

Innovation Propensity in the EU Candidate Countries

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Abstract Innovation activities in transition economies generally lag behind developed economies. This is also the case in the latest group of EU candidate countries whose innovation performance lags behind EU-27 average. In this paper we analyze the innovation propensity of firms in EU candidate countries (Croatia, FYR Macedonia, Montenegro and Turkey). The analysis relies on the Business Environment and Enterprise Performance Survey (BEEPS 2009) data. By employing probit model we have identified determinants of innovation propensity in analyzed countries. The results point to external factors such as the subsidies, customer pressure to innovate, obstacles from high tax burdens, political instability and inadequate education of workforce as significant positive predictors. Based on the results, few innovation policy recommendations are proposed.

Keywords Innovation propensity · EU candidate countries · Innovation determinants

JEL Classification O31 · P52

Introduction

Innovations are considered crucial for achieving competitive advantage and improving business performance (Roberts 2001; Cainelli et al. 2004, 2006). Due to the importance of innovation for business and economic growth, research on determinants of innovation development attracted considerable attention in the

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literature (e.g. Atuahene-Gima 1995; Chandy and Tellis 2000; Danneels and Kleinschmidt 2001; Hult et al. 2004; Laursen and Salter 2006). One stream of literature explores internal factors that drive innovation (Cohen and Levinthal 1990; Trott 1998; Conner and Prahalad 1996; Eisenhardt and Martin 2000) while other focuses more on external factors. Importance of external factors for innovation development is introduced in literature in early market pull models of innovation (von Hippel 1978). Another notable example comes from Porter (1990) who finds strong competition, demanding customers and aggressive suppliers the factors that affect firms' capabilities to innovate.

Notwithstanding the importance of innovation for economic growth, both the literature and the analysis of the available data have revealed that in the case of transition economies, the innovation activity is rather subdued. This is in particular evident in transition economies that lag in their development behind more advanced transition countries. In such cases, it is important to analyze what the dominant factors leading to innovation in the lagging countries are, in order to be able to adjust relevant policies. Without innovation capacities increases, the lagging countries would not be able to create lasting conditions for sustainable growth.

In this paper we analyze the innovation propensity of firms and investigate their determinants in EU candidate countries. Specifically, we compare four countries: Croatia, FYR Macedonia, Montenegro and Turkey. Both Croatia and Turkey belong to the group of catching-up countries, according to European Innovation Scoreboard 2009 (EIS 2009)¹ meaning that innovation performance of these countries is below the EU-27, but increasing over time. The average growth rate of innovation performance in catching-up countries over 5 years is 5.5%. Turkey is among moderate growers while Croatia is slow grower.

The number of patent applications in these countries also indicates low level of innovativeness. For example, Eurostat reports average of 113.94 patent applications to the EP per million of inhabitants for EU-27 average in year 2006, while the comparative number for Croatia is 7.77 and 2.57 for Turkey. The latest available Eurostat data on applications to USPTO repeat the story. The average for EU-27 countries is 40.37; Croatia had 2.74 and Turkey 0.11 patent applications in year 2003.

To the best of our knowledge, the determinants of innovation propensity have not yet been quantitatively analyzed in the literature for the specific group of countries, mostly due to the limited data sources. Due to this reason, our analysis encompasses both external and internal factors of innovation development. Since the countries have expressed their interest to join the European Union, the analysis of their innovation activity is also important from the aspects of future joint innovation policy. Thus, the results of the analysis performed in this paper should contribute to the literature as well as to the discussion on policy design.

The structure of the paper is following. **Model and Data** presents the data used and proposes the analytical framework. **Estimation Results and Discussion** reveals the results of empirical exercise. The last section sums the conclusions.

¹ FYR Macedonia and Montenegro are not included in EIS.

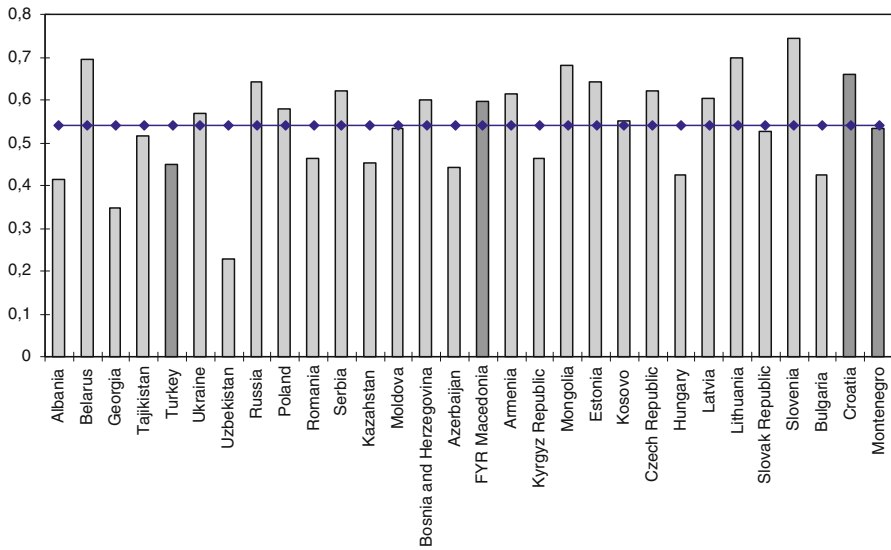


Fig. 1 Share of firms with new products. Source: authors' calculations based on BEEPS

Model and Data

In addition to relying on the existing theoretical literature and results from the studies conducted in other countries, the empirical framework in our paper is guided by the used dataset, i.e. Business Environment and Enterprise Performance Survey (BEEPS) data, which is a survey conducted jointly by EBRD (2011) and the World Bank.² In our analysis we use the fourth round of the survey BEEPS 2009, which was conducted in 29 countries and covered almost 12,000 enterprises. As we aim to explore innovation propensity in the EU candidate countries, we rely on data for Croatia, FYR Macedonia, Montenegro and Turkey. The BEEPS 2009 includes data for 159 enterprises in Croatia, 366 enterprises in FYR Macedonia, 116 in Montenegro and 1152 enterprises in Turkey. This makes the total sample of 1,793 enterprises.³

Analysis of BEEPS data for selected countries reveals that approximately half of the firms report development of new product (Turkey 44.62%, FYR Macedonia 53.56%, Croatia 65.41% and Montenegro 53.45%). When compared to the whole sample average, Croatia and Macedonia innovate more, while development of innovation in firms in Turkey and Montenegro is below the average (Fig. 1). When it comes to investment in inbound R&D activities, the situation is slightly different. While 51.57% of Croatian and 41.26% Macedonian enterprises are involved in

² More information on the survey, together with the questionnaire and the data can be found on the EBRD (2011) internet page <http://www.ebrd.com/pages/research/economics/data/beeps.shtml>.

³ The actual estimation sample is somewhat reduced, to exclude those enterprises that did not respond to the innovation-related question. It consists of 1,787 firms.

internal R&D activities, in Turkey only 27.17% and in Montenegro 24.14% of enterprises perform R&D activities.

In order to be able to further analyze the determinants of differences in innovation propensity across the countries, we proceed with the formulation of the estimation model. In our model most of the variables refer to external factors and their influence on innovation propensity. But, in addition to those variables we also include variables related to ownership, operating as part of a group of enterprises and size that refer to internal factor affecting innovation activities.

The dependent variable in our model is the answer to the survey question whether the firm has introduced new product or service within the last 3 year period. Since the dependent variable is binary, we have estimated a probit model.

Model specification is following:

$$inno = 1 \text{ if } inno^* = \alpha'x_i + \varepsilon_i > 0; 0 \text{ otherwise}$$

where $inno^*$ is a latent variable associated to $inno$, a binary variable that takes value 1 when firm reported product innovation development and 0 otherwise. ε_i refers to an error term.

The vector of independent variables is specified as follows:

$X_i =$ (Country effect, Enterprise size, Ownership, Competition, Customers, Subvention, Tax rates, Tax administration, Political instability, Corruption, Labour regulations, Inadequate education of workforce).

The choice of independent variables is, as already stated, influenced by the data availability, but follows the results of previous analysis. The rationale for the assumption of each variable relevance as innovation propensity determinant is briefly explained below⁴.

Country effect refers to dummy variable for each country. Since we were not able to capture all relevant variables for country differences (i.e. other business conditions, innovation policy variables), the inclusion of country dummies aims to capture the specificities not addressed by other variables in the model.

Ownership variables Inclusion of the ownership variables aims to capture the differences between private and state-owned firms. The speed of privatization processes in the EU candidate countries lag behind more advanced transition economies, so the difference might not be so pronounced as in the market economies. However, the issue whether state-owned firms could be innovation leaders are frequently publicly debated in sampled countries, so by inclusion of this variable we wanted to address this issue from another perspective. Policy discussions frequently advocate support to innovative activities in small private enterprises. On the other side of the spectrum are large, usually still at least partially owned government enterprises, which used to be (under the planned economy system) the leaders of innovative activity. In the transition context, it seems that the state-owned enterprises have lost their innovative capacity, but the new privately owned firms have not yet filled-in the established gap. In that situation, the speed of

⁴ The precise definition of the transformation of the respondents' answers into variables is presented in the [Appendix](#) Table at the end of the paper.

economic restructuring also influences the global innovative indicators at the country level.

Additional reason for including the ownership variable is the possibility to differentiate between private domestic and private foreign firms in order to reveal whether there are some arguments for the knowledge spillover (or transfer) concept within this limited framework. By doing so, we seek to find effects of foreign investments on innovation propensity in transition economies. Within the policy concept, FDI is expected not only to bring additional capital but also to enable the transfer of technology, know-how and improve the average level of organizational skills in the host country, and thus help to improve the competitive position of the country as well as aid to the creation of preconditions for long-term sustainable growth. Whether the process ends up in actual innovation depends on a number of other home and host country conditions. In our model we explore only the question whether foreign ownership affects probability of product innovation development.

Size variables In the analysis we include set of variables referring to firm size. In particular, we explore how firm size and being the part of larger enterprise group affect propensity to innovate. The assumption is that firms belonging to enterprise groups should have an access to knowledge and resources available within the group that enables them to increase their innovation potential.

Furthermore, it is important to explore how firm's size influences the propensity to innovate as it is often considered that small firms lack resources for innovation activities. As large firms have available resources for innovation development, they invest more in R&D and thus innovate more (Rothwell 1984). But, one should keep in mind that SMEs rely on external sources and supplement in-bound R&D activities that enable them to innovate (MacPherson 1997). Due to fast changes the transition economies experience (in terms of creating new enterprises and changing the overall structure of the economy), the differences in innovation activities will continue to be important research question in the future analysis.

The subsidies from national, regional or local governments, or EU sources that in the survey refer to any type of the subsidy, not just subsidies for innovation activities, which implies that we hypothesize that any kind of subsidy can enhance innovation activity. We included this variable in the analysis because for the countries in question it is frequently argued that the firms receiving subsidies (at least from the domestic government) are those that are not likely to be profitable in the near future. Indeed, one of the issues strictly monitored within the Croatian EU accession process has been the state aid policy, which had to be severely redesigned in order to comply with the EU requirements. The literature finds that public funding of innovation activities is sometimes considered as the determinant of innovation input or R&D intensity (Polder et al. 2009; Griffith et al. 2006). Overall conclusion is that subsidies and funding from local, national or EU level positively affects decision to invest in R&D and/or the level of R&D investment. Although it is questionable whether we could directly relate the subsidies to innovation activity of the firm, we still believe that this is an important question that needs to be addressed for the analyzed countries.

The quality of labour variable refers to employers' perception on the obstacles related to the labour market, i.e. to labour regulations and adequacy of education of

workforce. There are many reasons for such assumptions. The most important is the relatively high mismatch between the demand and supply on the labour market, which not only relates to the formal education of the workforce, but to the availability of the skills. The second is that the analyzed countries suffer from relatively high brain drain, which has resulted in even more unfavourable human capital preconditions for innovation activities to occur. The last is the frequently discussed rigid labour market regulations, which might pose severe obstacles to firms when engaging in certain cooperation activities. The lack of qualified employees for innovation activities is the one of the most pronounced problems in innovating firms in Croatia and Turkey. CIS 2006 data reveal that 20.6% of innovators in Croatia and 17.6% innovating firms in Turkey have faced this problem.

Business climate variables Related to obstacles coming from existing regulations, we included a set of business climate variables, which address the evaluation of tax rates and tax administration, political instability, and corruption. This argument was frequently addressed in the foreign direct investment literature, when emphasized that potential investors to the analyzed countries list precisely these issues as relevant for investment decision making. If these issues are significant obstacles for foreign investors, they might also pose severe problems for domestic firms. Even though the domestic firms might be more used to conducting business in such circumstances, high administrative and overall political and corruption related expenses, certainly increase the general level of doing business expenditures, which might defer the innovative activities of the incumbent enterprises and seem prohibitively high for the newcomers to the market.

Market pressures variables are directly related to the decision making process regarding products and services development and refers to importance of both competitors and consumer pressure to innovate with product innovations. It aims to capture strategic motives of innovative firms. Porter (1990) considers competitors' and consumers' pressures as the drivers of innovation activities in companies. In order to meet customer preferences and requirements, firms introduce product innovations. Furthermore, innovations enable firms to outperform competitors, improve market position or to sustain current one. In fact, continuous determination to innovation is required in order to profit from innovations (Roberts 2001). Therefore, competition can pressure firms to innovate. Foreign firms' entry on the transition economies' markets might put additional pressures on the domestic firms to innovate. It is worth noting that included competition pressures variables refer to importance of competition for developing product innovation regardless of market scope of the firm, i.e. we don't take into account whether firms operate on domestic or international market. Due to globalization processes firms are exposed to foreign competitors regardless of market they operate on. And since the transition economies have opened their markets to international flows, this effect is very likely to be present in the analyzed countries as well.

Since the innovation activity factors have not been frequently quantitatively assessed for the analyzed group of countries, we argue that the results of the empirical exercise will provide a step forward to policy oriented discussions. The next section presents the results of the estimation approach described and discusses the main results.

Estimation Results and Discussion

The results of the estimation procedure are presented in Table 1. Before proceeding with the discussion, it has to be noticed that the overall diagnostic properties of the estimated equation are satisfactory, although not ideal. The McFadden's statistics as well as prediction rate are rather low, implying that there are probably other factors which are not included in the analysis here, but which influence the innovativeness of the firms in the analyzed countries. At the same time, all the included variables are jointly significant; the model does not suffer from additional heteroskedasticity and is able to classify the innovative and non-innovative firms with similar success rate.

The results show that the strongest positive impact on innovation propensity in analyzed countries comes from receiving some sort of subsidy. Public subsidies enable firms to successfully develop and introduce to the market product innovations. Our findings indicate importance of subsidies in general (not just innovation subsidies) for encouraging innovation development in the transition countries. In other words, subsidies received for purposes other than innovation development can enable firms to innovate. This is a strong argument for innovation policy in the analyzed countries, since most of them have relatively low innovation propensity. Subsidy schemes should be understood as an instrument for improving innovation propensity in the group of countries lagging behind EU-27 average. However, specific policy recommendations leading to precisely targeted policy measures requires additional research which is beyond the scope of this paper. We could only argue that in the circumstances when the innovation propensity is rather low, and the restructuring of the economy relatively slow, there is certainly some scope for the careful design of innovation supporting actions that should also positively influence the future economic growth path of the analyzed countries.

The next positive association with innovation propensity is the response that firms are having difficulties with finding adequate workers and that they consider it as a major obstacle to their business activity. Eurostat data enables comparisons of employment in R&D to total employment, which reveals that the average for EU-27 countries is 0.73 (in full time equivalent), while the same indicator for Croatia stood at 0.43 and for Turkey at 0.27 in year 2009. In addition to this fact that reveals already lower share of employment in R&D activities, an issue of brain-drain has to be taken into account. Most of the transition countries, included the ones analyzed here, suffer from this phenomenon. The highly educated young people frequently emigrate to more advanced economies, which additionally deteriorates the already inadequate human resources in the transition countries (Horvat 2004; Tung and Lazarova 2006). The innovative enterprises have already detected the potential labour market shortages and this could adversely affect the future innovation potential increases. Therefore, serious attention should be directed towards improving the available human capital stock in the analyzed countries, or their innovative capacities would additionally lag behind more developed EU economies.

Other identified positive predictors of innovation propensity are discussed below.

The relatively high importance of foreign competition could be attributed to the market liberalization, which according at least to EBRD 2011 structural indicators is already relatively high. However, the fact remains that transition economies in their

Table 1 Probability that the enterprise has introduced new product or service

	Estimated coefficients (robust standard errors)	Marginal effects (at \bar{x}) \times 100
Constant	0.039 (0.136)	
Country effect (vs. Croatia)		
Montenegro	-0.171 (0.163)	-0.068
Macedonia	-0.114 (0.128)	-0.046
Turkey	-0.625*** (0.117)	-0.244
Enterprise size (vs. medium)		
Very small	-0.288 (0.205)	-0.113
Small	-0.142* (0.075)	-0.057
Large	0.026 (0.077)	0.010
Part	0.223** (0.107)	0.088
Ownership (vs. domestic and other)		
Foreign	0.077 (0.156)	0.031
Government	-0.288 (0.479)	-0.113
Competition foreign	0.118* (0.064)	0.047
Competition domestic	0.035 (0.070)	0.014
Customers	0.229*** (0.079)	0.091
Subvention	0.317*** (0.111)	0.125
Tax rates	0.141* (0.074)	0.056
Tax administration	-0.065 (0.089)	-0.026
Political instability	0.140* (0.079)	0.056
Corruption	-0.046 (0.082)	-0.018
Labour regulations	-0.029 (0.114)	-0.012
Inadequate education of workforce	0.237*** (0.079)	0.094
Diagnostics		
<i>N</i>	1,787	
LogL	-1179.77	
Wald (19) χ^2	118.38***	
Pseudo R^2	0.047	
Prediction (%)	59.49	
Hosmer–Lemeshow (8) χ^2	10.87	
Classification table	True	
Classified	Innovation	No innovation
Innovation	536	362
No-innovation	362	527

Source: authors' estimates

Coefficients marked *** are significant at level of 1%, ** at level of 5%, and * at level of 10%

Marginal effects are evaluated at the mean of the sample data. The marginal effect of specific variable is expressed as the percentage point changes from this level of the predicted probability of innovation at the mean of the data. Since independent variables are dummy variables, the marginal effect represents the change in the probability of innovation for firms with and without that characteristic, holding other characteristics constant at the same time. Marginal effects in bold are related to coefficients significant at least at 10%

previous system did not have developed competition pressures, neither from domestic firms nor in terms of customers' requirements. The first phases of transition brought opening of domestic markets to international firms, and thus the first form of competition was introduced through this channel. This effect still remains, as the most competition pressures are perceived to come from international and not domestic markets. In addition to liberalization effect, this could also be related to the fact that three out of four countries analyzed in this paper have relatively small internal markets. In these circumstances, to develop a product or service that would be competitive even on domestic market; a firm needs to take into account larger market developments and could not focus only on the dynamics of the domestic markets. Extant studies in Croatia confirm that presence on international market drives innovation development (Radas and Božić 2009). In the context of small economies, presence on international market is especially relevant as domestic market is not large enough to assure returns on investment in innovation development. Innovating firms indeed aim to grow through innovation activities and their focus often goes beyond local and national market (although this can be industry specific). The Fig. 2 illustrates this by using the Survey data. It can be seen that the firms that had innovation in the analyzed period at the same time on average had higher percentage of sales achieved through direct exports in two analyzed countries—Croatia and Turkey. Customers are found to be significant driver of innovation propensity in the selected group of transition countries. Prior to market liberalization, the product shortages in the market created a pool of relatively undemanding customers. Only with the liberalization, which had as a consequence introduction of new products and services on the local markets, the attitudes of the customers started to change. It can be expected that this effect will be even stronger in the future, even though the recent crisis could have decreased the growth rate for a while.

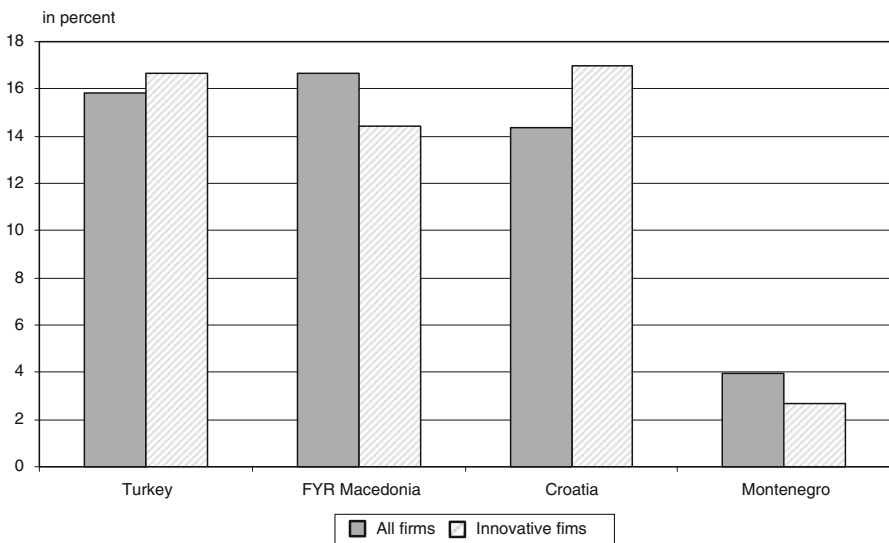


Fig. 2 Percentage of direct export in total sales. Source: authors' calculations based on BEEPS

It seems that being a part of a larger firm helps in increasing the innovation activity. This could be attributed to the fact that larger firms are capable of developing products and services on different markets, and then gradually spread the introduction of new products on all the markets they operate on. Furthermore being a part of the larger group enable them the access to the knowledge and skills available inside the group. This certainly has positive effect on innovation activities. Although we could not corroborate the assumption with the data, at least a segment of these firms are probably part of multinational corporations. The international component is important in the context of relatively small domestic markets, where the unit cost of developing new products could be prohibitively high. Therefore, larger firms who operate internationally, which are able to benefit from integrating smaller domestic markets, could benefit more from developing new products.

The last two significantly positive predictors of innovative activity are directly related to government policy. The first one is the fact that innovative firms find tax rates to be discouraging for their business activity. The government burden of the innovative firms is, therefore, considered too high. The direct policy implications of these findings are that, probably, it would be beneficial to the governments of the analyzed countries to alleviate the tax pressures. In line with that argument, a majority of EU members had introduced tax incentives for R&D (European Commission 2009). Even though such schemes might induce more R&D, if the overall administrative burden pressures are too high, the firms might still find the government sector size overwhelming.

The second is the recognized problem of potential political instability. The firms that are more innovative are at the same time more inclined to address the issue of political instability as a major obstacle to their business activity. This could be attributed to the fact that developing new products and services requires significant time and effort. Therefore, in order to engage in such activities, firms judge the relative stability of the market (i.e. the country) they want to operate in. If they find the prospects of instability, they will more likely defer the innovation decision. Thus, potential political instability might be more important for innovative firms than “business-as-usual” enterprises.

Identified negative predictors for innovation are: Turkish enterprises (vs. Croatian) and being small enterprise (vs. medium-sized). The first statement is related to the data presented in Fig. 1. There could be noticed that Turkey belongs to the group of countries with below average share of firms with new products or services on the market. On the other hand, Croatia, Montenegro and FYR Macedonia are above average or just on the average. The second statement is related to the fact that small enterprises are less likely to develop new products, since they frequently lack resources for their introduction. This especially refers to lack of knowledge and experience in developing new products. Fairtlough (1992) argues that innovation in SMEs is developed usually employing knowledge and skills of employees previously employed in large firms. As already previously emphasized, the policy measures to support innovative activities of SMEs frequently publicly advocated in analyzed countries, might give positive overall results only in the longer term. The results obtained from this analysis implies that the present situation calls for more comprehensive policy options, that would give favourable results even in the shorter run.

The variables that were not found significant were nevertheless of the expected sign. Thus, the firms on average in all the analyzed countries, in comparison to Croatia, have lower innovation propensity. Very small firms have lower and large firms higher innovation propensity than the medium-sized enterprises. Firms in foreign ownership have higher and government-owned enterprises lower innovation propensity than domestic firms. Competition from domestic firms positively influences the pressures to introduce new products on the market. Higher demands from tax administration, increased corruption and restrictive labour regulations pose severe obstacles to innovation. All of these statements, although not significant in the analysis, are similar to situation in other countries.

Concluding Remarks

The aim of the paper was to identify determinants of innovation propensity in EU candidate countries: Croatia, FYR Macedonia, Montenegro and Turkey. Even though the need to enhance the innovation activity is frequently publicly advocated in the analyzed countries, the quantitative assessments are scarce in the literature. The analysis in this paper was performed based on the results of Business Environment and Enterprise Performance Survey (BEEPS), and provides an insight into issues relevant for discussing both national and eventual future joint innovation policies.

According to the findings, external factors are indeed significant determinants of innovation propensity in EU candidate countries. The most important positive predictors that affect innovation propensity are subsidies, customer pressure to innovate, foreign competition pressures, obstacles related to high tax burden, political instability and inadequate education of workforce. Analysis reveals significance of two internal factors: firm size and being part of the group for determining innovation propensity in the selected group of countries.

The results of the estimates in this paper are in general accordance with the similar results for other countries, but also confirm some stylized facts frequently publicly discussed in the EU candidate countries. We will therefore emphasize the policy implications stemming from the presented estimation results, in order to encourage further discussion on possible specific policy recommendations that would lead to increased innovation activity of the analyzed countries.

Such results imply that factors that can be influenced by policy (makers) play an important role in determining innovation propensity. This especially refers to two areas that we have been established to have significant impact on innovation in the analyzed countries—subsidy schemes and education of workforce. Thus, these areas should be especially considered when creating policies to encourage innovation activities in EU candidate countries.

The finding on importance of subsidies of all types for fostering innovation propensity is very important from the policy perspective. Innovation policy should consider various models of subsidies to encourage innovation activities. Usually, policymakers aim to encourage innovation propensity by directly subsidising innovation activities. These schemes actually support innovation activities in

innovating firms. Even though some are already in place in the analyzed countries, the evaluation methods of their effectiveness are still undeveloped. However, the discussion on which scheme precisely should be applied in which country is beyond the scope of this paper, but deserves attention in future research.

Innovators in selected group of countries perceive shortages of skilled workforce. As this factor is significantly related to the probability of innovation development, it should be seriously considered how to address this problem in national education policies. This factor can be especially damaging for innovation propensity in the future of the EU candidate countries and can have adverse effects on the future economic growth.

Appendix: Variable definition

Variable	Description (dummy variables)
Innovation	=1 if enterprise has introduced new products or services
Montenegro	=1 if respondent is from Montenegro
Macedonia	=1 if respondent is from Macedonia
Turkey	=1 if respondent is from Turkey
Very small	=1 if enterprise has less than 5 employed
Small	=1 if enterprise has more than 5 and less than 19 employed
Large	=1 if enterprise has more than 100 employed
Part	=1 if enterprise is a part of a larger firm
Foreign	=1 if share of foreign ownership is more than 50%
Government	=1 if share of government ownership is more than 50%
Competition foreign	=1 if it is fairly important (3) and very important (4) factor for developing new products or services
Competition domestic	=1 if it is fairly important (3) and very important (4) factor for developing new products or services
Customers	=1 if it is fairly important (3) and very important (4) factor for developing new products or services
Subvention	=1 if enterprise received subsidies from national, regional or local governments or European Union sources
Tax rates	=1 if respondent declared that it represents major obstacle (3) or very severe obstacle (4)
Tax administration	=1 if respondent declared that it represents major obstacle (3) or very severe obstacle (4)
Political instability	=1 if respondent declared that it represents major obstacle (3) or very severe obstacle (4)
Corruption	=1 if respondent declared that it represents major obstacle (3) or very severe obstacle (4)
Labour regulations	=1 if respondent declared that it represents major obstacle (3) or very severe obstacle (4)
Inadequate education of workforce	=1 if respondent declared that it represents major obstacle (3) or very severe obstacle (4)

References

- Atuahene-Gima K (1995) An exploratory analysis of the impact of market orientation on new product performance: a contingent approach. *J Prod Innov Manag* 12:275–293
- Cainelli G, Evangelista R, Savona M (2004) The impact of innovation on economic performance in services. *Serv Ind J* 24(1):116–130
- Cainelli G, Evangelista R, Savona M (2006) Innovation and economic performance in services: a firm-level analysis. *Camb J Econ* 30:435–458
- Chandy RK, Tellis GJ (2000) The incumbent's curse? Incumbency, size and radical product innovation. *J Mark* 64:1–17
- Cohen WM, Levinthal DA (1990) A new perspective on learning and innovation. *Admin Sci Q* 35:128–152
- Conner KR, Prahalad CK (1996) A resource-based theory of the firm: knowledge versus opportunism. *Organ Sci* 7(5):477–501
- Danneels E, Kleinschmidt EJ (2001) Product innovativeness from the firm's perspective: its dimensions and their relation with project selection and performance. *J Prod Innov Manag* 18:357–373
- EBRD Structural indicators database. <http://www.ebrd.com/country/sector/econo/stats/sci.xls>, accessed 10th March, 2011
- Eisenhardt KM, Martin JA (2000) Dynamic capabilities: what are they? *Strateg Manag J* 21:1105–1121
- European Commission (2009) Expert group on impacts of R&D tax incentives design and evaluation of tax incentives for business research and development good practice and future developments, final report, November 15
- Fairtlough G (1992) Three misconceptions about innovation. *Technol Anal Strateg Manag* 4(1):77–82
- Griffith R, Huergo E, Mairesse J, Peters B (2006) Innovation and productivity across four European countries. *Oxf Rev Econ Policy* 22(4):483–498
- Horvat V (2004) Brain drain: threat to successful transition in South East Europe? *Southeast Eur Politics* 5(1):76–93
- Hult GTM, Hurley RF, Knight GA (2004) Innovativeness: its antecedents and impact on business performance. *Ind Mark Manag* 33:429–438
- Laursen K, Salter A (2006) Open for innovation: the role of openness in explaining innovation performance among U.K. Manuf Firms *Strateg Manag J* 27:131–150
- MacPherson AD (1997) A comparison of within-firm and external sources of product innovation. *Growth Chang* 28:289–308
- Polder M, van Leeuwen G, Mohnen P, Raymond W (2009) Productivity effects of innovation modes. Discussion paper (09033). Statistics Netherlands, The Hague/Heerlen
- Porter ME (1990) The competitive advantage of nation. In: Porter ME (1998) *On competition*. A Harvard business review book
- Radas S, Božić Lj (2009) The antecedents of SME innovativeness in an emerging transition economy. *Technovation* 29:438–450
- Roberts PW (2001) Innovation and firm-level persistent profitability: a Schumpeterian framework. *Manag Decis Econ* 22:239–250
- Rothwell R (1984) The role of small firms in the emergence of new technologies. *Omega* 12:19–29
- Trott P (1998) Growing business by generating genuine business opportunities. *J Appl Manag Stud* 7(4):211–222
- Tung RL, Lazarova M (2006) Brain drain versus brain gain: an exploratory study of ex-host country nationals in Central and East Europe. *Int J Hum Resour Manag* 17(11):1853–1872
- von Hippel E (1978) A customer-active paradigm for industrial product idea generation. *Res Policy* 7:240–266