wiiw

Wiener Institut für Internationale Wirtschaftsvergleiche

The Vienna Institute for International Economic Studies

Monthly Report | 8-9/12

Contents

Contents

Trade and economic integration in the CIS: an evaluation*

BY VASILY ASTROV, PETER HAVLIK AND OLGA PINDYUK

The republics of the former Soviet Union (FSU) provide a unique opportunity to examine the impact of alternative economic integration agreements. Even more than twenty years after the collapse of the Soviet Union there still remain significant – albeit weakening and varying in individual cases – economic, trade and cultural linkages among the FSU republics. At the same time, there is a substantial variation in the institutional arrangements governing trade between FSU republics, both across the region and over time. A functioning Belarus-Russia-Kazakhstan Customs Union (BRK-CU) would comprise the bulk of the FSU economy and represent a significant step towards an attempted re-integration of the FSU – even more so if Ukraine were to join as well. The BRK-CU had been in preparation for several years (the respective agreement was signed in 2007) but it was de facto launched in January 2010. It accounts for more than 85% of the CIS' GDP and exports, for 78% of imports and 60% of population.

The BRK-CU largely eliminated the remaining non-tariff barriers in mutual trade and, upon the adoption of a Common External Tariff (CET) in 2010, unified the participating countries' trade policies vis-à-vis third countries.[1] As a result of CET adoption, the average (un-weighted) level of protection declined by about 2 p.p. in Russia and 1.3 p.p. in Belarus, but increased by around 2.5 p.p. in Kazakhstan.

The current CET set-up is in line with Russia's WTO commitments; however, should Kazakhstan or Belarus accede to the WTO in the future on more liberal terms, the CET would need to be adjusted accordingly. The BRK-CU has also implemented a common Customs Code which set common rules for goods' declaration, customs procedures, the methodology of estimating the customs value, customs control, and assessment and collection of customs duties. In January 2012, the BRK-CU was further upgraded to the Common Economic Space (CES) which is supposed not only to provide free movement of goods, services, capital and labour, but also to ensure common policies in a wide range of policy areas, with the ultimate goal of setting up the Eurasian Economic Union by 2015. The CES framework encompasses 17 sector agreements covering a coordination of macroeconomic, competition and public procurement policies, joint regulation of 'natural monopolies', harmonization of subsidies to industry and agriculture, and unification of technical regulations. Probably most importantly, the CES agreements also envisage the unification of energy (oil and, ultimately, gas) prices (arguably the main 'carrot' for Belarus' participation in the project) and transport tariffs across member countries (the latter is particularly in the interest of Kazakhstan). Both Belarus and Kazakhstan may also benefit from the relocation of customs clearance services to the external borders of the BRK-CU.

Generally, integration attempts on the post-Soviet space have been complicated by a remarkable diversity in the economic performance and economic structures of the countries concerned, the dominance of Russia being an important factor as well. The processes of de-industrialization, de-agrarization and structural shifts towards services in Belarus, Russia, Kazakhstan and Ukraine have been broadly similar to those observed earlier in other transition countries. Within industry, Belarus and Ukraine have the highest shares of manufacturing whereas Russia and especially Kazakhstan have a large extraction sector. Within manufacturing, the biggest sector is food and beverages (in Belarus) and basic metals (Ukraine, Kazakhstan and Russia) respectively. From the perspective of their diverse industrial specialization, a joint import

* This contribution is a non-technical summary of the key findings of a recently completed research project financed by the Jubilee Fund of the Oesterreichische Nationalbank (Project No. 14097).

1 Kazakhstan has secured duty-free imports of 409 products up until 2015.

tariff structure of the Customs Union should affect the individual member countries differently.

Trade disintegration has been one of the consequences of the collapse of the Soviet Union. Various integration attempts notwithstanding, further trade disintegration could not be averted and the shares of mutual (intra-CIS) trade have markedly declined in the past two decades. Simultaneously with the process of regional disintegration there has been a process of integration of post-Soviet states into the global economy. Our difference-in-difference gravity-based estimation results indicate that during the period 1999-2009 liberalization took place primarily in the trade of Belarus, Russia, Kazakhstan and Ukraine with third countries whereas in their mutual trade, barriers in many manufacturing and services sectors actually increased.

There are still important structural differences in intra-CIS compared to extra-CIS trade of these countries, regarding exports in particular. These differences have important implications for growth and development patterns in the countries concerned. The existing specialization patterns and comparative advantages may – apart from purely political considerations – provide some economic rationale for closer trade integration. Besides, trade exchanges within the CIS – imports in particular – still remain rather important, especially for the smaller countries such as Belarus but also Kazakhstan. For Russia, the CIS shares in both exports and imports are rather low (about 15%). Russia's interest in CIS integration (Customs Union, EurAsEC, etc.) is probably more of a political rather than an economic nature.

Mutual trade exchanges (within the BRK-CU and Ukraine) have been rather heterogeneous and the analysis is plagued by serious data problems. In Belarus and Ukraine, intra-regional exports have recovered slightly faster than total exports since the 2008/2009 crisis. Russian and Kazakh exports to their regional partners have suffered particularly strongly during the recent crisis, suggesting temporary regional trade disintegration. Preliminary data for 2011 suggest a robust recovery of intra-regional trade. Belarus and Ukraine have a fairly diversified commodity export structure whereas Russian and Kazakh exports are strongly concentrated on mineral fuels and metals. There is a structural and regional dichotomy in the commodity trade composition – mostly with respect to Belarus and Ukraine. Excepting Russia, the intra-CIS trade structure is more 'advanced', still reflecting the inherited links from the Soviet period and limited progress in restructuring. There is a considerable differentiation in trade specialization both across individual countries and in revealed comparative advantage (RCA) patterns in their bilateral and total trade. Positive RCAs in mineral fuels (Russia and Kazakhstan) are mirrored by negative RCA values (signifying comparative disadvantage) in their trade with most other commodity groups. Ukraine has positive RCAs in most commodity groups (except mineral fuels) in trade with both BRK-CU partners and the world.

The BRK-CU is potentially relevant for Ukraine, and its possible membership has recently been a subject of heated debates. However, despite Russian advances and the arguably 'pro-Russian' foreign policy course of Ukrainian president Yanukovych, Ukraine has so far declined full-fledged BRK-CU membership. Apart from tricky political issues, an important reason for Ukraine's reluctant position is its WTO-related commitments: its import tariffs (4.5% on un-weighted average basis) are lower than the CET of the BRK-CU (above 6%). If Ukraine raises its customs duties for imports from third countries to the BRK-CU level, these countries – most of which are WTO members – would surely demand compensations. Besides, membership in the BRK-CU is incompatible with Ukraine's forthcoming DCFTA (deep and comprehensive free trade agreement) with the EU.

Available estimates of the economic effects of the Belarus-Russia-Kazakhstan Customs Union differ by a wide margin: it may boost the participating countries' GDPs by about 15% up until 2015. Other authors argue that the BRK-CU is a welfare-reducing arrangement. Our CGE-modelling estimates suggest that BRK-CU membership appears

to bring net GDP and welfare losses to Kazakhstan. In contrast, Belarus and Russia benefit from the BRK-CU in terms of GDP and labour income growth. However, these benefits prove relatively small, given that the economies of these two countries were already highly integrated prior to the BRK-CU formation. Our estimates also suggest that joining the BRK-CU might potentially bring net GDP losses to Ukraine. There also seems to be little (economic) justification for Russia prompting Ukraine to join the BRK-CU. Ukraine, on the other hand, is likely to experience a significant increase in GDP and real labour income after implementing the DCFTA with the EU. The benefits are expected to accumulate in the long run – they come with a significant restructuring of the economy, with the country's economy becoming more services-oriented. This will be possible owing to a strong capital inflow to the country and growth in domestic consumption.

Volume and variety of intra-bloc trade in an expanded European Union*

BY NEIL FOSTER

This article examines the development of exports within the expanded European Union over the period 2000-2007. It addresses the issues of how and why within-bloc exports have developed following accession. The paper shows that exports within CEFTA[1] and within other accession countries have grown more quickly than those between old EU members, but that after accounting for traditional gravity determinants there has been no significant change in this behaviour following accession in 2004. As such, this is likely to reflect a natural realignment of trade patterns following the communist era, as well as the relatively stronger performance of the new entrants when compared with existing EU members. The results also indicate that much of the increase in exports within the accession countries has been due to an increase in the variety of products traded, rather than an increase in the volume of existing products.

Intensive and extensive margins of exports

Recent research in international trade has emphasised the distinction between the intensive and extensive margins of trade, with the intensive margin capturing the volume of traded goods and the extensive margin the variety of goods traded. Brenton and Newfarmer (2007) find that most export growth for 99 developing countries over the period 1995-2004 came through intensifying growth of existing products to existing markets. Along the extensive margin, they find that growth was mainly driven by diversification into new markets rather than through the introduction of new products. Evennett and Venables (2002) find that a third of the growth of exports of developing countries between 1970 and 1997 can be attributed to the expansion of the extensive margin. Felbermayr and Kohler (2006) find that the extensive margin played a larger role in the growth of world trade between 1950 and 1970 and again in the mid-1990s, while the intensive margin was more important in the intervening years. Helpman, Melitz and Rubinstein (2006) find that the majority of the growth of trade between 1970 and 1997 is attributable to the intensive margin rather than the extensive margin.

Data construction and sources

Our analysis requires disaggregated data on bilateral export flows between the EU-25 members, as well as a number of other country and country-pair specific variables to be used as explanatory variables in our gravity equation. Data on bilateral export flows are from the COMEXT database and are collected for the period 1999-2007. These data are at the CN 8-digit level, which has data on 9576 different product categories. Data on GDP, GDP per capita and population are from the World Bank's World Development Indicators (2009), with GDP measured in constant 2000 dollars. Geographic variables are taken from CEPII.[2] These data include distance between capital cities and dummies for common language and common border. A landlocked dummy is also constructed taking the value 0, 1, 2 depending on whether none, one or both partners are landlocked respectively.

Measurement of the intensive and extensive margins of exports

We construct indices of the intensive and extensive margins based upon Feenstra (1994) and Hummels and Klenow (2005). They define the Extensive Margin (EM) as:

$$EM_{jm} = \frac{\sum_{i \in I_{jm}} p_{kmi} x_{kmi}}{\sum_{i \in I} p_{kmi} x_{kmi}},$$

where I_{jm} is the set of observable categories in which the exporting country j has positive exports to m, p_{kmi} is the price of a unit of good i exported

* This research forms a part of the project on 'The revival of NMS mutual trade after their EU accession: In search of the reasons behind', which is funded by the Jubilee Fund of the Oesterreichische Nationalbank (OeNB).

1 CEFTA (Central European Free Trade Agreement) was signed in 1992 by the Czech Republic, Hungary, Poland and Slovakia. Later on Slovenia, Romania, Bulgaria and Croatia acceded as well.

2 http://www.cepii.fr/anglaisgraph/bdd/distances.htm.

from reference country k to country m (measured as the unit value, that is $value/quantity$), and x_{kmi} is the quantity of good i exported from reference country k to country m. Reference country k has positive exports to m in all I categories. In our analysis, the reference 'country' k is chosen to be the EU-25 countries (that is, we consider the sum of all EU-25 countries' exports for reference). EM_{jm} can thus be thought of as a weighted count of j's categories relative to k's categories. If all categories are of equal importance then the extensive margin is simply the fraction of categories in which j exports to m. More generally however, the categories are weighted according to their importance in $k's$ exports to m.

The intensive margin (IM) compares nominal shipments for country j and k in a common set of goods. It is given by

$$IM_{jm} = \frac{\sum_{i \in I_{jm}} p_{jmi} x_{jmi}}{\sum_{i \in I_{jm}} p_{kmi} x_{kmi}}$$

IM_{jm} equals j's nominal exports relative to k's nominal exports in those categories in which j exports to $m(I_{jm})$.

Descriptive statistics

Table 1 reports the average intensive export margin to Visegrad[3] countries for each of the EU-25 countries in the period prior to (Column 1) and post (Column 2) accession along with the change in this variable in the two periods (Column 3). The final three columns report the same statistics for the extensive export margin. Considering the intensive margin we observe that there was a decline in the intensive margin of exports to Visegrad countries for all countries except the Visegrad countries themselves, along with Slovenia, Luxembourg and the Netherlands. This indicates that for most countries there was a decline in the volume of products exported to Visegrad countries in the post-accession period. Visegrad countries experienced an increase in the volume of products exported to other Visegrad countries however. In terms of the extensive margin we observe for all countries except Ireland and Portugal an increase in the extensive margin in the post-accession period, indicating that countries were exporting a wider variety of products to Visegrad countries in the post-accession period. The largest increases were found for Belgium, Lithuania and Slovenia. The main thing to draw from this table is that the major difference between intra-Visegrad trade and the exports of the other countries to Visegrad countries in the post-accession period is that Visegrad countries tended to export an increased volume of products amongst themselves, while most other countries saw a drop in the volume of products exported to Visegrad countries.

Table 1

Changes in the intensive and extensive margins

	PRE-IM	POST-IM	ΔIM	PRE-EM	POST-EM	ΔEM
AT	0.086	0.075	-0.011	0.841	0.877	0.035
BE	0.053	0.050	-0.004	0.699	0.785	0.086
CY	0.007	0.005	-0.003	0.026	0.029	0.003
CZ	0.122	0.137	0.015	0.889	0.925	0.037
DE	0.396	0.368	-0.027	0.955	0.957	0.002
DK	0.019	0.017	-0.002	0.479	0.539	0.060
EE	0.008	0.007	-0.002	0.102	0.148	0.046
ES	0.053	0.035	-0.018	0.586	0.658	0.071
FI	0.018	0.016	-0.002	0.457	0.476	0.019
FR	0.084	0.074	-0.010	0.792	0.854	0.062
GB	0.057	0.042	-0.015	0.721	0.761	0.040
GR	0.014	0.009	-0.005	0.175	0.196	0.021
HU	0.036	0.055	0.018	0.645	0.697	0.052
IE	0.031	0.020	-0.011	0.233	0.204	-0.030
IT	0.112	0.089	-0.023	0.822	0.861	0.039
LT	0.008	0.008	0.000	0.196	0.326	0.130
LU	0.008	0.011	0.003	0.200	0.226	0.026
LV	0.011	0.006	-0.005	0.096	0.152	0.056
MT	0.014	0.011	-0.003	0.011	0.029	0.018
NL	0.056	0.069	0.013	0.738	0.800	0.063
PL	0.066	0.087	0.021	0.785	0.851	0.066
PT	0.010	0.009	-0.001	0.248	0.247	-0.001
SE	0.027	0.026	-0.002	0.621	0.648	0.028
SI	0.018	0.020	0.002	0.470	0.561	0.091
SK	0.050	0.065	0.015	0.749	0.802	0.053

Methodology

While the descriptive statistics provide some support for there being significant differences in export performance amongst blocs within the EU and since EU

[3] In our analysis we consider the original members of CEFTA, i.e. the Czech Republic, Hungary, Poland, Slovakia, as a regional bloc of interest, which are also known as the Visegrad countries.

accession, in what follows we address these issues in greater detail using a more formal analytical approach. The aim is to reformulate the gravity equation to take account of the dual margins of international trade. Employing the gravity model along with the use of interaction terms and dummy variables will allow an examination of whether the two margins have developed differently for intra-Visegrad and Visegrad–EU-15 trade, as well as address such issues as whether the growth in intra-Visegrad trade since 2004 has occurred along the intensive or extensive margin. To address these issues we make use of the gravity model of trade. Our starting point is the fairly standard version of the gravity equation:

$$trade_{jmt} = \sum_{z=1}^{z} \beta_j Gravity_{z\,rct} + \delta_1 VISEGRAD_{rct} + \delta_2 EU15_{rct} + \delta_3 OTHEU_{rct} + \varepsilon_{rct}$$

where $trade$ refers to the level of (bilateral) exports or to the intensive or extensive margin, $Gravity$ refers to standard gravity determinants (which would include distance, the level of GDP of exporter and importer, common border dummy and so on), $VISEGRAD$ is a dummy equal to one if countries j and m are both in Visegrad, $EU15$ is a dummy equal to one if both countries are in the EU-15, while $OTHEU$ is a dummy equal to one if both exporter and importer are in the remaining group of 10 accession countries.

The model as specified will allow us to examine whether exports and the margins have developed differently for different country groupings, after controlling for standard gravity determinants of trade. The excluded (comparison) group will be bilateral trade flows between members of different blocs (e.g. an EU-15 country trading with a Visegrad country). Introducing interaction terms between the bloc dummies and a dummy variable for the post-accession period will allow us to examine whether the development of the margins for the different bilateral relationships behaved differently before and after accession.

Results

As a first step we run the regressions for each of our three trade variables (logs of total exports, intensive margin, extensive margin) excluding the particular EU region dummies, but including various fixed results. The results when the log of exports is the dependent variable are largely as expected. The coefficients on distance are negative and significant, with a value slightly larger in absolute value than the value of one often found in the literature. The coefficients on common language and common border are positive and significant as expected, while that on landlocked tends to be negative and significant. The model as specified explains a large portion of the variance in exporting, with an R-squared ranging from 0.88 to 0.99 (when country and time dummies are included).

When considering the intensive and extensive margins as the dependent variable we find coefficients that are largely consistent with those for total (bilateral) exports. The major exceptions are for the GDP of the importer and the population of the importer when considering the intensive margin, in which cases we tend to find negative (and often significant) coefficients. In terms of the R-squared we observe that the gravity model does not explain as much of the variance in IM or EM as it does total exports, but that the model tends to explain the variation in EM to a greater extent than it does for IM.

In the next stage the three sets of country-group fixed effects ($EU15$, $VISEGRAD$, $OTHEU$) are included. The results obtained allow us to examine whether our measures of trade have developed differently for the three country groupings over the period studied. The coefficients on the gravity variables of these extended models are largely consistent with those described above, and so we turn immediately to the results on the bloc-dummies (see Table 2).

The results for the EU-15 are found to be mixed, depending upon the specification of the gravity equation employed. For exports we find negative and significant coefficients in Columns 1 and 3, but a positive and significant one in Column 2. When looking at the margins the coefficients are more consistent. In particular, for IM we find a coefficient

Table 2

Effects of inclusion of intra-bloc dummy variables

	Exports			
	(1)	(2)	(3)	(4)
VARIABLES	EXP	EXP	EXP	EXP
$INTRA-EU15$	-0.0145	0.0967**	-0.101**	0.00150
	(0.0431)	(0.0473)	(0.0466)	(0.0591)
$INTRA-VISEGRAD$	1.081***	1.001***	1.068***	1.008***
	(0.0862)	(0.0865)	(0.0861)	(0.0857)
$INTRA-OTHEU$	0.810***	0.719***	1.083***	0.937***
	(0.150)	(0.148)	(0.141)	(0.142)
Year dummies	No	Yes	Yes	Yes
Exporter dummies	No	No	Yes	Yes
Importer dummies	No	No	No	Yes
Observations	4,945	4,945	4,945	4,945
R-squared	0.881	0.998	0.998	0.999
F-test	2419	160469	157524	133591

	Intensive margin			
	(1)	(2)	(3)	(4)
VARIABLES	IM	IM	IM	IM
	(0.00126)	(0.00130)	(0.00119)	(0.0511)
$INTRA-EU15$	-0.0123***	-0.0189***	0.00192	0.000838
	(0.00248)	(0.00272)	(0.00246)	(0.00225)
$INTRA-VISEGRAD$	-0.00622	-0.00151	0.00605	0.00212
	(0.00667)	(0.00668)	(0.00613)	(0.00627)
$INTRA-OTHEU$	0.00969*	0.0151***	-0.00623	-0.0105*
	(0.00548)	(0.00549)	(0.00533)	(0.00548)
Year dummies	No	Yes	Yes	Yes
Exporter dummies	No	No	Yes	Yes
Importer dummies	No	No	No	Yes
Observations	4,945	4,945	4,945	4,945
R-squared	0.535	0.702	0.801	0.811
F-test	295.7	347.3	407.9	363.4

	Extensive margin			
	(1)	(2)	(3)	(4)
VARIABLES	EM	EM	EM	EM
$INTRA-EU15$	-0.0310***	-0.0489***	-0.0146**	-0.00514
	(0.00578)	(0.00617)	(0.00572)	(0.00555)
$INTRA-VISEGRAD$	0.191***	0.204***	0.213***	0.208***
	(0.0133)	(0.0134)	(0.0118)	(0.0110)
$INTRA-OTHEU$	0.242***	0.257***	0.231***	0.211***
	(0.0132)	(0.0134)	(0.0129)	(0.0135)
Year dummies	No	Yes	Yes	Yes
Exporter dummies	No	No	Yes	Yes
Importer dummies	No	No	No	Yes
Observations	4,945	4,945	4,945	4,945
R-squared	0.840	0.957	0.974	0.977
F-test	2719	5338	5407	5224

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

that is negative when significant, and for EM a negative coefficient that is significant in 3 out of 4 cases. For Visegrad countries the results point to a strong positive impact of the intra-bloc dummy, suggesting that exports between Visegrad countries are higher than would be expected from the gravity model for the whole period considered. The results on the margins indicate that these higher exports are due to a greater variety of goods exported, with the coefficients on the intensive margin being insignificant. The results for the remaining new members are similar to those for Visegrad, with a large positive coefficient found when looking at the level of exports. In general, the size of this coefficient is smaller – though not significantly so – than that for Visegrad exports. Once again, much of the higher exports between CEECs is found to occur through an increase in the variety of products exported. In this case, there are significant coefficients found when considering the intensive margin, but they are positive in two cases (Columns 1 and 2) and negative in two (Columns 3 and 4).

The results presented above suggest that over the whole period of interest (2000-2007) intra-Visegrad and intra-other new members' exports were higher than would have been expected by considering the gravity equation, while those of the EU-15 were either at or below the level expected. The larger exports among Visegrad and other CEECs that are observed are found to have occurred mainly along the extensive margin, with countries exporting a greater variety of products.

As yet however, we have not been able to answer the question of whether there were changes in the post-accession period. In the final stage therefore we introduce interactions between the country-group dummies and a dummy variable for the post-accession period (i.e. the variable takes the value one in all years after and including 2004). The coefficients on these variables allow us to examine whether trade has responded differently to accession in certain country-groups, and whether there is evidence of any hub-and-spoke arrangement being diminished following accession. Once again, the gravity determinants are largely consistent with those reported above so we move directly to our variables of interest (Table 3).

Considering exports we find that the coefficients on the bloc dummies included are consistent with those reported above for Visegrad and the other new members being large, positive and highly significant. For the EU-15 we find coefficients that are positive and significant in Columns 1 and 2, but insignificant in the remaining two columns. The coefficients on the interactions of the bloc dummies with the post-accession dummy result in negative and significant coefficients for the EU-15, but insignificant coefficients in the other two cases. The results support the view that there has been a decline in intra-EU-15 exports in the post-accession period, but that there is no evidence of such a non-linear relationship in the extent of intra-bloc exporting for Visegrad and the new member states. This latter result suggests that after controlling for standard gravity determinants there has been no significant change in export behaviour for intra-Visegrad exports or exports between other new member states, and is consistent with the view that the reason for the observed increase in intra-Visegrad exports in the post-accession period is due to a natural realignment of trade and to the relatively higher growth of Visegrad countries when compared with EU-15 countries.

Turning to the results on the intensive margin we observe that there are few significant coefficients when looking at the bloc dummies included linearly. Only in the case of the EU-15 (Columns 1 and 2) and the other new member states (Columns 3 and 4) do we find significant coefficients, which in all cases are negative. When interacted with the post-accession dummy we find positive and significant coefficients for Visegrad (Columns 3 and 4) and in all cases for the new member states. These results suggest that at least part of the increase in intra-bloc exports for these countries is due to an increase in the volume of products exported in the post-accession period. When considering the extensive margin we again find negative coefficients (that are significant in two cases) on the EU-15 dummy, and consistently positive and significant

Table 3

Inclusion of intra-bloc and accession dummy interactions

	Exports			
	(1)	(2)	(3)	(4)
VARIABLES	EXP	EXP	EXP	EXP
$INTRA - EU15 \times POST$	-0.149***	-0.156***	-0.129***	-0.120**
	(0.0508)	(0.0507)	(0.0460)	(0.0521)
$INTRA - VISEGRAD \times POST$	0.189	0.194	0.155	0.145
	(0.148)	(0.147)	(0.144)	(0.124)
$INTRA - OTHEU \times POST$	0.255	0.257	0.252	0.254
	(0.279)	(0.278)	(0.258)	(0.255)
Year dummies	No	Yes	Yes	Yes
Exporter dummies	No	No	Yes	Yes
Importer dummies	No	No	No	Yes
Observations	4,945	4,945	4,945	4,945
R-squared	0.882	0.998	0.998	0.999
F-test	1807	140484	148734	128415

	Intensive margin			
	(1)	(2)	(3)	(4)
VARIABLES	IM	IM	IM	IM
$INTRA - EU15 \times POST$	0.00373	0.00407	0.00200	0.00109
	(0.00337)	(0.00337)	(0.00299)	(0.00319)
$INTRA - VISEGRAD \times POST$	0.0179	0.0176	0.0195*	0.0204*
	(0.0122)	(0.0122)	(0.0114)	(0.0112)
$INTRA - OTHEU \times POST$	0.0271***	0.0269***	0.0264***	0.0280***
	(0.00982)	(0.00979)	(0.00924)	(0.00954)
Year dummies	No	Yes	Yes	Yes
Exporter dummies	No	No	Yes	Yes
Importer dummies	No	No	No	Yes
Observations	4,945	4,945	4,945	4,945
R-squared	0.538	0.703	0.802	0.812
F-test	219.0	303.8	380.0	347.4

	Extensive margin			
	(1)	(2)	(3)	(4)
VARIABLES	EM	EM	EM	EM
$INTRA - EU15 \times POST$	-0.00673	-0.00549	-0.0153***	-0.00729
	(0.00743)	(0.00741)	(0.00575)	(0.00611)
$INTRA - VISEGRAD \times POST$	0.00312	0.00198	0.00846	0.000867
	(0.0236)	(0.0234)	(0.0193)	(0.0182)
$INTRA - OTHEU \times POST$	-0.0242	-0.0254	-0.0190	-0.0229
	(0.0249)	(0.0252)	(0.0253)	(0.0254)
Year dummies	No	Yes	Yes	Yes
Exporter dummies	No	No	Yes	Yes
Importer dummies	No	No	No	Yes
Observations	4,945	4,945	4,945	4,945
R-squared	0.841	0.957	0.974	0.978
F-test	2016	4652	5107	5032

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

coefficients for Visegrad countries and the other new members. The results also indicate however that there has been no significant change in behaviour in the post-accession period for these two blocs, with no significant coefficients found on the interaction between the post-accession dummy and the dummies for Visegrad and the other new member states (after controlling for standard gravity determinants).

Conclusions

There has been a great deal of heterogeneity in the growth of exports within blocs inside the expanded EU in the recent past. While the growth of exports between old EU members has been rather sluggish, that of exports between new members has been much faster, in particular for Visegrad countries (Czech Republic, Hungary, Poland, Slovakia). In this article we try to shed some light on these developments. As a first step we address whether within-bloc exports were affected by the accession to the EU, which could be due to a movement away from a hub-and-spoke trading arrangement, or whether the differences represented a general trend that could be caused by a natural realignment of export structure following the period of communism or due to the relatively stronger economic performance of the new accession countries. In a second step, we examine whether the observed changes in exports have been due to an increase in the variety of goods traded, or to an increase in the volume of exports of existing products.

The results we present provide little support for there being an effect of the accession date on within-bloc exports. While exports within new accession countries (and within Visegrad countries in particular) have grown relatively quickly over the period considered, and significantly faster than those for old EU members, we find no evidence indicating that the growth rate of exports in accession countries increased significantly following accession in 2004 after controlling for standard determinants of trade. Our results also indicate that the growth in within-bloc exports amongst accession countries has occurred mainly along the extensive margin, indicating that the variety of products exported within this group of countries has increased. The results for the intensive margin tend to be either insignificant or negative, implying that there has been little change in the volume of existing products exported. Overall, our results would tend to support the view that the relatively strong growth of exports among accession countries is due to a natural realignment of exports and to the relatively stronger performance of these economies when compared with the old members of the EU. Given the still relatively low shares of exports currently going to other accession countries, we may expect that these high growth rates of within-bloc exports among accession countries will continue for some time.

References

Brenton, P. and R. Newfarmer (2007), 'Watching more than the discovery channel: Export cycles and diversification in development', *World Bank Policy Research Working Paper* No. 4302, The World Bank.

Evenett, S.J. and A.J. Venables (2002), 'Export growth by developing economies: Market entry and bilateral trade', mimeo.

Feenstra, R. (1994), 'New product varieties and the measurement of international prices', *American Economic Review*, Vol. 84, No. 1, pp. 157-177.

Felbermayr, G. and W. Kohler (2006), 'Exploring the intensive and extensive margins of world trade', *Review of World Economics*, pp. 642-674.

Funke, M. and R. Ruhwedel (2002), 'Export variety and export performance: Empirical evidence for the OECD countries', *Weltwirtschaftliches Archiv*, Vol. 138, No. 1, pp. 97-114.

Helpman, E., M. Melitz and Y. Rubinstein (2008), 'Estimating trade flows: Trading partners and trading volumes', *Quarterly Journal of Economics*, Vol. 123, pp. 441-487.

Hummels, D. and P. Klenow (2005), 'The variety and quality of a nation's exports', *American Economic Review*, Vol. 95, No. 3, pp. 704-723.

The gravity of cross-border R&D expenditure*

BY SANDRA M. LEITNER, ROBERT STEHRER AND BERNHARD DACHS**

Firms not only produce or sell their products and services abroad, but increasingly also conduct research and development (R&D) at locations outside their home countries – a phenomenon referred to as the 'internationalization of business R&D'. But this is more of a recent phenomenon. In the 1990s, R&D was still 'an important case of non-globalization'. However, during the past two decades, the internationalization of business R&D activities has accelerated strikingly. Specifically, as highlighted by the OECD (2008a), between 1995 and 2003, R&D expenditure of foreign affiliates increased twice as rapidly as their turnover or their host countries' aggregate imports. This renders R&D activities of foreign affiliates one of the most dynamic elements of the process of globalization. However, until recently, the main actors and recipients of cross-border R&D expenditure were developed countries. Lately, some new players have emerged, giving rise to new patterns of R&D internationalization. Especially in Asia, emerging economies gained importance as host countries of R&D internationalization activities, but developing countries also increasingly engaged in outward R&D activities. Despite these developments, the largest part of international R&D still takes place between the triad area, comprising the US, the EU and Japan (OECD, 2008b).

As such, the internationalization of R&D is a surprising development. The international economics as well as the international business literature long regarded R&D and the accumulation of knowledge by companies as activities that are bound to the home countries of multinational firms.

Given the profits that accrue from the presence and activities of R&D intensive foreign-owned firms, attracting them has been high on the political agenda of many economies as R&D expenditure of foreign-owned firms may increase aggregate R&D and innovation expenditure of the country or may give rise to substantial information and knowledge spillovers, foreign-owned firms may boost the demand for skilled personnel including R&D staff or, R&D efforts and the presence of foreign-owned firms may lead to structural change and agglomeration effects.

The ensuing analysis investigates determinants of the process of internationalization of R&D. It uses a novel and unique database of bilateral business R&D expenditure of foreign affiliates in the manufacturing sector of selected OECD countries for the period from 2001 to 2007.

Data

The ensuing analysis is based on a recently compiled database of bilateral business R&D expenditure of foreign affiliates in the manufacturing sector of selected OECD countries.[1] Data on bilateral business R&D expenditure of foreign affiliates cover the period from 2001 to 2007 and were collected from national sources and compiled by the Austrian Institute of Technology (AIT) and the Vienna Institute for International Economic Studies (wiiw) in 2011.[2] This data set was complemented by additional data from different sources: standard gravity indicators like distance ($DIST_{ij}$), common language ($COMLANG_{ij}$) or common border ($COMBORD_{ij}$) are taken from databases created by CEPII. Information on real GDP, tertiary school enrolment rates, high-technology exports and patent applications of resi-

* This article is based on a study financed by the European Commission, DG RTD on 'Internationalization of business investments in R&D and analysis of their economic impact'.

** Austrian Institute of Technology.

1 The following OECD countries are covered: Austria, Belgium, Bulgaria, Canada, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Japan, the Netherlands, Norway, Poland, Portugal, Romania, Spain, the Slovak Republic, Slovenia, Sweden, Turkey, the UK and the US.

2 Data were collected as part of the project 'Internationalisation of business investments in R&D and analysis of their economic impact' but have been slightly revised and updated for this paper.

dent and non-residents and total populations in country *i* and *j* come from the World Bank's *World Development Indicators* (WDI). Finally, information on the technology distance between country *i* and *j* was calculated with patent data provided by the EPO PATSTAT database. It is designed as a matrix of correlation coefficients such that the technology distance proxy increases with a decreasing technological distance between two countries.

On average, between 2001 and 2007, a recipient country in the sample received about EUR 98 million per year and per partner country. However, annual inward business R&D expenditure shows broad dispersion, ranging between EUR 0 and EUR 6.5 billion. More specifically, from 2001 to 2007, the following countries reported the highest R&D expenditure of foreign affiliates: with on average EUR 2.7 billion, the USA reported the highest inward R&D expenditure, followed by Germany with EUR 395 million on average, Japan with EUR 346 million on average and Canada with EUR 203 million on average.

Moreover, between 2001 and 2007, the USA received the highest inward R&D expenditure from Germany (with EUR 4.8 billion on average), followed by the UK (with EUR 4.3 billion on average) and Switzerland (EUR 3.4 billion on average). Germany reported the highest inward R&D expenditure from the USA (with EUR 3.4 billion on average), the Netherlands (EUR 1.7 billion on average) and France (with EUR 1.3 billion on average) while Japan reported the highest inward R&D expenditure from France (with EUR 2.4 billion on average), followed by the USA (with EUR 493 million on average) and the Netherlands (with EUR 435 million on average). Finally, between 2001 and 2007, Canada reported the highest inward R&D expenditure from the USA (with EUR 1.4 billion on average), the UK (with EUR 187 million on average) and Japan (with EUR 82 million on average). In contrast, among all recipient countries included in the sample, inward R&D expenditure was lowest in Bulgaria with an average EUR 7000 only, followed by Latvia (EUR 19,000 on average), Estonia (EUR 400,000 on average) and Romania (EUR 700,000 on average).

Figures 1 to 4 below give a general picture of the magnitudes of R&D internationalization, identify key players (Figure 1) and attractive locations for R&D efforts of foreign affiliates (Figure 2 and Figure 3) and show the spatial structure of the network of bilateral R&D expenditure between European countries (Figure 4). As such, they reveal important phenomena and help formulate hypotheses that will be tested in the ensuing analysis.

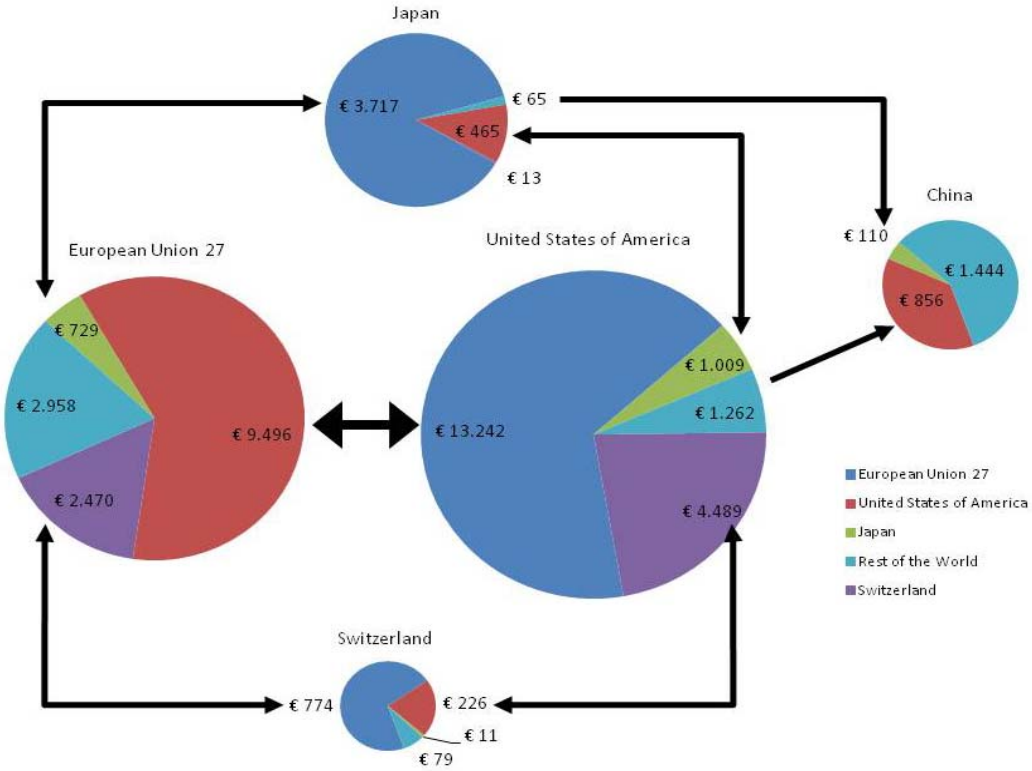
A general picture of inward R&D expenditure in the manufacturing sector by country of origin for key global players (that is the EU, the USA, Japan, China and Switzerland) is drawn in Figure 1 below. The size of each pie chart captures the total amount of inward R&D expenditure in a country, while pie slices represent the volume of inward R&D expenditure by country of origin. Arrows illustrate major R&D-based relations between countries. Figure 1 emphasizes that, as major recipients of inward R&D expenditure, both, the USA as well as the EU are the two key players in the process of internationalization of R&D. Specifically, in 2007, inward R&D expenditure of US firms in the EU and inward R&D expenditure of EU firms in the US together accounted for 2/3 of total inward R&D expenditure in manufacturing worldwide.[3]

Moreover it points at the strong mutual importance of both key players for their respective inward R&D volumes: in 2007, US firms accounted for more than 65% of total inward R&D expenditure in manufacturing in the EU. Similarly, around 62% of EU inward R&D expenditure in the manufacturing sector stem from US firms located in the EU. In addition, Switzerland was the second most important country of origin with around 16% of all inward R&D expenditure coming from Swiss firms located in the EU and around 22% located in the USA. In contrast, Japanese firms located either in the EU or the US accounted for a comparatively small fraction of inward R&D expenditure only.

[3] The European Union is considered as one entity, and intra-EU relationships (for example R&D of German firms in France) are not taken into account.

Figure 1

Inward R&D expenditure between the EU, the US, Japan, China and Switzerland: manufacturing only (2007, in EUR million at current prices)



Reading note: Firms from the European Union spent EUR 774 million on R&D in Switzerland in 2007; Swiss firms spent EUR 2,470 million on R&D in the EU-27 in 2007. Swiss data include also the service sector; data for China are estimated based on national sources and US and Japanese outward data.

Source: OECD, Eurostat, national statistical offices, own calculations.

More recently, China emerged as a new attractive location for R&D efforts of foreign-owned firms. While Chinese data is incomplete and plagued by methodological issues which render a comparison with data from OECD countries difficult, data on R&D expenditure of wholly foreign-owned firms that operate in China suggest around 2.5 billion EUR for the year 2007.

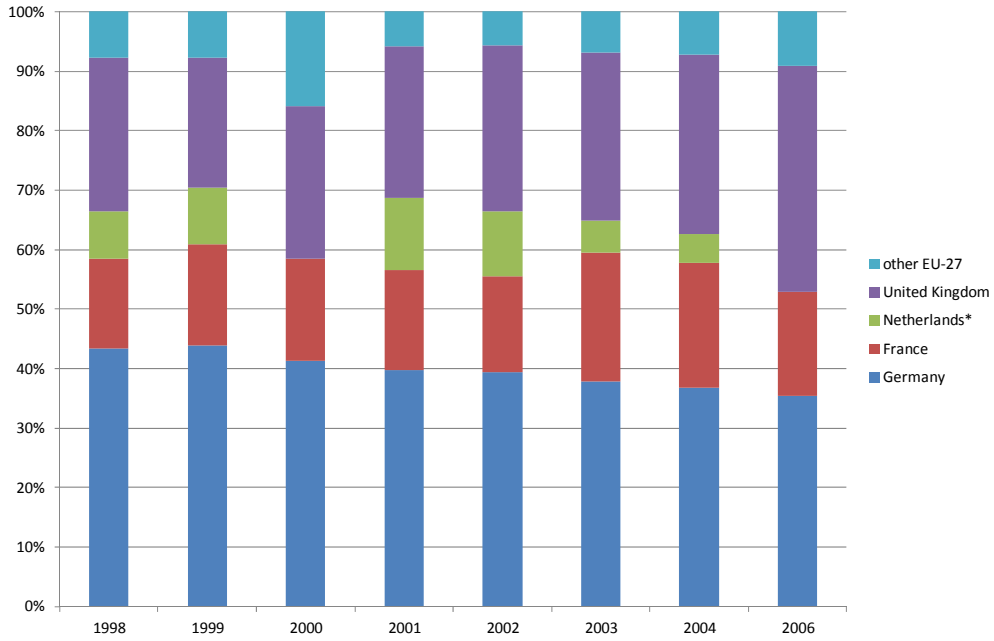
Next, Figure 2 takes a closer look at R&D expenditure of foreign affiliates located in the US, by country of origin (between 1998 and 2006) and therefore identifies the importance of inward R&D efforts of single EU countries in the US.[4] Specifically, it depicts the simple country penetration, as the ratio of inward R&D expenditure from a specific EU country to total inward R&D expenditure from the EU in the US and points at the dominance of three EU countries only. As far back as 1998 and up to 2006, German, French and the British foreign affiliates accounted for around 80% of total EU inward R&D expenditure in the US. Throughout, Germany ranked first, followed by the UK and France. Only in 2006 did the UK overtake Germany as the most important investor in R&D in the US. Hence, given that the US is the world's largest economy with a huge market and attractive sales potentials, the following hypothesis can be formulated:

Hypothesis 1: The size of the market is an important attractor for foreign-owned firms which need to adapt their products or processes to local conditions to meet local consumer preferences or to comply with local legal regulations and laws.

[4] Due to lacking data on outward R&D expenditure for most EU countries, Figure 2 is based on US inward data.

Figure 2

Countries of origin of EU inward Business Enterprise R&D (BERD) in the US (inward BERD from EU-27 country X in US / inward BERD from total EU-27 in US, 1998-2006)

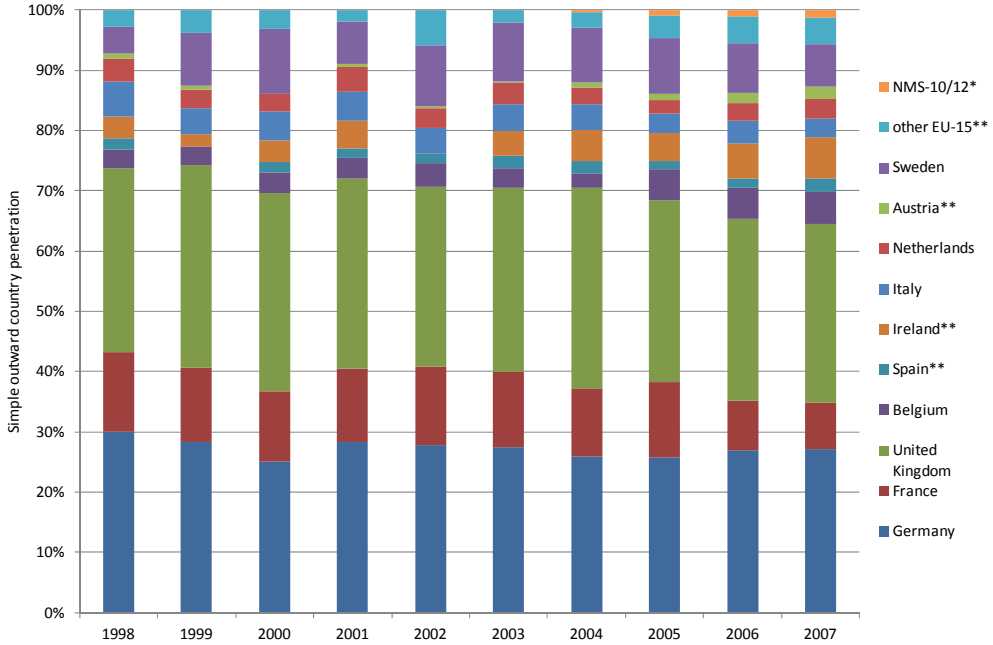


Note: * Included in other EU in 2000 and 2006; Total EU-27 includes all European companies except Swiss companies. No country breakdown is possible for 2005 and 2007.

Source: OECD based on US data by the US Bureau of Economic Analysis, own calculations.

Figure 3

Location of US inward BERD in the EU (US outward BERD in EU-27 country X / US outward BERD in total EU-27, 1999-2007)

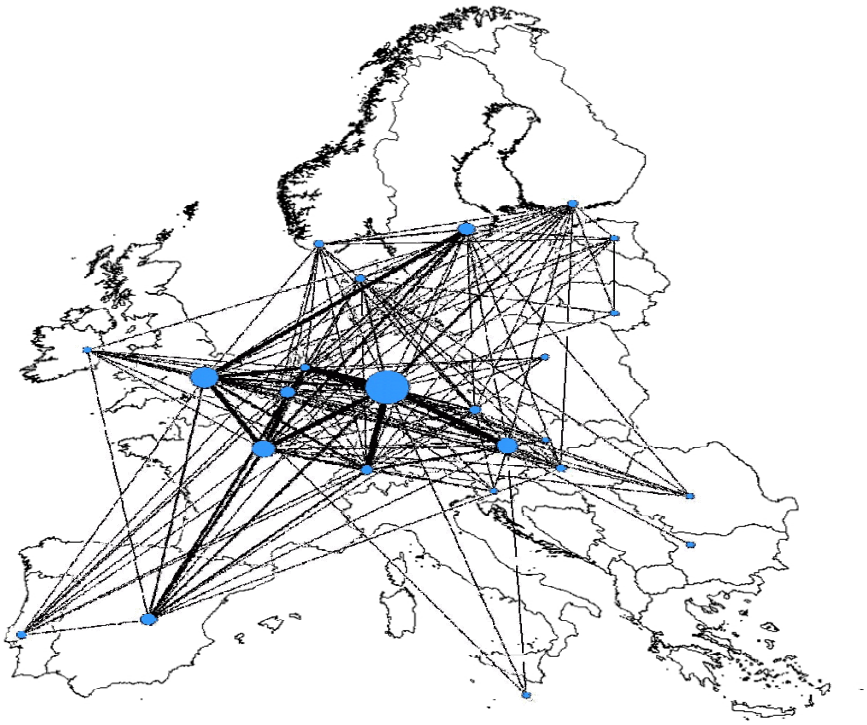


Note: * NMS-10/12 comprises the Czech Republic, Estonia, Cyprus, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia (all from 2004 to 2007) and in 2007 Bulgaria and Romania also. - ** Other EU-15 comprises Greece, Ireland (2002 only), Denmark, Luxemburg, Portugal, Finland, Austria (2000 only) and Spain (1999 only).

Source: OECD based on US outward data by the US Bureau of Economic Analysis, own calculations.

Figure 4

Inward BERD flows between European countries (2007)



Note: The strength of lines between country A and B corresponds to the sum of R&D expenditure of firms from country A which operate in country B, and vice versa. The size of the node per country corresponds to the sum of R&D expenditure of all foreign-owned firms in the country.

Source: OECD, Eurostat, national statistical offices, own calculations.

The opposite perspective is taken in Figure 3 which depicts R&D expenditure of US foreign affiliates located in the EU, by country of destination (between 1998 and 2007) as the ratio of US outward R&D expenditure in a particular EU country to total US outward R&D expenditure in the EU. It demonstrates that throughout the period from 1998 to 2007, the UK, Germany and France were the three most important and attractive individual EU countries for US R&D efforts, together absorbing around 70% of all US outward R&D expenditure in the EU. However, starting in 2005, France appears to have lost some ground while New Member States have become more attractive locations for US R&D efforts. The importance of the three largest EU economies as key locations for US R&D efforts in the EU underscores above hypothesis (H1) that '*the size of the market matters'*.

In addition, a comparison of Figures 2 and 3 shows that US inward R&D expenditure in the EU is much less concentrated in a few economies only than EU inward R&D expenditure in the US, as small and medium-sized EU economies (like Belgium, Ireland, the Netherlands or Austria) are comparatively more important locations for R&D efforts of US companies than the US is for foreign affiliates from small and medium-sized EU economies in the US.

Finally, Figure 4 zooms in on the EU and depicts the spatial structure of the network of R&D investments among European countries. The edge size (that is the link between countries) corresponds to the weighted degree centrality of a country, defined as the sum of R&D expenditure of firms from country A in country B and vice versa while the node size of each country corresponds to the sum of R&D expenditure of foreign-owned firms in the country. Nodes are located at the capital cities of each country.

The spatial network map for 2007 reveals a strong clustering of R&D investment in the centre of Europe while the periphery is participating to a

lower degree. Moreover, Germany appears as the central hub, showing high interaction intensity, particularly with its direct neighbours the Netherlands, Switzerland, Austria or France. Similar neighbourhood effects are apparent for the UK or Spain, which show particular high interaction intensity with Sweden and France or France and Belgium, respectively. In contrast, Finland has a diverse and big set of partner countries, in terms of absolute size, however, the interactions are comparatively low. Against that background, the following additional hypotheses can be formulated:

Hypothesis 2: Geographic distance is obstructive to R&D expenditure of foreign affiliates.

Hypothesis 3: Neighbouring countries are attractive locations for R&D efforts of foreign affiliates.

Hypothesis 4: 'The liability of foreignness' - cultural proximity is conducive to R&D efforts of foreign affiliates as lower cultural barriers improve market knowledge and the understanding of customer needs and facilitate communication and the exchange of information and knowledge across borders.

All in all, while New EU Member States (NMS) are in general connected to the system of R&D investment in Europe, the magnitudes are comparatively low, with the Czech Republic and Hungary showing the strongest R&D-based embeddedness. This peripheral position of NMS may mainly be due to the low number of MNCs originating from there. Interestingly, business R&D investment of NMS appears far less integrated than their public research (including universities and research institutions).

Econometric specification

In order to identify both home and host country characteristics that are either conducive or obstructive to the process of R&D internationalization, a gravity model approach is pursued. Generally, in the empirical literature, gravity models are popular and well known for their success in explaining international trade flows. In essence, the gravity equation for trade says that trade flows between two countries are proportional to the two country's size (as proxied by GDP) but inversely related to the distance between them. Moreover, these models also often account for physical or cultural proximity in terms of shared border, common language or colonial history, respectively. Increasingly, gravity models are also used to explain FDI flows, migration flows or flows of workers' remittances between countries. More recently, gravity models also found their way into the analysis of cross-border inventive activities.

Following the tradition of the gravity literature, the following econometric specifications are estimated to shed light on the roles of home and host country characteristics in driving cross-border business R&D expenditure:

$$\ln RD_{ijt} = \lambda_t + \alpha_i + \alpha_j + \beta_1 \ln DIST_{ij} + ... \\ ... + \beta_2 COMLANG_{ij} + \beta_3 COMBORD_{ij} + ... \\ ... + \beta_4 \ln GDP_{it} + \beta_5 \ln GDP_{jt} + \delta_z X_{zijt} + \varepsilon_{ijt} \quad (1)$$

And, if account is also taken of the level of economic development:

$$\ln RD_{ijt} = \lambda_t + \alpha_i + \alpha_j + \beta_1 \ln DIST_{ij} + ... \\ ... + \beta_2 COMLANG_{ij} + \beta_3 COMBORD_{ij} + ... \\ ... + \beta_4 \ln GDP_{it} + \beta_5 \ln GDP_{jt} + ... \\ ... + \beta_6 \ln\left(\frac{GDP_{it}}{POP_{it}}\right) + \beta_7 \ln\left(\frac{GDP_{jt}}{POP_{jt}}\right) + \delta_z X_{zijt} + \varepsilon_{ijt} \quad (2)$$

where lnRD_{ijt} is the log of business R&D expenditure of foreign affiliates from country *j* located in the host country *i* at time *t.*

ln$DIST_{ij}$ is the log of the geographical distance between country *i* and *j,* measured as the simple distance between most populated cities (in km). As an index of uncertainty and additional information costs (like additional costs of coordinating geographically dispersed R&D activities or of transfer-

ring knowledge over distance), R&D expenditure of foreign-owned firms is expected to decline with growing distance.

$COMLANG_{ij}$ and $COMBORD_{ij}$ are dummies taking the value 1 if the two countries *i* and *j* share a common language or border, respectively. Both are included to capture cultural and physical proximity between country *i* and *j* and are expected to foster R&D activities of foreign-owned firms. Specifically, strong cultural ties between countries ease communication and the exchange of information and knowledge across borders, while physical proximity reduces transportation costs, together rendering cross-border R&D activities comparatively easier and less costly.

Furthermore, $\ln GDP_{it}$ and $\ln GDP_{jt}$ refer to the log of real gross domestic product in country *i* and *j*, respectively and are proxies for the economic size of countries *i* and *j*. Positive effects are expected, since, given their superior market potentials and sales prospects that allow for an easy and quick recovery of sizeable R&D outlays, larger markets are more attractive and conducive to R&D efforts of foreign-owned firms.

Account is also taken of the role a country's level of economic development has in attracting business R&D expenditure of foreign-owned firms. As such, wealthier economies (as proxied by their respective real GDPs per capita, namely $\ln(GDP_{it}/POP_{it})$ for country *i* and $\ln(GDP_{jt}/POP_{jt})$ for country *j*) may not only have a higher purchasing power, but may also be home to consumers with a more pronounced 'love for variety' (see Dixit and Stiglitz, 1977) so that foreign-owned firms which develop or produce novel products or processes consider economies with higher standards of living more attractive markets with better profit perspectives.

In addition to above standard gravity model indicators, innovation related indicators are included to throw light on their roles in driving the internationalization of R&D. X_{zijt} is a matrix of *z* additional innovation related variables that are expected to affect R&D expenditure of foreign affiliates to different degrees. In particular, the analysis includes gross tertiary school enrolment rates in country *i* and *j* to account for the pivotal role the quality of human capital plays for any successful R&D efforts (ENR_TER). Specifically, empirical evidence highlights that cross-country differences in the quality and size of a skilled workforce are an important determinant of R&D internationalization.

Moreover, to capture a country's general level of inventiveness, the ratio of patent applications of residents to patent applications of non-residents in country *i* and *j* is included (PA_RATIO). Specifically, more inventive host countries are attractive for foreign-owned firms seeking to harness prevailing local technology and innovation capabilities for the development of new products or processes.

R&D activities of foreign-owned firms may also crucially depend on differences in countries' abilities to develop and produce internationally competitive high-technology products. In particular, countries with strong indigenous R&D and technological capabilities tend to specialize in high-technology industries and to generate high-technology products (and services) that more easily withstand fierce competition in the global arena. Hence, a high share of high-technology exports in GDP is indicative of an internationally competitive indigenous R&D base foreign-owned firms can harness to successfully develop new products and processes or to adapt products and processes to local conditions and preferences. Therefore, high-technology exports of country *i* and *j* (defined as the share of high-technology exports that are produced with high R&D intensity in total GDP) are included to capture the quality of indigenous R&D and technological capabilities (HTX_SH).

Additionally, cross-country differences in the levels of technological development may also affect the internationalization of R&D. Specifically, there has been a long-standing debate in the FDI literature on the existence and extent of technological spillovers from foreign direct investments with, however, lacking consensus. Some empirical studies lend support to the catching-up hypothesis and find

that technological spillovers increase with a widening of the technology distance. Others suggest the opposite such that only a narrow technology distance is conducive to technological spillovers as closer levels of technological development across countries renders them technologically more compatible, with sufficient absorptive capacities to benefit from each other's research efforts and successes. Hence, the technological distance between country *i* and *j* is included, in terms of a correlation coefficient which, by construction, lies between [0, 1] (TDIS). A high value of the coefficient indicates a narrow technological distance and similar specialization patterns between two countries.

Furthermore, dummies for EU-membership are included which capture whether only country *i* is a member of the EU, whether country *j* is a member of the EU only, or whether both *i* and *j* are EU-member countries. This will show whether R&D expenditure of foreign-owned firms is higher between EU member countries or between EU and non-EU countries. Finally, equation (1) also includes host and home country fixed effects (α_i and α_j for country *i* and *j*, respectively) to account for country heterogeneity and year fixed effects (λ_t) to take account of common macroeconomic shocks.

Results

Results are presented in Table 1 for different econometric specifications (see equations (1) and (2)) and estimation techniques: columns (1) to (3) provide results for the basic specification (equation (1)), while columns (4) to (6) also account for the effect of the level of economic development on R&D expenditure of foreign-owned firms (equation (2)). Moreover, from a methodological point of view, columns (1) and (4) provide results for pooled OLS, columns (2) and (5) for fixed effects for receiving and sending countries and columns (3) and (6) for random effects specific for bilateral country pairs. The main shortcoming of the pooled OLS approach lies in its inability to allow for heterogeneity of host and home countries since it assumes that all countries are homogeneous. This is remedied by fixed effects (column (2)) and random effects approaches (column (3)) which explicitly account for the heterogeneity of both individual host and home countries as well as for heterogeneity of host-home-country pairs, respectively.

The analysis confirms hypothesis 2 outlined above as it finds consistent evidence for the pivotal role geographic distance between countries plays in curbing the process of R&D internationalization. Specifically, R&D expenditure of foreign-owned firms falls by between 0.3% and 0.8% in response to a 1% increase in distance between countries, where distance captures additional coordinative costs of regionally dispersed R&D activities or diseconomies of scale and scope as a result of more decentralized R&D activities.

Moreover, cultural proximity tends to be a determinant of R&D expenditure of foreign affiliates. This supports the 'liability of foreignness' hypothesis formulated above: lower cultural barriers improve market knowledge and the understanding of customer needs and facilitate communication and the exchange of information and knowledge across borders. In a similar vein, in support of hypothesis 3, physical proximity also fosters the internationalization of R&D such that foreign affiliates located in neighbouring countries tend to spend significantly more on R&D activities than affiliates located farther away.

As expected, the size of both home and host countries emerges as one key determinant of cross-border R&D expenditure of foreign-owned firms. In particular, a 1% increase in the both host and home country's market size is associated with a rise in R&D expenditure by between 0.8% and 1%. However, size effects slightly differ across countries and tend to be stronger in the host country. This provides supportive evidence of the 'size matters' hypothesis.

The analysis also demonstrates that apart from size, prevailing levels of economic development matter for the scale of cross-country R&D expenditure. In particular, cross-border R&D expenditure tends to be higher in wealthier economies: a 1%

rise in the host country's GDP per capita increases R&D expenditure of foreign-owned firms by around 0.7% to 0.8% while a similar 1% increase in the home country's GDP per capita has a slightly higher effect and is associated with an around 1% increase in R&D efforts of foreign-owned firms.

Table 1

Host and home country determinants of R&D internationalization (2001-2007)

Dep.Var.: log of R&D expenditure of foreign-owned firms from country j in country i

Estimation technique	Pooled OLS	Country FE	Country-pair RE	Pooled OLS	Country FE	Country-pair RE
Variables	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-21.499***	-85.323**	-18.047***	-35.198***	-110.343**	-31.121***
	(18.55)	(2.00)	(10.88)	(21.18)	(2.13)	(13.25)
Log distance	-0.725***	-0.276***	-0.819***	-0.558***	-0.278***	-0.612***
	(7.70)	(3.05)	(5.66)	(6.11)	(3.07)	(4.37)
Common language	0.645***	-0.134	1.159***	0.091	-0.137	0.585
	(2.72)	(0.64)	(3.13)	(0.39)	(0.65)	(1.64)
Common border	0.399*	1.346***	0.292	0.873***	1.352***	0.761**
	(1.88)	(7.09)	(0.83)	(4.26)	(7.11)	(2.26)
Log real GDP HOST	1.082***	0.905	1.041***	0.832***	-0.938	0.770***
	(21.65)	(0.47)	(13.96)	(12.57)	(0.13)	(8.05)
Log real GDP HOME	0.896***	5.754***	0.841***	0.790***	9.946*	0.748***
	(17.54)	(2.62)	(11.12)	(16.04)	(1.80)	(10.33)
Log real GDP per capita HOST				0.666***	1.868	0.772***
				(4.86)	(0.29)	(4.13)
Log real GDP per capita HOME				1.139***	-4.851	0.938***
				(10.22)	(0.84)	(6.25)
Tertiary enrolment rate HOST	0.044***	0.011	0.029***	0.023***	0.009	0.009
	(9.04)	(0.45)	(4.61)	(4.11)	(0.38)	(1.35)
Tertiary enrolment rate HOME	0.002	0.007	-0.005	-0.008**	0.009	-0.011**
	(0.43)	(0.37)	(1.05)	(2.11)	(0.50)	(2.38)
Ratio patent applications residents HOST	-0.050***	0.009	-0.003	-0.050***	0.010	-0.003
	(2.95)	(0.26)	(0.18)	(3.12)	(0.31)	(0.22)
Raio patent applications residents HOME	-0.081***	-0.050	-0.021	-0.096***	-0.053	-0.023
	(4.21)	(1.21)	(1.17)	(5.25)	(1.27)	(1.28)
Share high-tech exports HOST	0.036*	0.039	0.049**	0.033*	0.039	0.045**
	(1.80)	(0.45)	(2.06)	(1.68)	(0.46)	(1.97)
Share high-tech exports HOME	0.021	-0.051	-0.020	0.016	-0.035	-0.023
	(1.19)	(1.21)	(1.07)	(0.96)	(0.76)	(1.27)
Technological distance	-0.250	1.388**	-0.318	0.779*	1.362**	0.510
	(0.55)	(2.49)	(0.47)	(1.78)	(2.43)	(0.79)
Dummy: HOST EU-member	1.031***		0.434	0.694**		0.348
	(3.27)		(0.87)	(2.32)		(0.74)
Dummy: HOME EU-member	1.797***		1.504***	1.610***		1.347***
	(5.60)		(2.80)	(5.30)		(2.66)
Dummy: HOST and HOME EU-member	1.259***		0.346	1.270***		0.518
	(3.73)		(0.66)	(3.96)		(1.05)
Year fixed effects	YES	YES	YES	YES	YES	YES
Observations	1054	1054	1054	1054	1054	1054
Adj. R^2	0.587	0.779	0.580	0.631	0.779	0.624
Number of i			362			362

Note: t-statistics in parentheses, *** p < 0.01, ** p < 0.05, * p < 0.1.

All regressions include time fixed effects. Estimation results in columns (1) and (4) are based on pooled OLS, results in columns (2) and (5) use country fixed effects for both receiving and sending countries while results in columns (3) and (6) use random effects specific for bilateral country-pairs.

Moreover, light is shed on the particular roles additional innovation-related indicators play for the process of R&D internationalization. Results in Table 1 highlight that human capital emerges as a non-negligible determinant of cross-country R&D expenditure of foreign-owned firms. However, results also reveal that underlying dynamics appear to differ across specifications. Specifically, column (1) to (3) show that there is evidence that a strong human capital base in the host country attracts business R&D: a 1 percentage point increase in the host country's tertiary enrolment rate is associated with a 2.9% increase in R&D expenditure of foreign affiliates. In contrast, results presented in columns (4) to (6) stress that, once levels of economic development of both host and home country are also taken into account, an abundance of human capital in the home country appears to discourage R&D internationalization activities of foreign-owned firms. However, diverging results on the role of human capital for the process of R&D internationalization are not – as it may seen - contradictory but suggest that, once levels of economic development are also controlled for, the host country's endowment with human capital becomes of secondary importance while its level of development (together with its economic size) assumes the role of main driver of the process of R&D internationalization.

Similarly, there is evidence that a strong and internationally competitive indigenous R&D base in the host country is conducive to R&D expenditure of foreign-owned firms. Hence, host countries that specialize in and generate internationally competitive high-technology products are attractive R&D locations for foreign-owned firms as they possess indigenous technological capabilities foreign-owned firms can exploit for their innovative activities.

The analysis also emphasizes that technological distance matters. In particular, R&D expenditure of foreign-owned firms appears to be higher between countries with similar technological specializations which may indicate that R&D activities of foreign-owned firms are attracted by potential spillovers in technological domains similar to their own specialization.

In contrast, no decisive role can be attributed to a country's general level of inventiveness in fostering R&D expenditure of foreign affiliates.

Finally, the analysis also demonstrates that cross-border R&D expenditure tend to be regionally dispersed across EU as well as non-EU member countries.

Summary and conclusion

In the course of the last two decades, R&D expenditure of foreign-owned firms increased tremendously, an indication that firms increasingly conduct research and development outside their home countries. Against that backdrop, the analysis identified important determinants of this more recent process of increased R&D internationalization. It uses a novel data set on R&D expenditure of foreign-owned firms in the manufacturing sector of a set of OECD countries, spanning the period from 2001 to 2007.

Generally, the results attribute a pivotal role to geographic distance in curbing R&D expenditure of foreign-owned firms. This may be explained by the costs of R&D internationalization (like additional costs of coordinating geographically dispersed R&D activities or of transferring knowledge over distance) which tend to noticeably increase with distance which, in turn, renders highly dispersed R&D activities more costly and consequently less attractive. Moreover, cultural proximity which facilitates communication and the exchange of knowledge as well as physical proximity which turns neighbouring countries attractive R&D hubs emerge as important determinants of the process of R&D internationalization. Furthermore, as expected, economic size and wealth of host and home countries alike are key determinants which – in the light of larger markets with more favourable sales prospects as well as wealthier consumers with a stronger and more pronounced 'love for variety' – stimulate R&D efforts of foreign affiliates.

In addition, R&D efforts of foreign-owned firms also respond to additional scientific or technological capabilities. In particular, while some indication is

found that a strong human capital base in the host country attracts business R&D of foreign-owned firms, there is additional evidence that an abundance of human capital in the home country tends to curtail the relocation of innovative activities to other parts of the world. Similarly, a strong and internationally competitive indigenous R&D base in the host country which foreign-owned firms can harness and exploit for their own research activities is conducive to R&D expenditure of foreign affiliates. Furthermore, R&D expenditure of foreign-owned firms is also significantly stronger among countries with similar levels of technological development, which renders technological compatibility among countries a non-negligible driver of the process of R&D internationalization. Finally, some indication is found that R&D expenditure of foreign-owned firms is regionally decentralized and not concentrated within the EU.

These results have important implications for science, technology and innovation policy. They point at areas where governments can take concerted action to render their countries more attractive for R&D activities of foreign-owned firms. These critical areas are science and education. Governments that succeed in strengthening domestic research and development capabilities and in raising tertiary enrolment rates may also succeed in attracting R&D of foreign-owned firms. Governments that want to attract R&D of foreign multinational firms should focus on the economic fundamentals - provide a healthy business environment, political stability, good public infrastructure, reasonable tax rates, a stable legal system including the protection of intellectual property rights - rather than grant special incentives to foreign-owned firms willing to locate R&D in this country.

References

Background report for the OECD forum on the internationalization of R&D, Brussels: Organisation for Economic Co-operation and Development.

Dixit, A.K. and J. E. Stiglitz (1977), 'Monopolistic competition and optimum product diversity', *American Economic Review*, Vol. 67, pp. 297-308.

OECD (2008a), 'Recent Trends in the Internationalisation of R&D in the Enterprise Sector, Special Session of Globalisation', DSTI/EAS/IND/SWP(2006)1/Final, Working Paper on Statistics, Organisation for Economic Co-operation and Development, Paris.

OECD (2008b), 'The Internationalisation of Business R&D: Evidence, Impacts and Implications', Organisation for Economic Co-operation and Development, Paris.

STATISTICAL ANNEX

Selected data on FDI in Central, East and Southeast Europe

(taken from the *wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012*)

Table 1

FDI inflow, EUR million [1)]

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	1851	2736	3152	6222	9052	6728	2437	1209	1341
Czech Republic	1863	4007	9374	4355	7634	4415	2110	4637	3890
Estonia	822	771	2307	1432	1985	1182	1323	1162	130
Hungary [2)]	1888	3439	6172	5454	2852	4191	1517	1728	2999
Latvia	271	513	568	1326	1698	863	68	286	1114
Lithuania	160	623	826	1448	1473	1341	47	568	875
Poland [3)]	4067	10237	7112	12711	15902	9736	7940	6674	9500 [4)]
Romania	1946	5183	5213	9061	7250	9496	3489	2220	1920
Slovakia	1914	2441	1952	3741	2618	3200	-4	397	1542
Slovenia	271	665	473	513	1106	1330	-470	274	791
New Member States-10	**15051**	**30615**	**37148**	**46264**	**51570**	**42481**	**18457**	**19155**	**24101**
Albania	157	278	213	259	481	665	717	793	742
Bosnia and Herzegovina	338	412	282	442	1329	684	181	174	313
Croatia	1762	950	1468	2765	3651	4219	2415	295	1048
Macedonia	100	261	77	345	506	400	145	159	304
Montenegro	44	53	403	496	683	656	1099	574	401
Serbia	1300	772	1268	3392	2513	2018	1410	1003	1949
Turkey	1505	2239	8063	16075	16086	13261	6030	6818	11425
Southeast Europe	**5205**	**4964**	**11773**	**23774**	**25249**	**21902**	**11997**	**9816**	**16182**
Belarus	152	131	245	280	1311	1539	1326	1048	2775
Kazakhstan	1854	3346	1583	5002	8123	9732	9497	8109	9274
Moldova	65	118	153	206	396	483	104	149	197
Russia	7041	12422	10336	23675	40237	51177	26254	32802	37974
Ukraine	1260	1380	6263	4467	7220	7457	3453	4893	5177
Selected CIS	**10372**	**17397**	**18580**	**33629**	**57287**	**70388**	**40633**	**47001**	**55397**
Total region	**30629**	**52975**	**67501**	**103667**	**134107**	**134771**	**71087**	**75973**	**95680**

Bulgaria: equity capital + reinvested earnings from 1997 + loans from 1996.
Czech Republic: equity capital + reinvested earnings from 1998 + loans from 1998.
Estonia: equity capital + reinvested earnings + loans.
Hungary: equity capital + reinvested earnings from 1995 + loans from 1995.
Latvia: equity capital + reinvested earnings from 1996 + loans from 1996.
Lithuania: equity capital + reinvested earnings from 1995 + loans from 1997.
Poland: equity capital + reinvested earnings + loans from 1991.
Romania: equity capital + reinvested earnings from 2003 + loans from 1998.
Slovakia: equity capital + reinvested earnings from 1995 + loans from 1995.
Slovenia: equity capital + reinvested earnings from 1994 + loans from 2001.

Albania: equity capital + reinvested earnings from 2008 + loans from 1999.
Bosnia and Herzegovina: equity capital + reinvested earnings from 2004 + loans from 2004.
Croatia: equity capital + reinvested earnings from 1997 + loans from 1997.
Macedonia: equity capital + reinvested earnings from 2003 + loans from 1996.
Montenegro: equity capital cash + loans from 2005.
Serbia: equity capital + reinvested earnings from 2007 + loans.
Turkey: equity capital + reinvested earnings from 1995 + loans from 2002.

Belarus: equity capital + reinvested earnings from 1997 + loans from 2000.
Kazakhstan: equity capital + reinvested earnings from 1996 + loans.
Moldova: equity capital + reinvested earnings from 1997 + loans from 1995.
Russia: equity capital + reinvested earnings from 1998 + loans from 1997.
Ukraine: equity capital + reinvested earnings from 2002 + loans from 2003.

1) Excluding Special Purpose Entities (SPEs). So far only Hungary and Poland provide data including/excluding SPEs. - 2) The respective values including SPEs in 2005-2010 are: 16239, 15709, 51015, 49590, 2545, -31805. - 3) The respective values including SPEs in 2005-2010 are: 8330, 15741, 17242, 10128, 9896, 7319. - 4) wiiw estimate.

Source: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks according to balance of payments statistics.

Table 2

FDI outflow, EUR million [1)]

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	23	-166	249	141	206	522	-68	173	137
Czech Republic	183	817	-15	1170	1184	2959	684	881	829
Estonia	137	217	556	882	1277	760	1115	100	-1046
Hungary [2)]	1463	892	1756	3127	2643	1514	1423	1005	3117
Latvia	44	89	103	136	270	166	-45	16	66
Lithuania	34	212	278	232	437	229	156	60	118
Poland [3)]	269	757	1574	4107	2680	2680	1932	4127	*3000* [4)]
Romania	36	56	-24	337	204	189	-62	-16	19
Slovakia	219	-17	120	408	438	362	651	247	353
Slovenia	421	441	516	687	1317	983	174	-60	40
New Member States-10	**2829**	**3297**	**5111**	**11227**	**10655**	**10365**	**5961**	**6533**	**6633**
Albania	.	11	3	8	17	55	28	5	30
Bosnia and Herzegovina	.	1	0	3	20	11	4	32	14
Croatia	106	279	192	208	216	973	888	-113	26
Macedonia	0	1	2	0	-1	-9	8	1	2
Montenegro	5	2	4	26	115	74	33	22	12
Serbia	105	-2	18	70	692	193	38	143	122
Turkey	424	627	855	736	1537	1733	1113	1104	1770
Southeast Europe	**641**	**919**	**1074**	**1052**	**2596**	**3030**	**2113**	**1194**	**1976**
Belarus	1	1	2	2	11	22	72	38	40
Kazakhstan	-108	-1029	-117	-306	2304	818	2266	5902	3254
Moldova	0	-1	0	-1	13	11	5	3	15
Russia	8606	11085	10240	18454	33547	37934	31407	39799	48318
Ukraine	12	3	221	-106	491	690	116	555	138
Selected CIS	**8511**	**10059**	**10345**	**18043**	**36365**	**39475**	**33866**	**46296**	**51765**
Total region	**11981**	**14275**	**16531**	**30321**	**49617**	**52870**	**41940**	**54024**	**60374**

Bulgaria: equity capital + reinvested earnings from 1999 + loans from 1997.
Czech Republic: equity capital + reinvested earnings from 1998 + loans from 1998.
Estonia: equity capital + reinvested earnings from 1996 + loans from 1993.
Hungary: equity capital + reinvested earnings from 1995 + loans from 1995.
Latvia: equity capital + reinvested earnings from 1996 + loans.
Lithuania: equity capital + reinvested earnings from 1997 + loans from 1997.
Poland: equity capital + reinvested earnings + loans from 1996.
Romania: equity capital + reinvested earnings from 2005 + loans from 2005.
Slovakia: equity capital + reinvested earnings from 1995 + loans from 1995.
Slovenia: equity capital + reinvested earnings from 1994 + loans from 2001.

Albania: equity capital + reinvested earnings from 2008 + loans from 2006.
Bosnia and Herzegovina: equity capital + reinvested earnings from 2006 + loans.
Croatia: equity capital + reinvested earnings from 1997 + loans from 1997.
Macedonia: equity capital.
Montenegro: equity capital cash + loans from 2010.
Serbia: equity capital + reinvested earnings from 2007 + loans.
Turkey: equity capital + reinvested earnings from 1999 + loans from 2002.

Belarus: equity capital+ reinvested earnings from 2007 + loans from 2002.
Kazakhstan: equity capital + reinvested earnings from 2004 + loans from 2000.
Moldova: equity capital + loans.
Russia: equity capital + reinvested earnings from 1998 + loans from 1997.
Ukraine: equity capital + reinvested earnings from 2008 + loans from 2005.

1) See footnote 1) in Table 1. - 2) The respective values including SPEs in 2005-2010 are: 10126, 14964, 48709, 48152, 2705, -34073. - 3) The respective values including SPEs in 2005-2010 are: 2767, 7122, 4020, 3072, 3715, 3557. - 4) wiiw estimate.

Source: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks according to balance of payments statistics.

Table 3

Inward FDI stock, EUR million [1)]

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	5045	7421	11757	17830	25770	31658	34170	36173	36829
Czech Republic	35852	42035	51424	60621	76338	81302	87330	96153	96798
Estonia	5553	7374	9561	9644	11386	11775	11654	12302	12763
Hungary [2)]	38329	45134	51644	60876	65044	62455	68810	67949	65250
Latvia	2630	3324	4159	5702	7466	8126	8072	8184	9373
Lithuania	3968	4690	6921	8377	10283	9191	9560	10297	10762
Poland [3)]	45896	63332	75231	91072	115980	110419	121641	145181	142000 [4)]
Romania	9661	15040	21884	34512	42771	48797	49985	52585	54353
Slovakia	12617	16068	19968	25517	29058	36226	36469	37632	40000 [4)]
Slovenia	5047	5580	6134	6822	9765	11236	10538	10772	11705
New Member States-10	**164597**	**209998**	**258681**	**320973**	**393861**	**411184**	**438230**	**477226**	**479833**
Albania	382	614	861	1048	1815	2040	2233	2640	3000 [4)]
Bosnia and Herzegovina	1236	1679	1951	2432	3666	4358	4723	4880	5000 [4)]
Croatia	6809	9114	12332	20782	30612	22191	25344	26166	23868
Macedonia	1292	1610	1769	2099	2545	2969	3141	3351	3500 [4)]
Montenegro	125	178	580	1076	1759	2414	3514	4088	4489
Serbia	2076	2848	4116	7508	10021	13459	14641	15711	17677
Turkey	26572	28309	60456	72227	104700	57749	99816	139215	108454
Southeast Europe	**38492**	**44352**	**82065**	**107172**	**155117**	**105181**	**153413**	**196050**	**165989**
Belarus	1519	1510	2014	2077	3044	4778	5952	7479	10035
Kazakhstan	14073	16425	21579	24986	30400	41720	50080	61801	72429
Moldova	571	620	862	972	1276	1832	1882	2173	2459
Russia	77371	89752	151745	201770	335441	152964	264072	372793	400000 [4)]
Ukraine	6055	7061	14553	17559	25905	33336	36282	43663	50053
Selected CIS	**99589**	**115369**	**190753**	**247364**	**396065**	**234630**	**358269**	**487910**	**534975**
Total region	**302678**	**369719**	**531499**	**675509**	**945043**	**750994**	**949911**	**1161186**	**1180797**

Bulgaria: equity capital + reinvested earnings from 1997 + loans from 1996.
Czech Republic: equity capital + reinvested earnings from 1997 + loans from 1997.
Estonia: equity capital + reinvested earnings + loans.
Hungary: equity capital + reinvested earnings from 1995 + loans from 1995.
Latvia: equity capital + reinvested earnings + loans.
Lithuania: equity capital + reinvested earnings + loans from 1996. From 2005 joint stock companies valued at market value (book value before).
Poland: equity capital + reinvested earnings + loans from 1992.
Romania: equity capital + reinvested earnings from 2003 + loans from 1994.
Slovakia: equity capital + reinvested earnings + loans.
Slovenia: equity capital + reinvested earnings + loans.

Albania: equity capital + reinvested earnings + loans.
Bosnia and Herzegovina: equity capital + reinvested earnings from 2003 + loans from 2003.
Croatia: equity capital + reinvested earnings from 1997 + loans form 1997.
Macedonia: equity capital + reinvested earnings + loans.
Montenegro: equity capital cash + loans from 2006; cumulated inflows from 2001.
Serbia: equity capital + reinvested earnings + loans; cumulated inflows until 2007.
Turkey: equity capital + reinvested earnings + loans from 2001.

Belarus: equity capital + reinvested earnings + loans from 2002.
Kazakhstan: equity capital + reinvested earnings + loans from 2000.
Moldova: equity capital + reinvested earnings from 1997 + loans from 1994.
Russia: equity capital + reinvested earnings from 1998 + loans from 1997.
Ukraine: equity capital + reinvested earnings + loans from 2002.

1) See footnote 1) in Table 1. - 2) The respective values including SPEs in 2005-2010 are: 74725, 91003, 133420, 182193, 183756, 159168. - 3) The respective values including SPEs in 2004-2010 are: 63601, 76785, 95554, 121280, 116634, 129128, 144557. - 4) 2010: wiiw estimate.

Source: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks according to international investment position.

Table 4

Outward FDI stock, EUR million [1)]

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	42	-129	105	344	552	1038	971	1158	1312
Czech Republic	1808	2760	3061	3810	5812	9002	10275	11166	11956
Estonia	816	1040	1639	2732	4193	4764	4605	4325	3611
Hungary [2)]	2782	4412	6601	9394	11801	12485	13363	14935	18439
Latvia	92	175	238	363	638	742	620	670	687
Lithuania	96	310	608	793	1072	1413	1597	1571	1557
Poland [3)]	1700	2188	3776	6451	9192	10889	13481	23950	28000 [4)]
Romania	165	200	181	668	842	1054	970	1131	1149
Slovakia	663	618	504	1006	1267	2113	2188	2495	3000 [4)]
Slovenia	1880	2224	2789	3452	4917	5677	5568	5519	5519
New Member States-10	**10043**	**13799**	**19500**	**29012**	**40285**	**49176**	**53639**	**66918**	**75230**
Albania	.	18	17	29	51	105	116	115	140 [4)]
Bosnia and Herzegovina	.	.	.	.	.	.	.	.	.
Croatia	1627	1563	1730	1833	2580	3750	4556	3283	3500
Macedonia	34	40	53	29	46	61	67	72	73 [4)]
Montenegro	5	7	11	37	152	226	259	281	293
Serbia	142	140	158	227	919	2750	2787	2944	3070
Turkey	4860	5183	7048	6732	8295	12823	15445	16143	18574
Southeast Europe	**6667**	**6952**	**9016**	**8887**	**12043**	**19714**	**23230**	**22837**	**25651**
Belarus	5	6	12	14	31	52	101	155	185
Kazakhstan	240	-713	-962	-765	1473	2299	4937	12273	15414
Moldova	19	18	21	18	28	41	45	51	69
Russia	72687	78741	123498	164282	252838	145726	210643	278629	320000 [4)]
Ukraine	133	146	396	261	4136	4969	5065	5992	6298
Selected CIS	**73084**	**78197**	**122965**	**163810**	**258507**	**153086**	**220791**	**297100**	**341965**
Total region, Poland incl.SPE	**89794**	**98947**	**151482**	**201710**	**310835**	**221977**	**297659**	**386856**	**442845**

Bulgaria: equity capital + reinvested earnings + loans.
Czech Republic: equity capital + reinvested earnings from 1997 + loans from 1997.
Estonia: equity capital + reinvested earnings + loans.
Hungary: equity capital + reinvested earnings from 1995 + loans from 1995.
Latvia: equity capital + reinvested earnings + loans.
Lithuania: equity capital + reinvested earnings + loans from 1996. From 2005 joint stock companies valued at market value (book value before).
Poland: equity capital + reinvested earnings + loans from 1996.
Romania: equity capital + reinvested earnings + loans from 2004.
Slovakia: equity capital + reinvested earnings + loans.
Slovenia: equity capital + reinvested earnings + loans.

Albania: equity capital + reinvested earnings + loans from 2008.
Bosnia and Herzegovina: not available.
Croatia: equity capital + reinvested earnings + loans.
Macedonia: equity capital + reinvested earnings + loans.
Montenegro: equity capital cash; cumulated outflows from 2001.
Serbia: equity capital + reinvested earnings + loans; cumulated outflows until 2007.
Turkey: equity capital + reinvested earnings + loans from 2009.

Belarus: equity capital + reinvested earnings + loans from 2001.
Kazakhstan: equity capital + reinvested earnings + loans from 2000.
Moldova: equity capital + loans from 1995.
Russia: equity capital + reinvested earnings from 1997 + loans from 1997.
Ukraine: equity capital + reinvested earnings + loans from 2005.

1) See footnote 1) in Table 1. - 2) The respective values including SPEs in 2005-2010 are: 25981, 43378, 90710, 134316, 127590, 103815. - 3) The respective values including SPEs in 2004-2010 are: 2457, 5304, 10875, 14413, 17062, 20547, 27573. - 4) 2010: wiiw estimate.

Source: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks according to international investment position.

Table 5

Inward FDI stock per capita in EUR

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	647	956	1523	2322	3373	4162	4518	4820	5018
Czech Republic	3511	4113	5016	5893	7354	7767	8312	9129	9175
Estonia	4110	5473	7110	7184	8491	8784	8696	9179	9527
Hungary	3789	4470	5125	6048	6475	6226	6871	6805	6558
Latvia	1134	1441	1813	2499	3288	3594	3590	3670	4550
Lithuania	1151	1369	2034	2475	3055	2744	2872	3174	3364
Poland	1202	1659	1972	2389	3043	2895	3187	3801	3712
Romania	445	694	1013	1600	1987	2270	2329	2456	2858
Slovakia	2345	2984	3705	4731	5380	6693	6722	6924	7339
Slovenia	2528	2793	3062	3394	4858	5529	5148	5254	5710
New Member States-10	**1605**	**2051**	**2530**	**3143**	**3858**	**4026**	**4292**	**4682**	**4837**
Albania	123	196	274	333	573	639	699	819	933
Bosnia and Herzegovina	323	437	508	633	954	1134	1229	1270	1301
Croatia	1533	2053	2776	4681	6901	5004	5722	*5923*	*5422*
Macedonia	636	791	867	1027	1245	1448	1530	1629	1699
Montenegro	201	285	931	1724	2809	3840	5564	6607	7241
Serbia	374	479	649	1101	1352	1607	1801	1927	2435
Turkey	397	418	882	1041	1491	812	1385	1907	1482
Southeast Europe	**435**	**497**	**911**	**1179**	**1692**	**1136**	**1641**	**2076**	**1755**
Belarus	157	159	212	219	314	502	627	789	1060
Kazakhstan	941	1090	1418	1623	1952	2644	3090	3759	4344
Moldova	158	172	240	271	357	513	528	610	691
Russia	537	626	1063	1419	2362	1078	1861	2609	2807
Ukraine	127	149	310	376	559	722	789	*954*	1097
Selected CIS	**453**	**527**	**875**	**1138**	**1823**	**1082**	**1650**	**2236**	**2456**
Total region	**737**	**901**	**1295**	**1646**	**2299**	**1824**	**2301**	**2801**	**2869**

Source: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012.

Table 6

FDI inflow as a percentage of gross fixed capital formation

	2003	2004	2005	2006	2007	2008	2009	2010	2011
Bulgaria	53.0	65.9	52.6	85.1	102.5	56.5	24.2	14.7	16.7
Czech Republic	8.2	16.8	34.7	14.3	21.4	10.7	6.0	12.7	10.5
Estonia	29.9	25.8	64.3	29.7	34.8	24.4	44.5	43.1	3.8
Hungary	11.4	18.4	30.5	28.0	13.2	18.3	8.0	9.9	17.8
Latvia	11.1	16.6	14.2	25.2	23.7	12.7	1.7	8.2	24.8
Lithuania	4.6	15.2	17.2	23.8	18.2	16.3	1.0	12.7	16.2
Poland	11.6	27.7	16.0	23.8	23.7	12.0	12.1	9.5	12.7
Romania	17.2	39.0	27.5	36.2	19.2	21.3	12.1	7.5	5.7
Slovakia	26.2	29.9	19.1	31.7	18.2	20.0	0.0	2.7	10.0
Slovenia	4.4	9.8	6.5	6.2	11.5	12.4	-5.7	3.6	11.4
New Member States-10	**13.5**	**25.1**	**25.3**	**26.9**	**23.9**	**17.1**	**9.6**	**9.8**	**11.7**
Albania	7.7	12.7	8.8	9.3	15.9	19.7	22.0	27.3	24.8
Bosnia and Herzegovina	.	20.3	11.5	19.1	42.3	17.7	5.9	6.4	10.6
Croatia	23.3	11.6	16.5	26.7	32.1	31.9	21.3	3.0	11.5
Macedonia	14.6	33.8	9.7	37.4	43.3	28.4	10.8	11.8	19.7
Montenegro	21.8	18.4	123.4	105.5	78.7	55.6	137.8	87.6	62.7
Serbia	44.8	21.1	32.9	69.2	36.4	26.0	26.0	20.8	28.7
Turkey	3.3	3.5	9.9	17.2	15.9	13.4	8.1	6.5	9.4
Southeast Europe	**8.8**	**6.1**	**11.8**	**20.6**	**19.8**	**16.8**	**12.1**	**7.8**	**11.1**
Kazakhstan	29.4	38.4	12.3	25.7	35.3	40.0	41.3	29.9	28.7
Russia	10.0	14.2	9.5	16.2	20.2	20.3	13.6	13.4	13.4
Ukraine	13.8	11.7	41.3	21.1	25.2	23.0	22.4	26.3	23.2

Source: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012.

Table 7

Inward FDI stock in NMS-10 by major home countries

as of December 2010, share in per cent

	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI	NMS-10
Austria	15.4	12.9	1.1	12.8	2.0	0.6	3.5	17.8	16.0	47.9	11.0
Belgium	1.2	2.8	0.4	3.3	0.2	0.6	2.5	1.6	3.5	2.7	2.4
Cyprus	5.4	3.8	2.7	2.5	4.9	3.1	2.2	4.8	2.8	1.4	3.2
Denmark	0.7	0.7	2.5	0.5	7.0	10.4	2.0	0.7	1.0	0.6	1.5
Finland	0.1	0.1	23.4	1.4	4.5	4.8	0.9	0.3	0.3	0.2	1.3
France	2.1	5.7	1.8	5.0	0.7	2.5	12.4	8.3	4.1	6.0	7.4
Germany	5.5	13.8	2.4	23.2	5.2	11.0	13.6	12.2	12.1	5.6	13.4
Greece	7.9	0.0	0.1	0.0	.	-0.1	0.0	5.7	0.0	0.1	1.2
Hungary	3.1	0.4	0.0	.	0.0	0.1	0.3	1.4	5.0	0.5	1.0
Italy	1.7	1.0	0.6	-4.2	0.5	0.1	7.0	5.3	7.9	6.2	3.3
Japan	0.2	1.2	0.0	1.2	0.0	.	0.8	0.3	0.3	0.3	0.7
Luxembourg	2.5	6.1	1.8	8.1	3.4	2.7	8.7	1.9	4.3	1.9	6.0
Netherlands	20.3	29.6	8.9	17.1	6.7	8.8	17.8	20.7	26.0	5.1	20.3
Norway	0.3	0.1	2.9	0.7	3.1	3.3	0.4	0.2	0.3	.	0.5
Russia	3.2	0.3	3.5	2.2	4.1	8.2	0.0	0.1	-0.5	0.7	0.9
Spain	2.4	3.6	0.4	1.4	0.5	0.1	3.3	2.0	0.6	0.0	2.4
Sweden	0.4	1.3	35.0	0.6	12.9	8.9	3.5	0.6	0.8	0.4	2.9
Switzerland	2.0	4.5	1.0	3.6	1.8	2.5	3.8	3.8	1.1	7.6	3.5
United Kingdom	7.4	2.4	2.0	2.6	2.2	1.2	3.7	1.2	1.4	2.9	3.0
United States	2.6	3.3	1.6	4.7	3.2	1.4	6.3	2.6	1.4	0.6	4.0
Other countries	15.6	6.2	7.9	13.3	37.2	30.0	7.3	8.4	11.8	9.3	10.0
EU-15	69.8	79.8	81.1	73.1	49.7	51.9	82.5	79.1	78.8	79.7	77.7
EU-27	82.8	88.6	87.0	76.4	73.8	78.1	86.1	87.8	91.9	82.2	83.9
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total, EUR mn	**36173**	**96153**	**12302**	**67949**	**8184**	**10297**	**150441**	**52585**	**37632**	**10772**	**482486**

CZ: Czech Republic, HU: Hungary, PL: Poland, SK: Slovakia, SI: Slovenia, BG: Bulgaria, RO: Romania, EE: Estonia, LV: Latvia, LT: Lithuania, NMS: New Member States.

Sources: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks.

Table 8

Inward FDI stock in SEE-7 and some selected CIS by major home countries

as of December 2010, share in per cent

	AL	BA	HR	MK	ME	RS	TR	SEE-7	KZ	RU	UA
Austria	13.7	19.7	28.9	11.1	8.7	18.5	5.1	10.0	2.2	1.7	6.1
Belgium	.	.	0.8	0.0	1.0	0.5	5.0	3.8	0.3	0.6	0.1
Croatia	0.2	14.1	.	2.2	-0.3	2.1	.	0.5	.	0.0	.
Cyprus	1.5	.	0.4	1.4	8.1	0.4	.	0.3	0.8	36.3	22.4
France	1.9	.	4.8	3.9	0.9	3.4	5.7	5.1	7.7	2.4	5.3
Germany	3.2	5.8	14.0	2.1	2.8	9.9	9.6	9.8	1.0	4.7	15.8
Greece	27.4	.	0.0	12.9	1.7	10.9	3.7	4.0	.	0.0	0.7
Hungary	0.1	.	12.1	10.3	8.9	2.5	0.0	2.2	0.0	0.2	1.6
Italy	15.2	2.5	3.3	1.7	11.8	5.9	2.5	3.2	0.1	0.3	2.2
Liechtenstein	.	.	0.7	0.5	0.6	0.1	.	0.1	0.1	0.1	0.2
Luxembourg	.	.	5.7	0.5	0.8	2.7	7.0	6.0	0.1	4.0	1.0
Netherlands	3.2	3.0	10.7	16.5	0.2	9.8	21.2	17.7	36.4	8.1	10.5
Russia	.	9.6	0.3	0.1	14.3	3.6	1.3	1.8	1.8	.	7.6
Serbia	.	18.0	0.0	2.5	-2.4	.	.	0.5	0.0	0.0	.
Slovenia	0.6	11.2	4.3	12.4	3.4	5.4	.	1.6	.	0.1	0.1
Sweden	.	.	0.7	0.2	0.2	0.1	0.2	0.3	0.2	3.7	3.8
Switzerland	2.5	5.4	1.5	4.5	9.3	2.6	2.2	2.4	2.1	1.3	1.9
Turkey	10.6	2.7	0.0	1.4	.	0.0	.	0.2	0.5	0.2	0.3
United Kingdom	0.2	.	3.7	3.3	7.5	2.7	8.1	6.7	3.0	1.6	5.1
United States	1.0	.	0.9	1.1	1.3	1.5	8.4	6.3	18.1	1.1	2.6
Other countries	18.8	8.1	6.9	11.2	21.2	17.5	19.9	17.5	25.7	33.8	12.7
EU-15	64.8	35.5	74.4	52.4	39.6	64.4	74.6	71.6	51.1	29.6	51.6
EU-27	67.3	45.9	91.8	80.1	65.2	75.8	75.0	76.4	52.1	66.7	78.6
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total, EUR mn	**2640**	**4880**	**26166**	**3351**	**4088**	**12841**	**134876**	**188842**	**61801**	**372793**	**33739**

AL: Albania, BA: Bosnia and Herzegovina, HR: Croatia, MK: Macedonia, ME: Montenegro, RS: Serbia, SEE: Southeast Europe, RU: Russia, UA: Ukraine.

Sources: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks.

Table 9

Inward FDI stock in NMS-10 by economic activities

as of December 2010, share in per cent

	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI	NMS-10
NACE Rev. 1 classification:		2009	2009				2009	2008	2009	2007	
A_B Agric., forestry, fishing	0.5	0.2	0.6	0.4	2.7	0.9	0.5	1.0	0.2	0.1	0.4
C Mining and quarrying	0.7	2.6	0.5	0.3	0.6	0.5	0.2	4.0	1.1	0.1	1.2
D Manufacturing	17.3	32.0	14.4	24.8	12.6	28.1	31.8	31.5	34.5	26.9	28.8
E Electricity, gas, water	5.3	8.0	3.8	5.5	3.8	8.7	4.1	5.5	13.3	3.0	6.1
F Construction	7.6	1.4	1.5	0.8	1.9	1.5	2.5	3.7	1.2	0.8	2.4
G Trade and repair etc.	13.5	9.9	11.2	12.7	12.0	13.4	15.9	12.2	11.0	13.1	12.9
H Hotels, restaurants	1.7	0.5	0.6	0.4	0.7	0.7	0.4	0.4	0.2	0.2	0.5
I Transport, communication	10.8	5.2	5.4	7.4	7.3	12.4	5.8	6.8	4.4	3.4	6.5
J Financial intermediation	17.8	20.4	30.1	9.5	23.5	12.4	18.6	20.5	20.9	40.4	18.6
K Real estate, business act.	23.4	16.2	30.5	30.8	25.0	18.7	17.6	13.7	12.3	11.5	19.3
L Public admin., defence etc.	0.0	0.0	.	.	0.0	.	.	.	.	.	0.0
M Education	0.0	0.0	0.0	.	0.0	.	.	.	.	0.0	0.0
N Health, social work	0.0	0.2	0.0	.	0.0	.	.	.	0.2	0.0	0.1
O Other community act.	0.6	1.1	1.0	.	1.3	.	.	.	0.6	0.4	0.4
Other activities (A-O)	0.6	.	0.4	5.2	8.6	0.8	0.5	0.7	0.05	0.2	1.3
Private purch.of real estate	.	2.2	.	2.2	.	1.9	2.1	.	.	.	1.4
Total by activities	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total by activities, EUR mn	**36173**	**87330**	**11268**	**67949**	**8184**	**10297**	**128494**	**48798**	**36469**	**9765**	**444726**

NACE Rev. 2 classification:	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI	NMS-10
A Agric., forestry, fishing	.	0.2	1.1	0.6	.	0.9	.	2.0	0.2	0.1	.
B Mining and quarrying	.	2.7	0.5	0.3	.	0.5	.	4.5	0.4	0.1	.
C Manufacturing	.	29.9	16.1	25.5	.	28.0	.	32.0	35.5	16.9	.
D Electricity, gas, steam etc.	.	7.2	3.3	6.1	.	8.7	.	6.9	0.1	2.6	.
E Water supply, waste manag.	.	0.8	0.8	0.2	.	0.2	.	0.5	14.9	0.2	.
F Construction	.	2.1	2.0	1.6	.	3.0	.	4.9	2.0	1.0	.
G Trade and repair	.	10.8	11.4	13.1	.	13.4	.	12.4	5.2	15.5	.
H Transportation, storage	.	1.4	5.4	2.0	.	2.2	.	1.5	4.8	1.0	.
I Accomod., food serv.act.	.	0.7	0.5	0.6	.	0.7	.	0.8	0.3	0.3	.
J Information, communication	.	6.5	3.0	7.7	.	10.7	.	5.9	7.4	2.3	.
K Financial, insurance act.	.	21.0	31.3	9.3	.	12.4	.	19.1	21.8	47.9	.
L Real estate activities	.	8.8	12.2	7.9	.	12.4	.	4.1	0.7	2.2	.
M Prof., scientific, techn.act.	.	4.9	8.6	10.2	.	3.6	.	3.6	5.4	2.2	.
N Admin., support serv.act.	.	0.8	3.4	.	.	1.0	.	1.2	0.0	0.6	.
O Public admin., defence etc.	.	.	.	.	.	.	.		.	.	.
P Education	.	0.0	0.1	.	.	0.0	.	.	0.0	0.0	.
Q Human health, soc.work	.	0.1	0.0	.	.	0.2	.	0.2	0.2	0.0	.
R Arts, entert., recreation	.	0.0	0.1	.	.	0.2	.	0.3	0.0	.	.
S Other service activities	.	0.1	0.1	.	.	0.1	.	0.0	0.3	0.1	.
T Act.of househ.as employers	.	.	.	.	.	.	.		.	.	.
Other activities (A-U)	.	.	0.1	12.7	.	.	.		0.7	7.2	.
Private purch.of real estate	.	2.2	.	2.2	.	1.9	.	0.0	.	.	.
Total by activities	.	100.0	.	100.0	.	100.0	.	100.0	100.0	100.0	.
Total by activities, EUR mn	.	**96153**	**12302**	**67949**	.	**10297**	.	**52585**	**37632**	**10772**	.

Sources: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks.

Table 10

Inward FDI stock in SEE-5, Kazakhstan, Russia and Ukraine by economic activities

as of December 2010, share in per cent

	AL	BA	HR	MK	TR	SEE-5	KZ	RU	UA
				2008					
NACE Rev. 1 classification:									
A_B Agriculture, hunting, forestry, fishing		0.3	0.5	1.0	0.2	0.3	0.1	1.5	1.9
C Mining and quarrying	12.6	1.6	1.2	5.7	1.8	1.9	18.3	17.6	2.7
D Manufacturing	15.8	34.7	21.5	29.9	29.4	28.1	8.8	40.6	27.9
E Electricity, gas and water supply	4.6	0.8	0.7	5.5	6.8	5.6	0.5	3.0	0.8
F Construction	8.7	0.9	1.6	3.9	0.7	1.0	1.6	2.6	5.2
G Wholesale, retail trade, repair of veh.etc.	9.2	13.6	17.0	.	11.7	12.3	4.2	9.5	10.7
H Hotels and restaurants	2.9	1.2	2.5	.	0.4	0.8	0.2	0.5	1.0
I Transport, storage and communication	15.2	17.5	8.4	.	16.9	15.3	1.4	3.5	3.8
J Financial intermediation	24.7	22.0	36.8	.	25.3	26.5	6.0	5.0	33.7
K Real estate, renting & business activities	2.1	3.8	8.8	.	3.7	4.4	56.7	15.6	10.7
L Public administr., defence, comp.soc.sec.	.	.	0.1	.	0.0	0.01	.	.	0.0
M Education	0.2	.	.	.	0.9	0.01	.	0.0	0.0
N Health and social work	2.3	0.4	0.0	.	.	0.8	0.1	0.1	0.3
O Other community, social & pers.services	0.5	0.2	0.9	.	2.4	2.0	2.0	0.6	1.3
Q Extra-territorial organizations and bodies	0.9	.	.	.		0.0		.	.
Other not elsewhere classified activities	0.0	3.1	.	53.9	.	1.0	.	.	.
Private purchase & sales of real estate	.	.	.	.		.		.	.
Total by activities	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Total by activities, EUR mn	**2640**	**4880**	**26166**	**2969**	**134876**	**171531**	**61801**	**87803**	**33739**

Sources: wiiw Database on Foreign Direct Investment in Central, East and Southeast Europe, 2012 based on respective National Banks.

Guide to wiiw statistical services on Central, East and Southeast Europe

	Source	Time of publication	Media	Availability	Price	
					Non-Members (n.a. = for wiiw Members only)	**Members**
Annual data	*Handbook of Statistics*	November	hardcopy + PDF	via postal service	€ 92.00	1 copy free, additional copies € 64.40 each
			PDF	CD-ROM or donwload	€ 75.00	free
			hardcopy + PDF + Excel[1)]	CD-ROM	€ 250.00[2)]	175.00[2)]
			Excel[1)] + PDF	download	€ 245.00	€ 171.50
			individual chapters	download	€ 37.00 per chapter	€ 37.00 per chapter
	Handbook of Statistics 2008: no printed version!		PDF[1)]	via e-mail	€ 80.00	€ 56.00
			Excel + PDF	CD-ROM or via e-mail	€ 200.00	€ 140.00
	wiiw Annual Database	continuously		online access via http://www.wsr.ac.at	€ 2.90 per data series	€ 1.90 per data series
Quarterly data (with selected annual data)	*Current Analyses and Forecasts*	February and July	hardcopy	via postal service	€ 80.00	free
			PDF	download	€ 65.00	free
	Monthly Report	Monthly Report nos. 10, 11, 12	hardcopy or PDF	download or via e-mail	n.a.	only available under the wiiw Service Package for € 2000.00
Monthly data	*Monthly Report*	continuously	hardcopy or PDF	download or via e-mail	n.a.	
	wiiw Monthly Database	continuously	monthly unlimited access	online access via http://mdb.ac.at	€ 80.00	free
			annual unlimited access		€ 800.00	free
Industrial Database (yearly)	*wiiw Industrial Database*	June	Excel	CD-ROM	€ 295.00	€ 206.50
				download	€ 290.00	€ 203.00
Database on FDI (yearly)	*wiiw Database on Foreign Direct Investment*	May	hardcopy	via postal service	€ 70.00	€ 49.00
			PDF	download	€ 65.00	€ 45.50
			HTML, Excel[1)], CSV on CD-ROM + hardcopy	via postal service	€ 145.00	€ 101.50
			HTML, Excel[1)], CSV	download	€ 140.00	€ 98.00

1) covering time range from 1990 up to the most recent year
2) including long PDF plus hardcopy

Orders from wiiw: via wiiw's website at www.wiiw.ac.at,
by fax to (+43 1) 533 66 10-50 (attention Ms. Ursula Köhrl)
or by e-mail to koehrl@wiiw.ac.at.

Index of subjects – August-September 2011 to August-September 2012

The monthly publication *wiiw Monthly Report* summarizes wiiw's major research topics and provides current statistics and analyses exclusively to subscribers to the wiiw Service Package. This information is for the subscribers' internal use only and may not be quoted except with the respective author's permission and express authorization. Unless otherwise indicated, all authors are members of the Vienna Institute's research staff or research associates of wiiw.

Economics editor: Leon Podkaminer

The Vienna Institute for International Economic Studies
(Wiener Institut für für Internationale Wirtschaftsvergleiche – wiiw)
Rahlgasse 3, A-1060 Vienna, Austria, Tel. (+43 1) 533 66 10, Fax (+43 1) 533 66 10-50
Email: wiiw@wiiw.ac.at, Web: www.wiiw.ac.at