally oriented ones is about 0.6. Hence, we can conclude that firms from manufacturing sector are more inclined towards pursuit of open innovation activities. The coefficient on dummy variable representing firms in CEEC group of countries is very low, with magnitude of about 0.03 suggesting that firms in these countries are more likely to develop innovations within their existing capacities.

6. Conclusions

Models of firm behaviour have for a long time established that the development of innovations takes place through several channels ranging from incremental improvements in everyday activities to in-house activities and to the open innovations developed in cooperation among firms and between firms and research institutions. Yet, at the empirical level, the efforts of researchers have until recently been concentrated on the impact of different innovation regimes on performance and competitiveness of firms. The general message coming from this literature is that the relative importance of a particular innovation

regime compared to others varies with respect to circumstances in which firms operate and thus general conclusions cannot be reached. Furthermore, there is an evident gap in the literature when it comes to the investigation of the determinants of the firms' choice of their innovation regimes. This study can be considered as one of the initial attempts to fill this gap.

The results with respect to the choice of firms between incremental innovations on the one hand and internally and externally oriented innovation regimes on the other are relatively similar. In general, larger firms, firms that export and firms belonging to groups have a higher probability of being both internally and externally oriented innovators. Furthermore, both organisational and marketing innovations are important for open innovators while improvements in relationships with external partners do not seem to matter for firms pursuing internally oriented innovation activities. While cost, knowledge and market impediments to innovation act as incentive for firms to invest additional efforts in innovation activities, our evidence makes it clear that the absence of demand-driven incentives has an adverse effect.

There is a long standing debate in the innovation literature that involves both academics and policy makers concerning the choice of firms between internally oriented and open innovation regimes. Our findings indicate that firms oriented towards international markets, those experiencing market-type barriers to innovation and those from the service sector have lower probability of being open innovators than those operating only on the domestic market and not facing this type of barriers. Moreover, improvements in relationships with external partners and the development of new sales and distribution methods increase the probability that firms will participate in open innovation activities. Finally, it is evident that firms in new EU member states are more inclined towards incremental and internal innovation regimes than towards open innovations. These findings may be taken as guidance for development of future policies that can facilitate stronger cooperation between these firms and their surroundings.

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Appendix

Printout of estimation (Base=Incremental Innovators)

```
. mlogit choice empl group Exp ORGSYS ORGSTR ORGREL MKTDES MKTMET HCosts HKnow HM
> kt HOth Serv Trade CEEC, vce(robust)

Iteration 0:   log pseudolikelihood =  -19782.371
Iteration 1:   log pseudolikelihood =  -15992.525
Iteration 2:   log pseudolikelihood =  -15791.705
Iteration 3:   log pseudolikelihood =  -15788.916
Iteration 4:   log pseudolikelihood =  -15788.826
Iteration 5:   log pseudolikelihood =  -15788.823
Iteration 6:   log pseudolikelihood =  -15788.823

Multinomial logistic regression                 Number of obs   =        32446
                                                  Wald chi2(30)   =      5385.81
                                                  Prob > chi2     =       0.0000
Log pseudolikelihood =  -15788.823                Pseudo R2       =       0.2019
```

choice	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
1						
empl	.2373346	.035378	6.71	0.000	.1679949	.3066742
group	.4540273	.1100752	4.12	0.000	.2382838	.6697708
Exp	.4673847	.0862173	5.42	0.000	.2984019	.6363675
ORGSYS	.973242	.1111576	8.76	0.000	.7553771	1.191107
ORGSTR	.51729	.118277	4.37	0.000	.2854712	.7491087
ORGREL	.0065587	.1259021	0.05	0.958	-.2402049	.2533223
MKTDES	1.164124	.1187759	9.80	0.000	.9313278	1.396921
MKTMET	.4514369	.1248352	3.62	0.000	.2067644	.6961094
HCosts	.5014502	.1100316	4.56	0.000	.2857922	.7171081
HKnow	-.0283735	.1046848	-0.27	0.786	-.233552	.176805
HMkt	.3136004	.0990714	3.17	0.002	.119424	.5077768
HOth	-.5502001	.0980188	-5.61	0.000	-.7423134	-.3580868
Serv	.5636489	.0975511	5.78	0.000	.3724523	.7548456
Trade	-.6555587	.1361764	-4.81	0.000	-.9224595	-.3886579
CEEC	2.786405	1.007343	2.77	0.006	.8120494	4.76076
_cons	-8.467964	1.025736	-8.26	0.000	-10.47837	-6.457558
2						
empl	.2230278	.014154	15.76	0.000	.1952865	.2507691
group	.6320683	.0438605	14.41	0.000	.5461033	.7180333
Exp	.2175027	.0347307	6.26	0.000	.1494317	.2855737
ORGSYS	.9650151	.0440092	21.93	0.000	.8787586	1.051272
ORGSTR	.63401	.0455925	13.91	0.000	.5446504	.7233695
ORGREL	.3415287	.0534968	6.38	0.000	.2366768	.4463806
MKTDES	.9727883	.0534696	18.19	0.000	.8679898	1.077587
MKTMET	.6542444	.0551151	11.87	0.000	.5462209	.762268
HCosts	.4818278	.0430759	11.19	0.000	.3974006	.566255
HKnow	.0994316	.0417717	2.38	0.017	.0175607	.1813026
HMkt	.0498523	.0392831	1.27	0.204	-.0271411	.1268457
HOth	-.6256195	.0391112	-16.00	0.000	-.7022761	-.548963
Serv	.0229251	.0413489	0.55	0.579	-.0581171	.1039674
Trade	-.627008	.0475826	-13.18	0.000	-.7202682	-.5337479
CEEC	-.8205996	.08056	-10.19	0.000	-.9784942	-.6627049
_cons	-2.318586	.0956553	-24.24	0.000	-2.506067	-2.131105

Printout of estimation (Base=Internally Oriented Innovators)

Multinomial logistic regression — Number of obs = 32446
Wald chi2(30) = 5385.81
Prob > chi2 = 0.0000
Log pseudolikelihood = -15788.823 — Pseudo R2 = 0.2019

choice	Coef.	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
0						
empl	-.2373346	.035378	-6.71	0.000	-.3066742	-.1679949
Exp	-.4673847	.0862173	-5.42	0.000	-.6363675	-.2984019
group	-.4540273	.1100752	-4.12	0.000	-.6697708	-.2382838
ORGSYS	-.973242	.1111576	-8.76	0.000	-1.191107	-.7553771
ORGSTR	-.51729	.118277	-4.37	0.000	-.7491087	-.2854712
ORGREL	-.0065587	.1259021	-0.05	0.958	-.2533223	.2402049
MKTDES	-1.164124	.1187759	-9.80	0.000	-1.396921	-.9313278
MKTMET	-.4514369	.1248352	-3.62	0.000	-.6961094	-.2067644
HCosts	-.5014502	.1100316	-4.56	0.000	-.7171081	-.2857922
HKnow	.0283735	.1046848	0.27	0.786	-.176805	.233552
HMkt	-.3136004	.0990714	-3.17	0.002	-.5077768	-.119424
HOth	.5502001	.0980188	5.61	0.000	.3580868	.7423134
Serv	-.5636489	.0975511	-5.78	0.000	-.7548456	-.3724523
Trade	.6555587	.1361764	4.81	0.000	.3886579	.9224595
CEEC	-2.786405	1.007343	-2.77	0.006	-4.76076	-.8120494
_cons	8.467964	1.025736	8.26	0.000	6.457558	10.47837
2						
empl	-.0143068	.0354831	-0.40	0.687	-.0838523	.0552387
Exp	-.249882	.0877062	-2.85	0.004	-.421783	-.0779809
group	.178041	.1100269	1.62	0.106	-.0376077	.3936897
ORGSYS	-.0082269	.112544	-0.07	0.942	-.2288091	.2123552
ORGSTR	.11672	.1192355	0.98	0.328	-.1169772	.3504172
ORGREL	.33497	.1234841	2.71	0.007	.0929456	.5769945
MKTDES	-.191336	.1170818	-1.63	0.102	-.4208121	.0381401
MKTMET	.2028075	.1228393	1.65	0.099	-.037953	.4435681
HCosts	-.0196224	.1123628	-0.17	0.861	-.2398494	.2006046
HKnow	.1278051	.1064153	1.20	0.230	-.0807651	.3363753
HMkt	-.2637481	.1006256	-2.62	0.009	-.4609706	-.0665257
HOth	-.0754194	.1001578	-0.75	0.451	-.271725	.1208862
Serv	-.5407238	.0997671	-5.42	0.000	-.7362638	-.3451838
Trade	.0285507	.1394364	0.20	0.838	-.2447396	.301841
CEEC	-3.607004	1.004437	-3.59	0.000	-5.575664	-1.638344
_cons	6.149377	1.022798	6.01	0.000	4.14473	8.154025

(choice==1 is the base outcome)

Relative Risk Ratios (Base=Incremental Innovators)

```
. mlogit, rrr

Multinomial logistic regression                 Number of obs   =      32446
                                                  Wald chi2(30)   =    5385.81
                                                  Prob > chi2     =     0.0000
Log pseudolikelihood = -15788.823                 Pseudo R2       =     0.2019
```

choice	RRR	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
1						
empl	1.267865	.0448546	6.71	0.000	1.182931	1.358898
group	1.574641	.173329	4.12	0.000	1.269069	1.953789
Exp	1.595815	.1375869	5.42	0.000	1.347703	1.889604
ORGSYS	2.646511	.2941799	8.76	0.000	2.128414	3.290722
ORGSTR	1.677475	.1984068	4.37	0.000	1.330389	2.115114
ORGREL	1.00658	.1267306	0.05	0.958	.7864667	1.288298
MKTDES	3.203117	.380453	9.80	0.000	2.537877	4.042732
MKTMET	1.570567	.1960621	3.62	0.000	1.229693	2.005933
HCosts	1.651114	.1816747	4.56	0.000	1.330816	2.048501
HKnow	.9720253	.1017563	-0.27	0.786	.7917164	1.193398
HMkt	1.368343	.1355637	3.17	0.002	1.126848	1.661593
HOth	.5768344	.0565406	-5.61	0.000	.4760114	.6990124
Serv	1.757072	.1714043	5.78	0.000	1.451289	2.127283
Trade	.5191519	.0706962	-4.81	0.000	.3975401	.6779661
CEEC	16.22259	16.3417	2.77	0.006	2.25252	116.8347
2						
empl	1.249855	.0176904	15.76	0.000	1.215659	1.285013
group	1.881498	.0825234	14.41	0.000	1.726512	2.050397
Exp	1.242969	.0431692	6.26	0.000	1.161174	1.330525
ORGSYS	2.624827	.1155166	21.93	0.000	2.407909	2.861287
ORGSTR	1.885155	.0859488	13.91	0.000	1.724006	2.061367
ORGREL	1.407097	.0752752	6.38	0.000	1.267032	1.562646
MKTDES	2.64531	.1414437	18.19	0.000	2.382117	2.937582
MKTMET	1.923689	.1060242	11.87	0.000	1.726715	2.143131
HCosts	1.619031	.0697412	11.19	0.000	1.487952	1.761657
HKnow	1.104543	.0461386	2.38	0.017	1.017716	1.198778
HMkt	1.051116	.0412911	1.27	0.204	.9732239	1.135242
HOth	.5349299	.0209217	-16.00	0.000	.4954563	.5775484
Serv	1.02319	.0423077	0.55	0.579	.9435394	1.109564
Trade	.5341877	.025418	-13.18	0.000	.4866217	.5864031
CEEC	.4401677	.0354599	-10.19	0.000	.3758767	.5154552

(choice==0 is the base outcome)

Relative Risk Ratios (Base=Internally Oriented Innovators)

```
. mlogit, rrr

Multinomial logistic regression                 Number of obs   =      32446
                                                Wald chi2(30)   =    5385.81
                                                Prob > chi2     =     0.0000
Log pseudolikelihood = -15788.823               Pseudo R2       =     0.2019
```

choice	RRR	Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
0						
empl	.7887274	.0279036	-6.71	0.000	.7358903	.8453581
Exp	.626639	.0540271	-5.42	0.000	.5292113	.7420031
group	.6350654	.069905	-4.12	0.000	.5118259	.787979
ORGSYS	.377856	.0420016	-8.76	0.000	.3038847	.4698334
ORGSTR	.5961339	.070509	-4.37	0.000	.4727878	.75166
ORGREL	.9934628	.1250791	-0.05	0.958	.7762177	1.27151
MKTDES	.3121959	.0370813	-9.80	0.000	.2473575	.3940302
MKTMET	.6367126	.0794841	-3.62	0.000	.4985211	.8132112
HCosts	.6056517	.0666408	-4.56	0.000	.4881619	.7514187
HKnow	1.02878	.1076976	0.27	0.786	.8379432	1.263078
HMkt	.730811	.0724025	-3.17	0.002	.6018321	.8874314
HOth	1.7336	.1699254	5.61	0.000	1.43059	2.10079
Serv	.5691286	.0555191	-5.78	0.000	.4700832	.6890425
Trade	1.926218	.2623055	4.81	0.000	1.475	2.51547
CEEC	.0616424	.0620951	-2.77	0.006	.0085591	.4439473
2						
empl	.9857951	.034979	-0.40	0.687	.9195671	1.056793
Exp	.7788927	.0683137	-2.85	0.004	.6558763	.924982
group	1.194874	.1314683	1.62	0.106	.9630907	1.482441
ORGSYS	.9918068	.1116219	-0.07	0.942	.7954804	1.236587
ORGSTR	1.123805	.1339974	0.98	0.328	.8896055	1.41966
ORGREL	1.397898	.1726183	2.71	0.007	1.097402	1.780678
MKTDES	.8258551	.0966926	-1.63	0.102	.6565134	1.038877
MKTMET	1.224837	.150458	1.65	0.099	.9627582	1.558257
HCosts	.9805689	.1101794	-0.17	0.861	.7867464	1.222141
HKnow	1.136332	.1209231	1.20	0.230	.9224104	1.399864
HMkt	.768167	.0772972	-2.62	0.009	.6306712	.9356389
HOth	.9273544	.0928817	-0.75	0.451	.7620638	1.128496
Serv	.5823266	.0580971	-5.42	0.000	.4788999	.7080902
Trade	1.028962	.1434748	0.20	0.838	.7829084	1.352346
CEEC	.027133	.0272534	-3.59	0.000	.003789	.1943015

(choice==1 is the base outcome)

Descriptive statistics of variables

-> choice = 0

Variable	Obs	Mean	Std. Dev.	Min	Max
empl	24916	3.570435	1.085327	0	10.24871
Exp	24916	.2640472	.4408334	0	1
group	24916	.0927516	.2900899	0	1
ORGSYS	24916	.1080029	.3103903	0	1
ORGSTR	24916	.1168326	.3212271	0	1
ORGREL	24916	.0583159	.2343446	0	1
MKTDES	24916	.0431851	.2032777	0	1
MKTMET	24916	.0520549	.2221422	0	1
HCosts	24916	.5995746	.4899944	0	1
HKnow	24916	.5083882	.4999397	0	1
HMkt	24916	.4626345	.4986119	0	1
HOth	24916	.2996869	.45813	0	1
Serv	24916	.1924065	.3941985	0	1
Trade	24916	.2530101	.4347454	0	1
CEEC	24916	.9755177	.154544	0	1

-> choice = 1

Variable	Obs	Mean	Std. Dev.	Min	Max
empl	646	4.29828	1.472445	2.302585	9.811153
Exp	646	.4535604	.4982245	0	1
group	646	.2244582	.4175483	0	1
ORGSYS	646	.4102167	.4922541	0	1
ORGSTR	646	.4009288	.4904664	0	1
ORGREL	646	.2074303	.4057806	0	1
MKTDES	646	.2631579	.4406886	0	1
MKTMET	646	.2027864	.4023863	0	1
HCosts	646	.7229102	.447908	0	1
HKnow	646	.6021672	.4898298	0	1
HMkt	646	.5866873	.4928096	0	1
HOth	646	.2352941	.4245112	0	1
Serv	646	.2817337	.4501928	0	1
Trade	646	.1083591	.3110743	0	1
CEEC	646	.998452	.0393445	0	1

-> choice = 2

Variable	Obs	Mean	Std. Dev.	Min	Max
empl	6884	4.27965	1.41773	.6931472	10.98275
Exp	6884	.4140035	.4925849	0	1
group	6884	.2561011	.43651	0	1
ORGSYS	6884	.4585997	.4983193	0	1
ORGSTR	6884	.4631028	.498673	0	1
ORGREL	6884	.2805055	.4492789	0	1
MKTDES	6884	.2791981	.4486377	0	1
MKTMET	6884	.2597327	.4385197	0	1
HCosts	6884	.6991575	.4586577	0	1
HKnow	6884	.5941313	.491095	0	1
HMkt	6884	.5309413	.499078	0	1
HOth	6884	.214265	.4103413	0	1
Serv	6884	.204387	.4032822	0	1
Trade	6884	.1438117	.3509242	0	1
CEEC	6884	.93957	.2382991	0	1