

# **Development of Emerging Stock Markets and the Demand for Cross-Listing**

Adriana Korczak<sup>a</sup>  
*University of Bristol*

Piotr Korczak<sup>b</sup>  
*University of Bristol*

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Abstract: This study provides new insights into the link between local stock market development and the demand for cross-listing. Analyzing 14 Central and Eastern European (CEE) stock markets over two decades we find that the link is nonlinear: as a market starts growing from its inception so does the cross-listing activity but when the market reaches a certain point of development, the demand for overseas listing starts to fade. The results have important policy implications and they shed new light on the competitiveness and prospects of local stock markets in emerging economies.

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<sup>a</sup> School of Economics, Finance and Management, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, UK. Tel: +44 117 3310531. Email: [Adriana.Korczak@bristol.ac.uk](mailto:Adriana.Korczak@bristol.ac.uk).

<sup>b</sup> School of Economics, Finance and Management, University of Bristol, 8 Woodland Road, Bristol BS8 1TN, UK. Tel: +44 117 9288407. Email: [P.Korczak@bristol.ac.uk](mailto:P.Korczak@bristol.ac.uk).

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## 1. Introduction

Stock markets around the world compete for listings. The competitive pressures are particularly severe for emerging countries whose less developed domestic equity markets are, according to the general perception, at a disadvantaged position compared to global financial centers. The concerns that listings of emerging market firms would migrate abroad were expressed in the financial press<sup>1</sup> and in policy oriented research reports (e.g., Claessens et al., 2000, 2003), and the issue triggered academic research aiming to explore and explain the links between the local stock market development and the scope of cross-listing activities by domestic companies.

The empirical literature in the area provides mixed and inconclusive evidence though. Studies by Moel (2001) and Karolyi (2004) focus on the impact of cross-listing on the local market development in two samples of emerging markets. They find that there is a negative contemporaneous link: countries with more depositary receipt (DR) issues<sup>2</sup> tend to have less developed equity markets. To provide a simple test of the dynamics of the process, Moel (2001) moves on to study Granger causality between cross-listing and market development and finds that increases in the DR activity precede decreases in the market development, and not vice versa. Karolyi (2004) disaggregates the DR sample into different types of listing and finds a striking result that lower profile and less liquid cross-listings are negatively associated with the local market development to the same, if not larger, extent than high profile listings on foreign exchanges. This leads him to conclude, in contrast to Moel (2001), that cross-listing is as much an outcome of poor market development as its cause.

The conjecture is further and more formally tested by Claessens et al. (2006) in a large sample of both developed and emerging markets. Even though in their main tests Claessens et al. (2006) focus on the impact of macro factors on both the local market development and the scope of firm internationalization (mainly cross-listing), in a supplementary analysis they address the point raised by Karolyi (2004) and directly test the impact of past market development on the scope of internationalization. They find strong evidence that companies from more developed local stock markets are more likely to

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<sup>1</sup> See, e.g. 'Latin America's stock markets: High and dry', *The Economist* (19 February 2000); 'ADRs prove a double-edged sword', *Financial Times* (6 April 1998).

<sup>2</sup> Similarly to other studies, throughout the paper we use the terms 'cross-listing' and 'depositary receipt activity' interchangeably. Depositary receipts issues are a predominant mode of entry to foreign equity markets used by emerging markets firms (e.g., Foerster and Karolyi, 1999; Salva, 2003). See Section 2 for background information on depositary receipts.

internationalize in the subsequent year. The argument in Karolyi (2004) would suggest a negative relation, and the result also contradicts the finding in Moel (2001). Claessens et al. (2006) interpret their finding from the perspective of international investors' interest and argue that the investors are more willing to provide financing to firms from sounder domestic market environments.

In this paper we aim to reconcile the different views. The design of our tests closely follows Claessens et al. (2006) but we allow for a nonlinear relation between past domestic market development and the demand for cross-listing. We argue that at a certain level of the domestic market development the relation between market development and cross-listing changes. A less-developed local market does not offer the sufficient capital and liquidity pool and firms need to go overseas to satisfy their financing needs, in line with the argument in Karolyi (2004).<sup>3</sup> As the market grows, fueled by macroeconomic and institutional reforms, so do both firms' financing needs and the attractiveness of assets to investors. This in turn leads to a larger internationalization of capital raising activities (Claessens et al., 2006). However, at some level of its development, the local market becomes competitive and offers sufficient financing opportunities so that local firms no longer need to go abroad and they can benefit from the improved environment of the domestic market. Reformulating the argument in Karolyi (2004), firms do not seek foreign listings when the domestic market is developed enough.

The following example illustrates the decreasing popularity of foreign listings as the significance of the domestic market grows. Poland's KGHM Polska Miedz, was partially privatized in July 1997 and listed on the Warsaw Stock Exchange and cross-listed on the London Stock Exchange. At that time, this was the largest privatization in the history of the still relatively underdeveloped Polish market. The overseas offering accounted for 58% of all shares offered and 18% of all shares outstanding. At the end of 2009, KGHM was still one of the largest companies on the Warsaw Stock Exchange with a 5.0% share in the total market capitalization and a 13.1% share in the total trading value. In meantime, the Polish stock market had developed significantly, and the most popular measure of stock market development, the ratio of the market capitalization to GDP quadrupled from 7.7% at the end of 1997 to 31.5% at the end of 2009. In September 2009 KGHM announced delisting from London arguing that the DR program 'has ceased to be effective. Investor interest in this form

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<sup>3</sup> Karolyi (2006) provides a comprehensive survey of the theoretical and empirical literature on various benefits of cross-listing, its drivers and consequences.

of investment in the shares of KGHM Polska Miedz S.A. has become weak. The number of issued GDRs has fallen to around 0.5% of the share capital of the Company, and for several months has remained at this level. Investors prefer to directly purchase the Company's ordinary shares on the Warsaw Stock Exchange, where they will continue to be listed.'<sup>4</sup>

Our sample includes 14 countries from Central and Eastern Europe and the sample period spans 1991 and 2009. The CEE markets offer a good testing ground as they allow us to observe the link between the market development and the demand for cross-listing from the inceptions of the local markets and through different stages of their development. Moreover, the previous studies look at the cross-listing activity up to the year 2000 and their sample period coincides with the unprecedented increase in the number of foreign listings and the surge in depositary receipts activity in the 1990s. After 2000 the total number of cross-listings flattened and while there still were between 100 and 200 new companies entering overseas markets via DR programs every year (BNY Mellon, 2010), many firms decided to withdraw from foreign exchanges sparking a discussion on the attractiveness of global financial centers to foreign issuers (e.g., Zingales, 2007; Doidge et al., 2009). All of this makes our sample and the period worth investigating to gain new insights into the link between local stock market development and the demand for cross-listing.

We find strong evidence of the statistically and economically significant nonlinear link between the DR activity and (lagged) local stock market development. The results indicate that there is a threshold level of the local stock development below which listing only domestically is not a viable option for companies that seek financing. Our results indicate however that cross-listing activity is not a one-way trend that does not revert. We show that the activity is triggered by the local market underdevelopment but when the local market reaches a certain stage, the demand for cross-listing starts to fade. Our results are robust to the choice of measure of DR activity and the local stock market development, and they hold after controlling for the general economic development, growth opportunities, capital account liberalization and the quality of corporate governance. Altogether, they shed new light on the findings of earlier studies that explore the link between stock market development and the demand for cross-listing. Our study also contributes to the recent literature on long term cross-listing waves (Sarkissian and Schill, 2010; Fernandes and Giannetti, 2010) by providing evidence on the mechanism that drives the country-level demand for overseas listing.

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<sup>4</sup> See, the company's current report no 36/2009, available at [www.kghm.pl](http://www.kghm.pl).

The remainder of the paper is structured as follows. Background information on depositary receipts is presented in Section 2. Section 3 outlines the data selection process, definition of the variables and presents the regression methodology. The descriptive analysis of CEE firms' cross-listing activities is presented in Section 4. The empirical results are presented in Section 5, and Section 6 concludes the paper and presents policy implications of the study.

## **2. A primer on depositary receipts**

Depositary receipts (DRs) are negotiable certificates that represent shares of foreign firms. They are created in a process in which a depositary bank purchases a foreign firm's shares in the firm's home market, deposits them on an account at a custodian bank, and then issues depositary receipts that represent those shares in another country (host country) where the DRs start trading. The issuance of so called sponsored DRs is driven by the foreign firm's decision and an agreement that the firm makes with a depositary bank. Unsponsored DRs are issued in a response to investors needs and are initiated by brokers in the host country and do not involve engagement of the underlying firm. DRs are close substitutes of the underlying shares and they bear the same cash flow and voting rights. DRs can be cancelled and exchanged to underlying shares in a process that reverses the DR creation process.

The largest group of depositary receipts are American Depositary Receipts (ADRs) which are issued in the United States and represent shares of non-U.S. firms. They come in different forms. Level II and Level III ADRs are listed on U.S. exchanges, such as the New York Stock Exchange and Nasdaq, and the underlying firms are obliged to meet the strictest listing standards equivalent to the standards of U.S. domestic exchange listings. Level I ADRs are traded over-the-counter (OTC) and are less strictly regulated. Rule 144A ADRs are the least sophisticated option and they are offered as private placements to qualified institutional buyers (QIB) and are traded in the Portal system. Level III and Rule 144A ADR issues are associated with capital raising while Level I and II ADRs issues do not raise new capital and are only offered on the basis of existing shares traded in the foreign market.

Global Depositary Receipts (GDRs) are issued in international markets other than the U.S. and they can involve capital raising. The leading market for GDRs is the London Stock Exchange, where GDRs are listed on either the Main Market or the Professional Securities

Market (PSM). Regulations related to PSM-listed DRs are less onerous and PSM-listed DRs are traded only by institutional investors.

An alternative to a DR listing abroad is a direct ordinary share listing. In the U.S. they are rare though mainly because of the settlement problems involved. Direct share listings in the U.S. are only possible on stock exchanges and they are dominated by Canadian firms (Foerster and Karolyi, 1999). In London, ordinary listings by foreign firms are much more popular than in the U.S. but they are mainly chosen by firms from developed markets, while emerging market firms dominate DR listings (Salva, 2003).

### **3. Data and methodology**

The paper focuses on depositary receipt programs of companies located in emerging countries of Central and Eastern Europe.<sup>5</sup> We identify the sample countries as all countries in the region that are classified by Standard and Poor's as either emerging or frontier as of September 2010. The major common characteristic they share is their transition from the communist into market-oriented economy that occurred over the last two decades. The countries have experienced a rapid development of equity markets since their inception in the 1990s, fueled by economic reforms and privatization, and that stock market growth from infancy is what motivates the choice of the sample in this study: by looking at the CEE countries over the period 1991-2009 we are able to analyze the demand for cross-listing and corporate responses to various levels of the domestic market development. Still, there is some heterogeneity across the sample countries. We have economies of different size, different GDP per capita, some of our countries in recent years joined the European Union or the Eurozone, and the countries have followed different approaches to equity market regulation.<sup>6</sup> The choice of the CEE emerging markets also complements the study by Karolyi (2004) who looks at twelve emerging countries in Latin America and South East Asia.

The primary source of data on depositary receipt programs are online DR directories of the Bank of New York Mellon, JPMorgan and Citi. A complication arises in that companies change depositary banks and/or the type of the DR program offered (e.g., from OTC listed to exchange listed), and the directories tend to list the current program only with a

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<sup>5</sup> To be precise, Kazakhstan is an Asian country but we include it in our sample because of its history as a Soviet Union republic and its transition economy characteristics shared with CEE countries.

<sup>6</sup> Glaeser et al. (2001) provide a discussion of the approach to regulation and supervision and the associated development of equity markets in the Czech Republic, Hungary and Poland in the 1990s.

starting date denoting the most recent depositary agreement. To address this, we checked additional notes with the relevant information on the history of the DR program available in the Citi directory. Furthermore, the directories of active programs were complemented by lists of terminated DR programs (either past programs by firms with still active DR programs or firms without any current programs) available from the three banks. All information was additionally cross-checked with listing directories of the New York Stock Exchange, Nasdaq, London Stock Exchange, OTC Bulletin Board and local stock exchanges in the CEE countries, as well as the information on the companies' websites and in Datastream.

As a result, we compiled a complete data set of DR programs by CEE companies in a form of a firm-year panel. The panel identifies the name (and previous names where applicable) of the company, country of origin, underlying ISIN and Sedol codes, years in which the company had an active DR program (or programs where applicable), Cusip codes of the DR program(s), and a set of identifier variables indicating whether the DR program was sponsored or unsponsored, whether it was a single listing (i.e., whether or not the underlying share was listed in the domestic exchange), and whether it listed on the NYSE, Nasdaq, Amex, London Stock Exchange, OTC and Portal. As indicated on companies' websites and in Datastream, some CEE companies cross-list in Luxembourg, Frankfurt or on German regional stock exchanges, often in addition to listings in the U.S. or London. We are not able, however, to compile a complete list of all historical listings in those alternative locations and therefore we do not treat them as separate categories. The respective DR programs are included in the sample though. Altogether, the panel includes 2033 firm-year observations.

The firm level data in the DR panel are matched on the basis of the ISIN code with year-end market capitalization data (in USD millions) sourced from Datastream. The capitalization data are available for 67.2% of all firm-year observation in the panel, and for 70.6% of observations for sponsored programs, on which the tests predominantly focus. The major gaps in the data availability are for Kazakhstan and Ukraine, for which Datastream starts its coverage in 2009 and 2006, respectively. The data availability is also incomplete for Bulgaria and Romania and for earlier years for the Slovak Republic. The firm level data are then aggregated to form a country-year panel of DR activity. For every year in every country we sum the number and market capitalization of firms with active DR programs. Throughout the paper, if not mentioned otherwise, we look at sponsored programs only, which in the initial firm-year panel constitute 84.7% of all observations. The focus on sponsored programs

is determined by the main aim of this study which is to analyze corporate listing responses to stock market development. Unsponsored DR programs are created by brokers in association with depositary banks without engagement of the underlying firm and hence cannot be treated as the firm's decision. As mentioned above, for a few countries for selected years the information on market capitalization of individual firms is either missing or incomplete. To avoid misleading inferences in such instances, the aggregate market capitalization for respective country-year observations is set to missing values.

Two variables measure the scope of DR activity in a given country and year. The first one is the market capitalization of DR firms scaled by the total domestic market capitalization. The second one is the number of DR firms scaled by the total number of firms listed domestically. The domestic market capitalization and the total number of domestic firms listed in the local market are sourced from the World Development Indicators database. For the majority of cases, the variables can be interpreted as the proportion of local firms that list overseas via a depositary receipt program. However, there is a small group of firms that list DRs overseas and do not list underlying shares locally and, consequently, they enter the numerator of our measures but do not enter the denominator. Such single listings account for 7.5% of all firm-year observations in the initial data set.

To analyze the link between the DR activity and local stock market development, we pool the data across countries and over time and run a set of random-effect Tobit regressions, similar to the tests in Claessens et al. (2006). The choice of the Tobit approach is driven by the structure of the DR activity measures that by definition are left-censored at zero.<sup>7</sup> We use two different measures of the domestic stock market development: market capitalization relative to the GDP and the annual value traded relative to the GDP. Both measures come from the World Development Indicators database. To capture the nonlinear link between cross-listing and market development, we additionally include the square of the development measures in our regressions. The control variables include the overall economic development proxied by the (log of) GDP per capita, growth opportunities proxied by the GDP growth rate and the (log of) price-earnings ratio for the market, the securities market and capital account liberalization indices and the antidirector right index. As noted by Claessens et al. (2006), liberalization is a necessary condition to observe international investment and capital raising, while the inclusion of the antidirector rights index controls for 'legal bonding' motivation of international cross-listing (Stulz, 1999; Coffee, 2002). All independent variables are lagged

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<sup>7</sup> As a robustness check we also run least-squares fixed and random-effect regressions (see Section 5.3).

by one year to minimize the problem of potential endogeneity in the regressions. Detailed definitions and sources of the variables are presented in Appendix A.

#### **4. Depositary receipt activity by CEE companies**

The first CEE company to issue depositary receipts was Hungary's Fotex that pursued ADR Level I OTC listing in July 1992. As presented in Figure 1, the late 1990s witnessed a rapid surge in cross-listings. In 1999 the number of companies with (sponsored) DR programs exceeded 100 and then after a slowdown at the beginning of 2000s it rose again towards the 200 mark at the end of the sample period. In terms of listing destinations, the London Stock Exchange, U.S. exchanges, OTC market and Portal system were all gaining in the 1990s, with the non-exchange venues being the most popular, followed by London and U.S. exchanges. After 2000, the popularity of OTC and U.S. exchanges remained relatively constant, while Portal and London gain significantly in the last few years of the sample period. London listings and Portal placements move largely together because it is common among CEE companies to offer the so called bifurcated structure of DR programs, with one tranche offered to U.S. qualified institutional buyers (QIB) and traded in the Portal system and another tranche offered to non-U.S. investors in a global offering traded on the London Stock Exchange. Overall, the relative larger popularity of the London Stock Exchange over U.S. exchanges is not surprising taking into account the preference for geographic proximity in the choice of overseas listings documented by Sarkissian and Schill (2004).

Figure 2 presents the pattern of the scaled DR activity: the market capitalization of firms with active DR programs scaled by the capitalization of local markets and the total number of DR firms scaled by the total number of firms listed domestically. Panel A presents the regional total which by definition is biased towards larger markets, and Panel B presents cross-country (equally-weighted) averages. While the fraction of firms with DR programs was steadily increasing, the relative cross-listing activity in the capitalization terms peaked in 2000/2001 and then decreased in the 2000s. It is worth noting that even though the ratio of the number of DR firms to all listed firms never exceeded 10%, in 2001 the ratio of market capitalization of all CEE firms with DR programs to the total capitalization of CEE local markets presented in Panel A of Figure 2 reached 90%. Because in some smaller countries the DR activity was weaker, the cross-country average ratio was just above 50%. Still, the

number was significantly above the ratio based on the number of firms, consistent with well-documented tendency of larger companies to cross-list (e.g., Doidge et al., 2004).

A snapshot of absolute and relative DR activity across countries in selected years is presented in Table 1, and Figure 3 depicts time series of relative DR activity for countries with the largest number of active DR in the sample period. A few important observations can be made. The countries form clusters that share similar patterns in DR activity. In terms of the absolute number of cross-listings, the Czech Republic, Hungary and Poland had a peak in the number of DR firms in the late 1990s and since then it has been decreasing due to the prevalent delistings from overseas location and few new listings. The number of DR programs from Russia, Ukraine and Kazakhstan was steadily increasing throughout the whole sample period, and the three countries had the largest number of DR firms in our sample at the end of 2009. The patterns in relative DR activity are different. The Czech Republic and Hungary after the surge in the 1990s had a very high and stable ratio based on market capitalization, while for Poland and Russia the ratio was increasing throughout the 1990s and then decreasing in the 2000s. Country-year observations with the highest market capitalization and number based ratios are both from Russia. In 2000 and 2001 the capitalization ratio was above 100%, and the top count ratio was reached in 2009 at 35%. The former is the effect of single overseas listings without the domestic listing and also Initial Public Offerings pursued in overseas markets first, followed by domestic offering in later years.

Table 1 provides also information on the two measures of the local market development: market capitalization to GDP and value traded to GDP. The numbers and patterns vary across countries. With the exception of the Czech Republic, the measures were low in the 1990s but increased strongly in the 2000s. Throughout the 2000s local markets in Croatia, Kazakhstan, Russia and Poland were visibly growing, while in other countries they were fairly stable. Taken together, the patterns of DR activity and the patterns of local market development differ across our sample countries and the determination of the impact of market development on the firms' cross-listing choices an open empirical question we address in the next section.

## 5. Regression results

### 5.1. Main regressions

Table 2 presents results of the main regressions. In Panel A, the dependent variable is the market capitalization of firms with active DR programs scaled by the total market capitalization of the local market. The independent variables of interest are two measures of the local stock market development: its capitalization relative to the GDP (models (1) to (6)) and the value of trading relative to the GDP (models (7) to (12)). To test the nonlinear effect of the local market development on the demand for cross-listing, the regressions also include squares of the development measures. All independent variables are lagged by one year.

We find strong evidence in favor of the significant nonlinear link between the DR activity and (past) local stock market development. The coefficients of the development proxies are consistently positive and strongly significant, while the coefficients of the squared measures are consistently significantly negative. The results indicate that there is a threshold level of the local stock development below which listing only domestically is not a viable option for companies that seek financing. The underdevelopment of the market triggers the demand for cross-listing, as argued by Karolyi (2004). At lower ranges of the market development the DR activity grows in line with the local market, which confirms the findings in Claessens et al. (2006), but when the local market development reaches a certain level, the companies no longer seek foreign listings and the DR activity starts to decline. Panel B of Table 2, with the scaled number of firms with DR programs as the dependent variable, reveals a similar relation. With the exception of specification (4), in which the coefficient of the square of the development measure becomes marginally insignificant, the coefficients have the same sign and remain strongly significant. Altogether, our results are robust to the choice of the measure of DR activity and the local stock market development, and they clearly hold when we control for the general economic development, growth opportunities, capital account liberalization and the quality of corporate governance.

To present the economic interpretation of our result, we focus on the estimated coefficients of the basic model in specification (1) in Panel A. The coefficients imply the threshold stock market capitalization scaled by the GDP of 65.9%. This means that, on average, when the market grows beyond that point, the demand for cross-listing starts decreasing. To put the number in a perspective, at the end of 2009 the ratio for the United

States was 105.8%, and the respective number for the United Kingdom was 128.6%. The mean ratio for 59 countries classified by Standard and Poor's as emerging or frontier was 48.4% and only 23.5% of them exceeded the 65.9% threshold indicated by our results. Still, it marks a significant development compared to 1999 when the average ratio was 35.3% with only 10.5% of countries above the estimated threshold. Generalizing our results to all emerging markets, many of them still have a way to go to create a viable domestic market that will be an alternative to raising capital by listing in foreign markets.

The control variable that comes consistently significant is the index of capital account liberalization. In line with the results in Claessens et al. (2006) we find that liberalization leads to larger DR activity. Other variables that come significant, but only in selected specifications, are two proxies for growth opportunities – GDP growth and the market's price-earnings ratio. As one can expect, their coefficients are positive indicating that companies go abroad to finance their growth needs. The general economic development measured by the GDP per capita and the quality of investor protection proxied by the antidirector rights index come by and large insignificant.

## *5.2. Results across DR types*

The previous section presents and discusses the main results of the analysis based on all sponsored depositary programs. This section complements those findings by looking at different DR types individually. We run a set of regressions that control for the GDP growth rate which is available for all country-year observations and helps us to preserve the sample size. The estimated coefficients are reported in Table 3. Specifications (1) and (7) in both panels of Table 3 show that our results are not sensitive to the inclusion of unsponsored DR programs in the sample. However, the results for unsponsored programs only, presented in columns (2) and (9) are mixed. The popularity of unsponsored programs seems not to be affected by the relative size of the local market, but it is affected in a similar way to sponsored programs when relative trading is taken as the market development measure. The mixed results are not surprising considering that the issuance of unsponsored programs is not the underlying firm's decision and is not a part of the firm's financing strategy. As such, the activity is likely to be driven by other factors than the response to the domestic market's development.

The results for depositary receipts with different listing venues share a lot of similarity. By and large, across all listing types we observe an increase in the DR popularity at a lower level of the domestic market development, and the popularity tends to decrease when local markets reach a certain stage of their development. London listed DRs are an exception. In three out of the four specifications we find an insignificant coefficient of the squared term which provides some evidence that the popularity of listing in London increases with the local market development and it does not tend to level off when the local market becomes bigger. It is an important finding in light of the popularity of London as the exchange market of choice for CEE firms. However, in the regressions with London listed DRs, unlike for other types of DRs, GDP growth never comes significant, which may indicate that listing on the London Stock Exchange is not driven by growing firms' financing needs. In some respect, OTC listed depositary receipts differ from the other DR types too. The threshold market development level estimated on the basis of the coefficients in models (3) to (6) in Panel A of Table 3 is 48.1% for OTC listings, while for the other DR types it is in the region 66.2%-67.3%. Considering that OTC traded DR issues, unlike the majority of other DR types<sup>8</sup>, do not permit capital raising, their attractiveness is likely to fade earlier in the domestic market development range. This is what our findings confirm.

Nevertheless, the similar patterns observed across the different listing types are related to the findings in Karolyi (2004). He concludes that emerging market firms respond to the underdevelopment of the domestic market in whatever form of foreign listing is available to them. Larger and stronger firms chose exchange listings while smaller firms opt for more accessible OTC or Portal issues. We find that the nonlinear pattern of the response is not related to the type of depositary receipts.

### *5.3. Robustness tests*

We perform a set of additional tests to check whether our results are sensitive to the estimation method applied and estimate the key regressions of interest using least squares fixed and random effects models. The results are reported in Table 4. The models in Panel A with the scaled market capitalization of DR firms as the dependent variable confirm our major finding on the nonlinear link between the (lagged) local market development and the

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<sup>8</sup> The other DR type that does not involve capital raising are a sub-group of U.S. exchange listed DRs, Level II ADRs. In the analysis we do not split the U.S. exchange listed DRs into subsamples based on capital raising activity and hence are not able to provide a more detailed analysis of this issue.

demand for cross-listing. The results change slightly when the scaled number of DR firms is used as the dependent variable as reported in Panel B. The coefficients of both local market development measures are positive and strongly significant but the coefficients of the squared term remain negative but lose their significance. The result indicates the linear positive link between local market development and internationalization, in line with results in Claessens et al. (2006).

## **6. Conclusions**

This paper aims to shed new light on the link between the local stock market development and the cross-listing activity by domestic firms. The empirical evidence to date is mixed. There is some support for the negative link indicating that companies list abroad in response to the poor market development at home (Karolyi, 2004), as well as for the positive link interpreted from the perspective of international investors who are more willing to provide financing to firms from better home country environments (Claessens et al., 2006). We argue that the relation is non-linear and provide strong evidence to support our argument. Using data for 14 Central and Eastern European countries over two decades we show that the flow of local companies to international financial centers is driven by the domestic stock market underdevelopment but the attractiveness of foreign listings starts to diminish when the local market reaches a certain development threshold.

Our results have important policy implications. To increase the relative competitiveness of local stock markets in relation to global financial centers, the efforts of governments and regulators need to be focused on strengthening the local market beyond the point at which domestic companies will see it as a viable alternative to venturing abroad. It is well-documented in the literature (e.g., La Porta et al., 1997; Levine and Zervos, 1998; Rajan and Zingales, 2003; Claessens et al., 2006) that this can be achieved through sound macroeconomic policies, openness, liberalization, strong legal rules and law enforcement.

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## Appendix A. Definitions of the variables and data sources

Variable	Definition and source
Market capitalization of DR firms	The sum of year-end market capitalization of all firms with active depositary programs in the country in a given year. Set to a missing value when the firm-level data are incomplete. <i>Source of the list of DR firms: Bank of New York Mellon, JPMorgan, Citi. Source of capitalization data: Datastream.</i>
Total domestic market capitalization	Market capitalization of domestically incorporated companies listed on the country's stock exchanges at the end of the year. <i>Source: World Development Indicators.</i>
Number of DR firms	The number of firms with active depositary programs in the country in a given year. <i>Source: Bank of New York Mellon, JPMorgan, Citi.</i>
Total number of firms listed domestically	The number of domestically incorporated companies listed on the country's stock exchanges at the end of the year. <i>Source: World Development Indicators.</i>
Market capitalization / GDP	Market capitalization of domestically incorporated companies listed on the country's stock exchanges at the end of the year scaled by the country's gross domestic product. <i>Source: World Development Indicators.</i>
Value traded / GDP	Total value of shares traded during the year on the country's stock exchanges scaled by the country's gross domestic product. <i>Source: World Development Indicators.</i>
Ln (GDP per capita)	The natural logarithm of the country's gross domestic product per capita. <i>Source: World Development Indicators.</i>
GDP growth	Annual growth of the country's gross domestic product. <i>Source: World Development Indicators.</i>
Ln (Price-Earnings ratio)	The natural logarithm of the price-earnings ratio for the country's Datastream market index. Available for Bulgaria, Czech Republic, Hungary, Poland, Romania, Russia and Slovenia. <i>Source: Datastream.</i>
Capital account liberalization	An index of policies to liberalize international financial transactions. It ranges from zero to three. A score of one is assigned for every existing provision related to (1) the unified exchange rate system, (2) no restrictions on capital inflows, and (3) no restrictions on capital outflows. Calculated annually up to 2005. Not available for Croatia, Slovak Republic and Slovenia. <i>Source: Abiad et al. (2008).</i>
Antidirector rights index	An index aggregating shareholder rights. It ranges from zero to five. A score of one is assigned for every existing provision related to (1) one-share-one-vote rule, (2) allowed proxy by mail, (3) shares not blocked before a general meeting, (4) oppressed minority rules, and (5) preemptive right to new issues. Available for 1990, 1995, 2000, 2005. For interim years the last available score is used. Not available for Kazakhstan, Russia and Ukraine. <i>Source: Martynova and Renneboog (2010); approach based on La Porta et al. (1998).</i>

**Table 1.** Summary of DR activity and stock market development across countries

The table presents basic information on depositary receipt activity and local stock market development for selected years for all sample countries. Country-year observations with incomplete data on the firm level are set to missing values.

		Bulgaria	Croatia	Czech Rep	Estonia	Hungary	Kazakhstan	Latvia	Lithuania	Poland	Romania	Russia	Slovak Rep	Slovenia	Ukraine
Number of companies with DRs	1995	0	0	2		5		0	0	1	0	3	1	0	
	2000	0	3	5	2	14	2	2	4	18	2	50	2	2	8
	2005	0	2	4	2	12	6	3	2	13	0	63	0	0	24
	2009	1	3	3	2	9	12	1	2	11	1	98	0	0	47
No of DR firms / Total no of firms listed domestically	1995	0.00	0.00	0.00		0.12		0.00	0.00	0.02	0.00	0.02	0.06	0.00	
	2000	0.00	0.05	0.04	0.09	0.23	0.09	0.03	0.07	0.08	0.00	0.20	0.00	0.05	0.06
	2005	0.00	0.01	0.11	0.13	0.27	0.10	0.07	0.05	0.05	0.00	0.21	0.00	0.00	0.11
	2009	0.00	0.01	0.12	0.13	0.21	0.17	0.03	0.05	0.03	0.00	0.35	0.00	0.00	0.16
Market cap of DR firms / Total domestic market cap	1995		0.00	0.19		0.54		0.00	0.00	0.00		0.00		0.00	
	2000		0.44	0.81	0.47	0.82		0.02	0.29	0.66		1.26		0.06	
	2005		0.10	0.83	0.41	0.90		0.02	0.11	0.47		0.81	0.00	0.00	
	2009		0.30	0.77	0.53	0.94	0.31	0.01	0.15	0.26		0.79	0.00	0.00	0.47
Market cap / GDP	1995	0.00	0.03	0.28		0.05		0.00	0.02	0.03	0.00	0.04	0.05	0.01	
	2000	0.05	0.13	0.19	0.33	0.25	0.07	0.07	0.14	0.18	0.03	0.15	0.04	0.13	0.06
	2005	0.19	0.29	0.31	0.25	0.30	0.18	0.16	0.32	0.31	0.21	0.72	0.07	0.22	0.29
	2009	0.15	0.41	0.28	0.14	0.22	0.53	0.07	0.12	0.31	0.19	0.70	0.05	0.24	0.15
Value traded / GDP	1995	0.00	0.00	0.07		0.01			0.00	0.02	0.00	0.00	0.03	0.02	
	2000	0.00	0.01	0.12	0.06	0.25	0.00	0.03	0.02	0.09	0.01	0.08	0.03	0.02	0.01
	2005	0.05	0.02	0.33	0.18	0.22	0.02	0.01	0.03	0.10	0.03	0.21	0.00	0.02	0.01
	2009	0.01	0.02	0.11	0.02	0.20	0.04	0.00	0.01	0.13	0.01	0.55	0.00	0.02	0.01

**Table 2.** Local stock market development and depositary receipt activity

This table presents coefficients of the random effect Tobit regressions of depositary receipt activity on the measures of domestic stock market development and a set of control variables. All explanatory variables are one year lagged. A constant is included in the regressions but not reported. The sample includes 14 Central and Eastern European countries over the period 1991-2009. Definitions of the variables are presented in Appendix A. p-values of the estimated coefficients are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Panel A. Dependent variable: Market capitalization of DR firms / Total domestic market capitalization</i>												
Market capitalization / GDP	1.485 (0.000)	1.512 (0.000)	1.065 (0.000)	0.959 (0.018)	2.033 (0.000)	0.968 (0.002)						
(Market capitalization / GDP) <sup>2</sup>	-1.126 (0.000)	-1.139 (0.000)	-0.859 (0.002)	-0.961 (0.004)	-2.751 (0.001)	-1.017 (0.001)						
Value traded / GDP							2.819 (0.000)	2.862 (0.000)	2.496 (0.000)	1.850 (0.005)	2.782 (0.025)	4.250 (0.000)
(Value traded / GDP) <sup>2</sup>							-4.509 (0.000)	-4.553 (0.000)	-4.107 (0.001)	-3.588 (0.005)	-8.546 (0.016)	-9.706 (0.000)
Ln (GDP per capita)		-0.011 (0.800)						-0.008 (0.845)				
GDP growth			1.578 (0.008)	0.963 (0.320)	1.375 (0.056)	-0.310 (0.599)			0.791 (0.158)	0.707 (0.457)	1.816 (0.013)	-0.778 (0.170)
Ln (Price-Earnings ratio)				0.115 (0.086)						0.145 (0.020)		
Capital account liberalization					0.136 (0.000)						0.145 (0.000)	
Antidirector rights index						0.041 (0.187)						-0.004 (0.883)
No of observations	153	153	153	68	87	130	148	148	148	68	85	128
No of countries	12	12	12	5	8	9	12	12	12	5	8	9
No of left-censored observations	31	31	31	11	11	27	26	26	26	11	9	25
Wald Chi <sup>2</sup>	34.95 (0.000)	35.01 (0.000)	43.46 (0.000)	18.71 (0.001)	88.29 (0.000)	17.20 (0.002)	32.06 (0.000)	32.02 (0.000)	34.69 (0.000)	18.44 (0.001)	70.26 (0.000)	32.61 (0.000)

(continued)

**Table 2.** - continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
<i>Panel B. Dependent variable: Number of DR firms / Total number of firms listed domestically</i>												
Market capitalization / GDP	0.294 (0.000)	0.270 (0.000)	0.199 (0.000)	0.180 (0.030)	0.345 (0.000)	0.165 (0.004)						
(Market capitalization / GDP) <sup>2</sup>	-0.188 (0.000)	-0.174 (0.001)	-0.128 (0.010)	-0.114 (0.103)	-0.417 (0.003)	-0.180 (0.003)						
Value traded / GDP							0.535 (0.000)	0.436 (0.000)	0.440 (0.000)	0.463 (0.000)	0.719 (0.000)	0.679 (0.000)
(Value traded / GDP) <sup>2</sup>							-0.652 (0.003)	-0.536 (0.013)	-0.532 (0.014)	-0.586 (0.016)	-2.016 (0.000)	-1.600 (0.001)
Ln (GDP per capita)		0.007 (0.360)						0.016 (0.007)				
GDP growth			0.397 (0.000)	0.367 (0.044)	0.327 (0.001)	0.163 (0.119)			0.234 (0.006)	0.261 (0.104)	0.308 (0.001)	0.130 (0.194)
Ln (Price-Earnings ratio)				-0.006 (0.582)						0.002 (0.855)		
Capital account liberalization					0.018 (0.000)						0.019 (0.000)	
Antidirector rights index						0.009 (0.116)						0.003 (0.500)
No of observations	207	207	207	87	127	165	201	201	201	87	124	163
No of countries	14	14	14	7	11	11	14	14	14	7	11	11
No of left-censored observations	41	41	41	16	21	38	36	36	36	16	19	36
Wald Chi <sup>2</sup>	57.52 (0.000)	58.68 (0.000)	80.90 (0.000)	20.31 (0.000)	115.31 (0.000)	28.77 (0.000)	52.68 (0.000)	62.29 (0.000)	62.71 (0.000)	39.09 (0.000)	92.44 (0.000)	38.43 (0.000)

**Table 3.** Local stock market development and depositary receipt activity by DR type

This table presents coefficients of the random effect Tobit regressions of depositary receipt activity on the measures of domestic stock market development and a set of control variables. All explanatory variables are one year lagged. A constant is included in the regressions but not reported. The sample includes 14 Central and Eastern European countries over the period 1991-2009. Definitions of the variables are presented in Appendix A. p-values of the estimated coefficients are reported in parentheses.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All spons and unspons	Unspons	U.S. Exch listed	London listed	OTC listed	Portal listed	All spons and unspons	Unspons	U.S. Exch listed	London listed	OTC listed	Portal listed
<i>Panel A. Dependent variable: Market capitalization of DR firms / Total domestic market capitalization</i>												
Market capitalization / GDP	1.083 (0.001)	0.146 (0.662)	0.620 (0.017)	0.701 (0.008)	0.550 (0.053)	1.015 (0.000)						
(Market capitalization / GDP) <sup>2</sup>	-0.869 (0.002)	-0.111 (0.674)	-0.468 (0.024)	-0.526 (0.029)	-0.572 (0.021)	-0.754 (0.003)						
Value traded / GDP							2.594 (0.000)	1.449 (0.008)	1.078 (0.010)	1.072 (0.043)	0.560 (0.219)	1.834 (0.001)
(Value traded / GDP) <sup>2</sup>							-4.179 (0.001)	-2.047 (0.025)	-1.625 (0.035)	-1.736 (0.110)	-1.737 (0.053)	-2.753 (0.013)
GDP growth	1.645 (0.007)	0.783 (0.268)	0.685 (0.228)	0.778 (0.155)	2.106 (0.000)	1.129 (0.041)	0.786 (0.163)	-0.277 (0.626)	0.576 (0.271)	0.403 (0.445)	1.887 (0.000)	0.815 (0.133)
No of observations	153	153	153	153	153	149	148	148	148	148	148	144
No of countries	12	12	12	12	12	11	12	12	12	12	12	11
No of left-censored observations	31	135	124	50	86	44	26	130	119	45	81	39
Wald Chi <sup>2</sup>	43.50 (0.000)	3.48 (0.324)	18.73 (0.000)	19.72 (0.000)	40.21 (0.000)	39.42 (0.000)	37.33 (0.000)	9.13 (0.028)	0.000 (0.000)	8.04 (0.045)	22.41 (0.000)	28.46 (0.000)

(continued)

**Table 3.** - continued

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	All spons and unspons	Unspons	U.S. Exch listed	London listed	OTC listed	Portal listed	All spons and unspons	Unspons	U.S. Exch listed	London listed	OTC listed	Portal listed
<i>Panel B. Dependent variable: Number of DR firms / Total number of firms listed domestically</i>												
Market capitalization / GDP	0.181 (0.000)	0.026 (0.392)	0.055 (0.004)	0.104 (0.003)	0.108 (0.005)	0.142 (0.000)						
(Market capitalization / GDP) <sup>2</sup>	-0.107 (0.038)	-0.013 (0.638)	-0.048 (0.002)	-0.052 (0.124)	-0.112 (0.003)	-0.047 (0.036)						
Value traded / GDP							0.443 (0.000)	0.203 (0.005)	0.097 (0.001)	0.235 (0.002)	0.240 (0.000)	0.212 (0.008)
(Value traded / GDP) <sup>2</sup>							-0.497 (0.025)	-0.280 (0.030)	-0.180 (0.001)	-0.164 (0.295)	-0.494 (0.000)	-0.085 (0.609)
GDP growth	0.430 (0.000)	0.122 (0.037)	0.091 (0.022)	0.086 (0.204)	0.319 (0.000)	0.084 (0.227)	0.242 (0.004)	0.033 (0.557)	0.065 (0.060)	0.031 (0.628)	0.122 (0.034)	0.060 (0.374)
No of observations	207	207	207	207	207	207	201	201	201	201	201	201
No of countries	14	14	14	14	14	14	14	14	14	14	14	14
No of left-censored observations	31	158	177	77	118	68	27	153	171	71	112	63
Wald Chi <sup>2</sup>	79.18 (0.000)	11.57 (0.009)	36.36 (0.000)	31.12 (0.000)	50.07 (0.000)	47.36 (0.000)	66.90 (0.000)	14.14 (0.003)	27.08 (0.000)	38.50 (0.000)	33.30 (0.000)	41.71 (0.000)

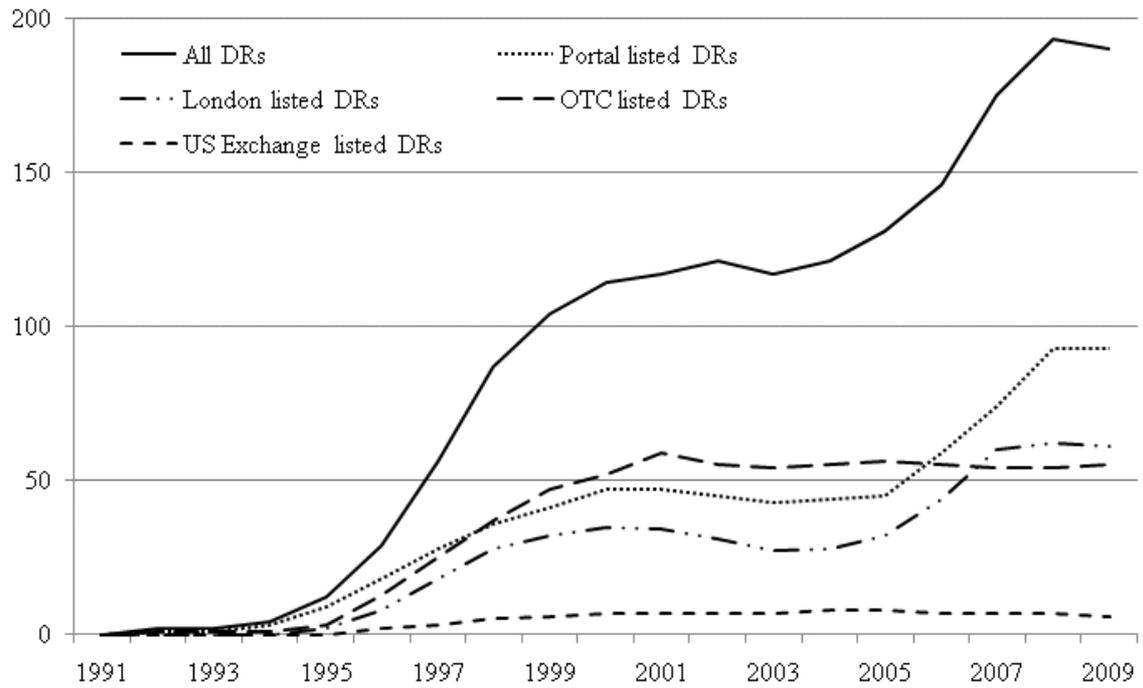
**Table 4.** Robustness tests – different estimation methods

This table presents coefficients of the fixed effect and random effect regressions of depositary receipt activity on the measures of domestic stock market development and a set of control variables. All explanatory variables are one year lagged. A constant is included in the regressions but not reported. The sample includes 14 Central and Eastern European countries over the period 1991-2009. Definitions of the variables are presented in Appendix A. p-values of the estimated coefficients are reported in parentheses. The significance test is based on standard errors robust to clustering within countries.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Fixed effects	Fixed effects	Random effects	Random effects	Fixed effects	Fixed effects	Random effects	Random effects
	<i>Panel A. Dependent variable</i>				<i>Panel B. Dependent variable:</i>			
	<i>Market capitalization of DR firms / Total domestic market capitalization</i>				<i>Number of DR firms / Total number of firms listed domestically</i>			
Market capitalization / GDP	0.804 (0.028)		1.023 (0.002)		0.141 (0.048)		0.150 (0.022)	
(Market capitalization / GDP) <sup>2</sup>	-0.665 (0.022)		-0.804 (0.002)		-0.082 (0.193)		-0.087 (0.153)	
Value traded / GDP		1.938 (0.008)		3.158 (0.000)		0.326 (0.048)		0.365 (0.014)
(Value traded / GDP) <sup>2</sup>		-3.246 (0.010)		-4.809 (0.000)		-0.331 (0.268)		-0.364 (0.207)
GDP growth	1.607 (0.233)	1.052 (0.409)	1.066 (0.376)	-0.058 (0.954)	0.382 (0.064)	0.238 (0.045)	0.363 (0.041)	0.214 (0.016)
No of observations	153	148	153	148	207	201	207	201
No of countries	12	12	12	12	14	14	14	14
Overall R <sup>2</sup>	0.077	0.288	0.128	0.442	0.111	0.264	0.119	0.282
F-statistic / Wald Chi <sup>2</sup>	3.58 (0.050)	6.58 (0.008)	13.19 (0.004)	37.80 (0.000)	3.67 (0.041)	5.05 (0.016)	11.34 (0.010)	18.33 (0.000)

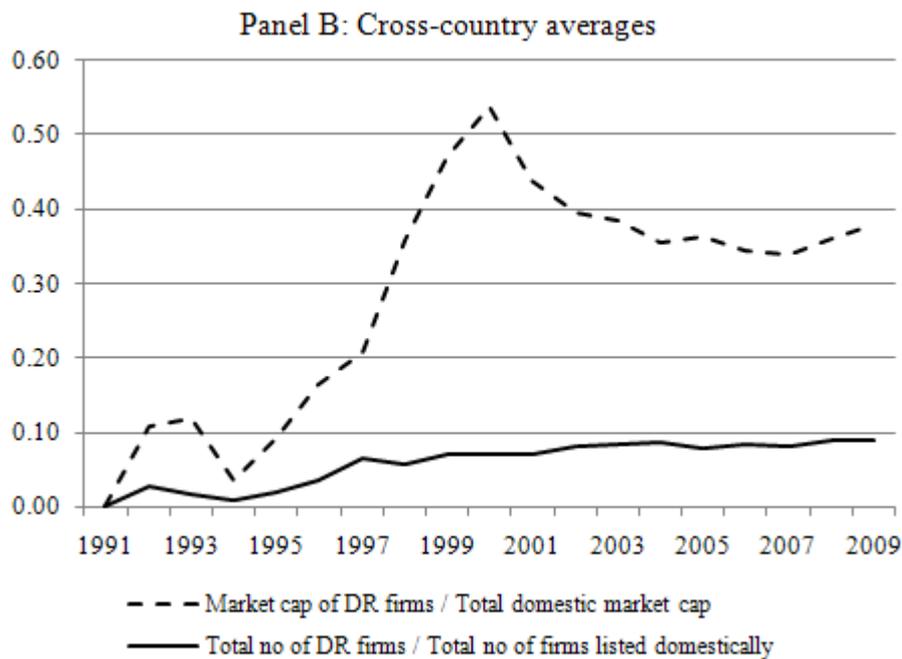
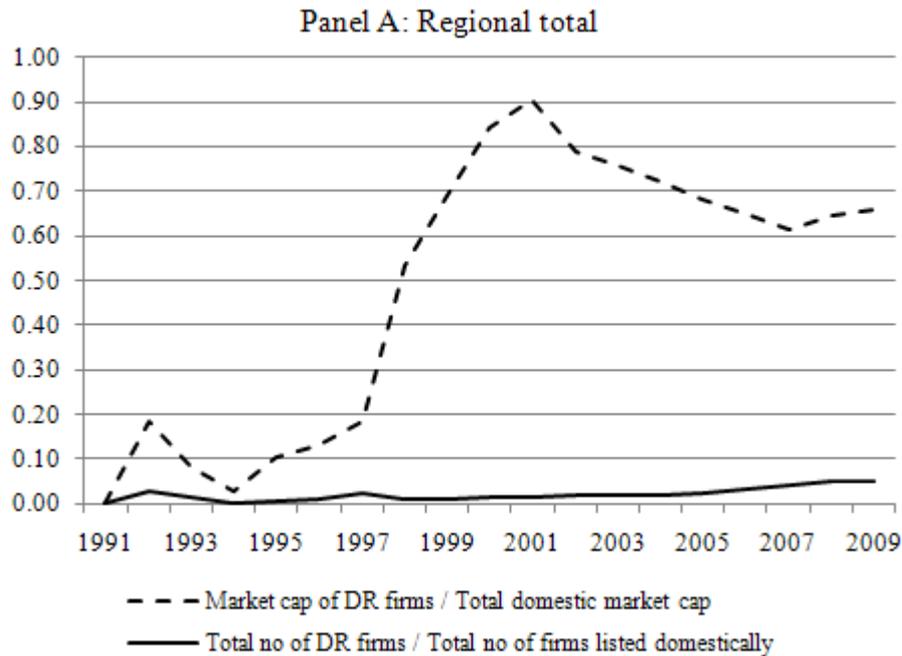
**Figure 1.** Companies with depositary receipt programs

The figure shows a time series of the number of companies from 14 Central and Eastern European countries with active depositary receipt programs over the period 1991-2009.



**Figure 2.** Depository receipt activity over time

The figure presents the depository receipt activity in the sample countries over time. Market capitalization of firms with DR programs scaled by the total capitalization of the domestic market is depicted with the dashed line, and the number of firms with DR programs scaled by the total number of firms listed domestically is depicted with the solid line. In Panel A the DR activity (capitalization or the number of firms) is summed across all countries and then scaled by the total aggregated size of the markets. Panel B presents cross-country averages of the activity measures. The sample includes 14 Central and Eastern European countries.



**Figure 3.** Development of DR activity over time in selected countries

The figure presents the depositary receipt activity in selected sample countries over time. Market capitalization of firms with DR programs scaled by the total capitalization of the domestic market is depicted with the dashed line, and the number of firms with DR programs scaled by the total number of firms listed domestically is depicted with the solid line.

