Knowledge spillovers, innovation activities and competitiveness of industries in eu member and candidate countries

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March 2013

KNOWLEDGE SPILLOVERS, INNOVATION ACTIVITIES AND COMPETITIVENESS OF INDUSTRIES IN EU MEMBER AND CANDIDATE COUNTRIES

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Abstract

The impact of innovation activities on performance and competitiveness of firms, industries and nations has been a matter of considerable interest over the past few decades. The existing empirical work has widened our knowledge of the complexity of the innovation process and its impact on the ability of firms to compete. This study investigates how knowledge spillovers generated through innovation activities of firms affect the ability of their industries to compete in terms of quality. We utilise the data from the Community Innovation Survey 2006 for several EU member and candidate countries which has recently become available and combine it with other EU wide datasets to create an industry database containing information on innovation activities, and performance at industry level. We use a simultaneous equations framework to examine the interdependencies between knowledge spillovers, innovation activities, quality upgrading and market share of industries from the selected countries on the single European market. The results of our work provide support for the relationship between innovations, quality upgrading and market share of industries and point to several types of spillovers which are relevant for competitiveness of national industries in EU member states.

Keywords: Knowledge spillovers, Competitiveness, EU market share, Simultaneous Equations

JEL: F12, O33

Working version of paper. Please cite as:

Stojcic, N. and Hashi, I. (2013). Knowledge spillovers, innovation activities and competitiveness of industries in EU member and candidate countries. Economic Annals, LVIII, 198.

1. Introduction

Over recent years predictions of endogenous growth models and Schumpeterian literature that specialisation in knowledge intensive industries improves the ability of nations to grow have spurred development of policies which lead to improvements in quality-driven competitiveness of nations. On empirical side, these predictions have facilitated the research on the relationship between innovation activities of firms and their performance and competitiveness as well as on the relationship between the structure of exported products and economic growth. The findings from this body of knowledge suggest that the relative quality of exports has an important role in explaining why some nations grow faster than others. Yet, little empirical work has been undertaken on the mechanisms of innovation at the industry level.

This paper seeks to explore the influence of innovation activities on the ability of industries from a selection of EU member states and candidate countries to compete in terms of quality on the single European market. The novelty of this approach lies in the use of a simultaneous equations framework which enables us to examine the relationship between knowledge spillovers, innovation activities, quality upgrading and the EU market share of industries while controlling for feedback effects in different stages of this process, and also the use of an industry level database containing innovation activities and other characteristics of industries in selected countries.

The paper is organised in seven sections. Section 2 will establish the theoretical framework of the research and will be followed by a critical assessment of the related empirical work in Section 3. The model used in the investigation and the research methodology will be developed in Section 4 and the characteristics of the dataset and the descriptive statistics discussed in Section 5. The main findings of the econometric work will be discussed in Section 6. Section 7 will conclude.

2. Theoretical framework

In models of endogenous growth the ability of nations to grow and to provide own citizens with better standard of living depends on their production of new knowledge or innovations (Romer, 1990). These models postulate that opportunity of monopoly profits motivates individuals to search for new and better ways of doing things (Aghion and Howitt, 1998). Through successive waves of innovations firms can improve the relative sophistication of their products climbing up on the quality ladder. However, over time part of this knowledge becomes diffused through imitations, competition or inter-firm networks improving the quality-driven competitiveness of entire industry and consequently economy. Building on these foundations the emphasis of international trade literature has moved from ability of nations to export towards the structure of their exported products (Hausmann et al., 2007).

The knowledge and technology spillovers are a key link between innovation activities of firms and quality-driven competitiveness of their industries. They enable firms, particularly small ones and new entrants, to overcome barriers to innovation such as high costs of obtaining needed information or investment in human capital by relying on efforts of their rivals, related firms or supporting institutions. In one group of models these spillovers are defined as side products of private innovation investments. In others, they are products of agglomeration externalities such as higher concentration of skilled workforce on geographically limited space or cooperation with research and science sector (Fallah and Ibrahim, 2004). Finally, the knowledge and technology spillovers can be promoted through mechanisms of domestic or international competition (Baldwin et al., 1999; Brooks, 2006).

3. Literature review

Over recent years an exhaustive body of work has been produced on innovation processes at the firm level (Loof et al., 2006). The general message coming from this literature is that cooperation with universities, research laboratories and other science institutions as well as the formal and informal inter-firm knowledge spillovers increase probability of firms to innovate and facilitate their transformation of innovation inputs into innovation outputs (Klomp et al., 2002; Kemp et al., 2003). In parallel development, trade and growth literature has investigated the link between relative sophistication of nation's exports and its economic growth. This literature suggests that economies with low level of GDP per capita tend to specialise in low quality goods while exports of developed economies are associated with goods of higher quality. Furthermore, the level of sophistication embodied in exported goods is positively associated with growth performance of nations (Hausmman et al., 2007, Minondo, 2010).

Findings with respect to knowledge transfer mechanisms confirm the existence of relationship between spatial spillovers arising from geographical proximity of firms and institutions, sectoral learning, labour mobility and exploitation of patents and levels of innovation output at industry level (Anselin et al., 1997). In one set of studies the authors have found that stronger pressure of price-competitive imports motivates incumbent producers to improve relative sophistication of their goods and to move to quality segment of market (Monfort et al., 2008). Also, the stronger participation on international market leads to higher quality of exported products just as the quality upgrading improves share of industry on international market (Dulleck et al., 2005).

The evidence with respect to existence of spillovers arising from FDI are rather ambiguous. Djankov and Hoekman (1997) do not find any impact of FDI on specialisation of industries in transition economies. Yet, Javorcik (2004) finds evidence of backward spillover linkages affecting productivity of firms in upstream sectors. His findings are consistent with those on industries in OECD economies (Baldwin et al., 1999). Greeneway et al., (1995) report that stronger intensity of multinationals in an industry gives rise to horizontal intra-industry trade while it has negative impact on vertical intra-industry trade. Such finding probably reflects the fact that knowledge spillovers generated through these channels lead to quality upgrading in industries of lagging economy which in turn gives rise to exchange in the products of the similar level of sophistication.

4. Dataset

The dataset used in this investigation encompasses the manufacturing industries of several countries which, in the period of analysis (2006) were either members of the EU (Czech Republic, Estonia, Spain, Hungary, Latvia, Lithuania and Slovak Republic) or were in final stage of accession (Bulgaria and Romania) and for which data were made available to us. It is obtained by merging three separate data sets. Firstly, the information on innovative activities of firms has been obtained from the 2006 round of the Community Innovation Survey (CIS 2006). This dataset contains information on innovation activities of all firms with more than ten employees in all EU member states (as well as a few others).[1] The information provided by

[1] Access to the raw data for the nine countries in this study was provided at the Eurostat Safe Center in Luxembourg in January 2011 where the empirical work was conducted. We are grateful to Sergio Valentin Pervan, the Eurostat officer in charge of our visit, for his cooperation and speedy handling of our work. The CIS data is available on CD ROM in anonymised form but it contains fewer variables than the raw dataset at the Safe Center. Not all member states allow access by researchers to the full raw data. Also some countries have high rates of missingness

individual firms were then aggregated at 3-digit NACE level to arrive at the innovation activities of 3-digit industries. As the surveys cover all firms with more than ten employees, the aggregation of the firm level data produces as close a dataset as possible to that of the full industry. This is also a procedure adopted by the Eurostat when publishing industry level information from the CIS data (i.e., aggregation of firm level data to create information on 2-digit industries).

The second dataset containing information on value and quantity of exports from and imports to the single European market for individual 3-digit industries from selected EU member states were extracted from Eurostat's Comext database. Furthermore, this dataset was combined with the Prodcomm dataset in order to construct the market shares of industries from individual countries in the EU27 market.[2] The third dataset containing information on the structure of 3-digit industries of individual EU member states such as the number of enterprises, costs of employees and wages, investment in tangible and intangible assets, the number of employees, etc. was extracted from the Eurostat's Structural Business Statistics database. The three datasets obtained in this way were merged together to form a unique industry level data set which has not been used in many previous studies.

5. Model specification

Our modelling strategy derives from the thesis that knowledge diffusion helps larger number of firms to successfully pursue innovation activities and to compete in quality which in turn provides the opportunity for producers to differentiate themselves from rivals. Through quality-driven competitiveness, firms (and their industries) will be able to seize the market share of their rivals on international markets. To this end, the model developed in this paper estimates the complex interrelation between innovation activities (or innovation input), spillover effects, innovation output, relative quality of exports and the market share of each country's industries on the EU27 market as a system of simultaneous equations.

The first stage of this process is defined in following equation.

$$Inout_{ij} = f(Ininput_{ij}, Eums_{ij}, Imp_{ij}, Sizeij, Uni_{ij}, Group_{ij}, VSpill_{ij}, HSpill_{ij}, SubDom_{ij}, SubEU_{ij}, HCosts_{ij}, HKnow_{ij}, OrgIn_{ij}, MktIn_{ij}, Tech_{ij}, Country_{j}) \quad (1)$$

The above equation (1) establishes a relationship between knowledge spillovers, investment in innovation activities and a set of other controlling variables on the one hand and the relative innovation output (*Inout*) which is defined as the value of sales arising from products new to firm and new to market in industry *i* from country *j*. This variable is constructed on the basis of responses by surveyed firms in CIS 2006 dataset which have been aggregated at 3-digit NACE level. The same dataset is the source of data on investment in innovations ($Ininput_{ij}$) which is defined as the total innovation expenditure of industry *i* in country *j* divided by mean value of this variable in individual country. Numerous findings from firm level studies, particularly those from the CDM type multi-stage models suggest that there is a positive relationship between investment in innovations and the innovation output which remains robust

on some parts of the questionnaire; Ireland and France have provided a reduced version of the questionnaire – with some of the variables of interest missing

[2] Since the Comext data is classified according to the Combined Nomenclature (CN) classification at the most disaggregated 8-digit level while other data were organised according to NACE classification the former dataset had to be first converted and then aggregated in order to be used. However, the concordance between NACE and CN classifications is not complete and, therefore, fully comparable data for industrial innovation, trade and quality could be created for some 521 observations in the manufacturing industry of the nine countries.

to inclusion of different measures for two variables. For this reason we expect to find positive sign on this variable.

The second stage of model analyses relationship between innovation activities of industry and the relative quality of its exports. The model takes following form

$$Reuv_{ij} = f(Inout_{ij}, Size_{ij}, Imp_{ij}, ExpNo_{ij}, Wpremium_{ij,} InvEmpl_{ij}, Group_{ij}, Tech_{ij,} Country_j) \quad (2)$$

In equation (2) dependent variable is relative unit export value (*Reuv*), defined as the ratio between unit value of exports to EU27[3] from industry *i* in country *j* and unit export value of EU 27 in that industry i. In the third stage of the model we examine the relationship between the relative quality of exports from industry *i* in country *j* to the single European market and the market share of its exports in that market. As previously mentioned, we expect that the higher quality of goods has as its consequence an increased market share of that industry. For this reason the third and final stage of our model is defined as

$$Eums_{ij} = f(Reuv_{ij}, Size_{ij}, Prod_{ij}, InvEmpl_{ij}, Group_{ij}, ExpNo_{ij}, Tech_{ij}, Country_{ij}) \quad (3)$$

The dependent variable in equation 3 is market share of industry *i* from country *j* on single European market. List of independent variables is presented in Table 1.

Table 1: Description of variables

Name	Description
Inout	Innovation output - Value of sales arising from products new to the firm and new to the market in each industry and country
Eums	EU market share – Exports of each industry to EU27 divided by EU27 apparent consumption (total output plus imports minus exports of the industry)
Size	Relative Size of the industry - Number of employees in industry *i* in country *j* divided by the average number of employees in that industry in EU27 [averaged over EU27]
Imp	Import intensity – Unit value of imports from other EU27 members divided by average unit value of intra-EU27 imports
Ininput	Innovation input (investment in innovations) – Total innovation expenditure of industry *i* from country *j* divided by the mean value of innovation input in country *j*
Uni	Cooperation with universities –Number of firms in each industry and country that consider cooperation with universities as a highly important source of information for innovations divided by total number of firms in that industry and country
Group	Intra-group spillovers – number of firms in an industry which are part of a group divided by total number of firms in that industry
VSpill	Vertical spillovers – Number of firms in each industrythat consider suppliers and customers as important sources of information for innovations divided by total number of firms in that industry
HSpill	Horizontal spillovers – Number of firms in each industry that consider rivals as important sources of information for innovations divided by total number of firms in that industry
SubDom	Access to domestic subsidies – Number of firms in each industry that receive domestic subsidies divided by total number of firms in that industry
SubEU	Access to EU subsidies – Number of firms in each industry that receive EU subsidies divided by total number of firms in that industry
HCosts	Cost barriers to innovations – Number of firms in each industry that consider costs as a highly important barrier to innovations divided by total number of firms in that industry
HKnow	Knowledge barriers to innovations – Number of firms in each industrythat consider the shortage of relevant knowledge as a highly important barrier to innovations divided by total number of firms in that industry
OrgIn	Organisational innovations – Number of firms in each industry that introduced organisational innovation divided by total number of firms in that industry

[3] Unit export value is calculated as the value of exports divided by the weight of exports.

MktIn	Marketing innovations - Number of firms in each industry thatas introduced marketing innovation divided by total number of firms in that industry
Ruev	Relative unit export value – Unit value of exports to EU27 from each industry *i* from country *j* divided by unit export value in EU27 (unit export value is equal to the value of exports divided by the weight of exports)
Wpremium	Wage premium (or skill premium) – Average wage per employee?? paid in each industry and country divided by average wage paid in that industry at EU27 level
InvEmpl	Investment per employee (capital intensity) – Investment in machinery and equipment divided by number of employees in each industry
Prod	Labour productivity – Turnover divided by number of employees in each industry
Mlow	Technology Dummy 1, equals 1 if industry is classified as medium low technology intensive
Mhigh	Technology Dummy 2, equals 1 if industry is classified as medium high technology intensive
High	Technology Dummy 3, equals 1 if industry is classified as high technology intensive
CTY	Country Dummies (7)

As the calculation of the precise level of spillover is not possible with the CIS data, a number of proxies are used to approximate different types of spillover. The knowledge arising as the side product of firms' (and their industries') involvement in international trade is captured by the EU market share of each industry (*Eums*) and the relative quality of imports in that industry (*Imp*), reflecting learning-by-exporting and import-related spillovers respectively. Both types of spillovers can act as incentive for firms to engage in innovation activities. However, higher market share can lead to the adoption of a 'quiet life' policy by firms just as the stronger presence of imports may act as an impediment to the innovation activities of firms by stealing their market and thus reducing funds available for restructuring and quality upgrading of their production. Therefore, for these two variables too, there is no a priori expectation about its sign.

The model also includes spatial spillovers such as the relative importance of cooperation between firms and universities (*Uni*) representing general knowledge spillovers from cooperation with scientific institutions, the horizontal intra-industry spillovers arising from actions of other rivals (*HSpill*) and the relative importance of vertical spillovers for innovation activities of firms (*VSpill*). The last spillover measure is the benefits derived by firms for being members of a group (often this may be a multinational firm where the benefits to members of the group are well established) (*Group*) All these variables are expected to have positive signs.

In addition to investment in innovations and knowledge spillovers the model controls for the relative size of industry (*Size*), and for the relative access of firms to subsidies from domestic (*SubDom*) and EU sources (*SubEU)*. In larger industries firms may find it easier to innovate due to greater economies of scale. Yet, larger industry size can lead to the previously described quiet life. The access to subsidies may complement the firms' efforts in transforming investments in innovation into innovation output. However,in the absence of strict controls over the use of these subsidies they can also be used to finance other kinds of activities just as the long term access to subsidies may create a culture of dependency which may make the firms complacent and weaken their desire to engage in innovation activities. Hence, the effect of these variables is ambiguous.

The model also controls for factors hampering innovation activities in particular, the cost factors *(HCosts)* and knowledge factors *(HKnow)*. For both variables we expect negative sign. To control for the factors facilitating innovation throughput (transformation of innovation inputs into innovation output) we include two variables representing organisational (*OrgIn*) and marketing innovations (*MktIn*). On one hand, organisational innovations may be seen as

channels for improvements in efficiency of firms thus facilitating transformation of innovation outputs into higher quality-driven competitiveness. On the other hand, marketing may be valuable source of differentiation. Moreover, Chisik (2003) demonstrates that the ability of producers to compete in quality may be constrained if they come from countries which are perceived as producers of low-quality goods. Bearing in mind that competitive profiles of new EU member states have for a long time been driven by price competitiveness we consider that marketing innovations be particularly important in these countries and for both variables we expect positive sign. Finally, we control for the technological intensity of industry ($Tech_{ij}$) and for the country of origin $(Country_j)$.

In second stage of model we also include number of firms who declare themselves to be exporters as measure of international trade spillovers (*ExpNo*) and wage premium (*Wpremium*) reflecting the skill intensity of industry. We expect that higher wages in industry reflect efforts of firms to attract skilled workers which can easier contribute to the quality upgrading of their exports. For this reason we expect a positive sign on this variable. Equation (2) also includes the capital intensity of industry *(InvEmpl)*. We expect that stronger investment in new technology and higher capital intensity of industry in general have positive impact on the quality of its exports. Finally, in third stage of model we include productivity of labour (*Prod)* which can be interpreted as an indicator of efficiency. For this reason we expect to find a positive sign on this variable. Table 1 with names and description of the variables is presented below.

6. Discussion of findings

The model we develop in this paper rests on thesis that causality leads from innovation activities of industries, over the quality of their exports to their market shares. These three stages of industrial behaviour are likely to be determined with some common set of observed and unobserved factors which gives rise to the potential problem of endogeneity. Furthermore, the dependent variable from third stage enters right hand side of first stage equation. In order to control for such nature of our model we employ framework of simultaneous equations, more specifically three stage least squares technique (3SLS) which in addition for controlling for potential endogeneity of some of our variables allows for feedback effect from EU market share to innovation activities of firms. In such setting, the endogenous variables are being instrumented with instruments found within system (other explanatory variables). The results of estimation are presented in Table 2.

Table 2: Results of estimations

Variable name	Innovation output equation (1st stage)	Relative export unit value equation (2nd stage)	EU market share equation (3rd stage)
Eums	1.97 (0.001)***	-	-
Imp	-0.19 (0.074)*	0.13 (0.000)***	-
Ininput	0.72 (0.000)***	-	-
Inoutput	-	0.04 (0.025)**	-
Reuv	-	-	0.44 (0.041)**
Size	-0.50 (0.194)	-0.08 (0.297)	0.56 (0.000)***
Uni	-4.88 (0.342)	-	-
Group	-6.69 (0.048)**	-1.10 (0.126)	1.46 (0.165)
VSpill	8.30 (0.027)**	-	-
HSpill	8.28 (0.097)**	-	-
SubDom	-10.81 (0.093)*	-	-
SubEU	19.64 (0.059)*	-	-
HCosts	-0.12 (0.977)	-	-
HKnow	-4.06 (0.320)	-	-

OrgIn	-3.88 (0.637)	-	-
MktIn	10.06 (0.430)	-	-
ExpNo	-	-0.001 (0.323)	0.002 (0.200)
Wpremium	-	0.41 (0.141)	-
Invempl	-	0.13 (0.049)**	-0.09 (0.232)
Prod	-	-	0.20 (0.004)***
Observations	503	503	503

p-values in brackets; *,** and *** denote conventional significance of coefficients
all equations include country and industry technology intensity dummy variables

In first stage of estimation, dependent variable and several explanatory variables including EU market share, import intensity, innovation input and size of industry are employed in logarithmic form. In innovation literature one of most studied issues is the relationship between innovation input (investment in innovations) and different measures of innovation output. Despite enormous amount of effort invested in an investigation of this relationship the evidence at both firm and industry level remain ambiguous. However, the second column of Table 3 makes clear that in our case there is statistically significant and positive relationship from innovation input to the innovation output. Hence, stronger investment in innovation activities for about 1% leads to an increase in turnover from products that are new to firm and to its market for about 0.72%.

Both coefficients for knowledge spillovers arising from international trade are statistically significant but with different signs. The 1% increase in EU market share of industry increases innovation output of its firms for about 2%. However, the coefficient on import intensity, second variable controlling for spillovers from international trade is negative and significant suggesting that an increase in the quality of imports on domestic market for 1% reduces innovation output of overall industry for about 0.2%. In interpreting these findings we must take into account the fact that the bulk of our sample are industries from new EU member states of Central and Eastern Europe. It is therefore likely that knowledge gained through competition on markets of other EU countries provides firms in these countries with new knowledge about products and production processes which can be applied at home in the development of own innovations.

Other variables measuring spillovers are all significant with the exception of variable representing cooperation with universities and research institutions. However, the signs of these variables differ. On one hand, the coefficient on variable representing intra-firm knowledge spillovers has negative sign suggesting that 1 percentage point increase in the number of firms that are part of a group reduces turnover of industry from new products for about 6.68 percentage points. On the other hand, channels of vertical and horizontal spillovers such as cooperation with suppliers and customers or with competitors have positive impact on the innovativeness of an industry. While the latter two findings are consistent with theoretical expectations the former finding is somewhat puzzling. A likely explanation is that participation in group enables firms to benefit from knowledge and innovation efforts of other group members which reduces their own incentives to innovate.

Among other controlling variables, only two variables representing access to subsidies are significant. The coefficient on variable measuring intensity of use of domestic subsidies has negative sign while the one on the access to EU subsidies is positive. Such finding probably reflects the fact that rules of domestic bodies for the access of firms to their funds are less strict than the ones that exist at the EU level. Finally, variables representing barriers to innovations and those representing involvement of firms in organisational and marketing innovations are statistically insignificant.

The results of second stage are mainly consistent with our expectations. The nature of variables used in this stage allows us to use most of them in logarithmed form. As expected, we can confirm the existence of causality running from the innovation activities of firms to the quality of exports from their industries on EU27 market. A 1% increase in innovation output of individual industry increases the relative quality of its exports for about 0.04%. Similarly, stronger quality of imports on domestic market has positive impact on the relative quality of industry's exports. On one hand, this can be evidence of spillovers generated through international trade. On the other hand, such finding may be a consequence of intra-industry trade and outsourcing of production from other EU members to countries in our sample. In such setting, transfer pricing could be used as mechanism to increase the relative export unit values of goods exported by industries in our sample which can be easily interpreted as an indicator of improvements in quality. Yet, the limitations of our dataset prevent us from further analysis of these issues. Finally, we also obtain positive and statistically significant coefficient on the variable representing investment in machinery and equipment. Stronger intensity of investment per employee increases the relative quality of industry's exports for about 0.13%.

As last part of our investigation we examine the relationship between the relative quality of exports and market share of an industry on EU market. As our investigation in section 4 revealed industries with highest share of EU market are also those with highest relative export unit values. Table 3 makes clear that there is a positive and statistically significant relationship between two. A 1% increase in the relative quality of exports increases EU market share of industry for about 0.44%. We also obtain positive and statistically significant sign on the coefficient representing size of industry. An increase in the relative size of industry for about 1% increases its market share for about 0.56%. It is therefore likely that mechanisms of spillovers generated through competition such as those mentioned earlier in this paper are at work. Finally, the market share of industries is positively influenced with the productivity of labour. Such finding can be taken as evidence that improvements in efficiency play important role in building of competitiveness of industries from member states on single EU market.

7. Conclusions

In recent years, the trade and growth literature has devoted much of its attention to the relationship between structure of a nation's exports and its growth prospects. Traditionally this line of research has argued that the ability of nations to export increases their growth prospects. Yet, newer contributions underline that far more important question for understanding of differences in growth among today's economies is the structure of their exported products. It is generally held that competitive profiles based on knowledge and technology intensive products offer higher prospects for growth than production of labour and resource intensive goods which bear little value added and can be more easily imitated. Such reasoning has given rise to development of new theories that attempt to establish how the quality of nations' exports can be improved and, in parallel development, to the changes in the behaviour of policy makers who develop policies aimed at improving the ability of firms and industries to compete in quality.

In understanding of paths towards quality-driven competitiveness important place belongs to innovations. Introduction of new goods and services and development of new ways of doing things enable firms to differentiate themselves from their rivals and to enjoy temporary monopoly power thus capturing above average returns. However, the benefits of such behaviour are not reserved only for practising firms as newly discovered knowledge gets diffused across market through various spillover channels such as trade, competition, interactions within group of firms and interactions with suppliers and distributors. To this end, the identification of these

channels and understanding of their relative importance for firms in individual countries or in groups of countries can help policy makers in creation of measures that would facilitate development of quality-driven competitiveness among their firms and industries.

The results of our work confirm the existence of relationship between innovation activities within industries, the quality of their exports and their competitiveness measured with market share. In this process important role belongs to knowledge spillovers, particularly those generated through international trade, horizontal and vertical interactions on domestic market and within-group exchange of knowledge. Furthermore, the evidence from regressions make clear that the EU-based subsidies are far more important for success of innovation activities among firms than domestic ones. Yet, our results also point to substantial discrepancies in representation of industries from new and old EU member states on single EU market and in the quality of their exports. In this context, our findings about factors and forces that facilitate innovation behaviour, quality upgrading and competitiveness of EU industries in general may be taken as basis for the development of future policies aimed at reducing such gaps.

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