# Foreign Direct Investment and Foreign Portfolio Investment in the contemporary globalized world: should they be still treated separately?

Humanicki, Marcin and Kelm, Robert and Olszewski, Krzysztof

Narodowy Bank Polski, University of Lodz

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**Marcin Humanicki, Robert Kelm, Krzysztof Olszewski**

**Abstract**

Foreign direct investment (FDI) and foreign portfolio investment (FPI) have been long considered as distinct and independent forms of international capital flows, but in the globalized world there are reasons to treat them as interconnected phenomena. This paper analyzes the mutual relationship between FDI and FPI and attempts to answer the question whether they complement or substitute for each other from a foreign investor's point of view. Firstly, the paper describes the main characteristics of FDI and FPI in terms of a trade-off between their volatility and profitability. Secondly, it provides a literature review on the determinants of these two types of foreign investment. Finally, we analyse the long-run and short-run relationships between FDI and FPI running VECM regressions on data for Poland. Our research suggests that these two forms of foreign investment are substitutes. To be more specific, in economically stable periods FDI tends to dominate over FPI, but during insecurity and economic distress, both in source and host countries, FPI starts to gain importance.

**Keywords:** foreign direct investment, foreign portfolio investment, emerging market economies, cointegration

**JEL Classifications:** F21, F41, O1

M. Humanicki (corresponding author)
Narodowy Bank Polski, Economic Institute, Swietokrzyska Street 11/21, 00-919 Warsaw, Poland
phone: +4822 1852604
e-mail: marcin.humanicki@nbp.pl

R. Kelm
University of Lodz, Chair of Econometric Models and Forecasts, Rewolucji 1905 Street 41, 90-213 Lodz, Poland
e-mail: emfrok@uni.lodz.pl

K. Olszewski
Narodowy Bank Polski, Financial Stability Department, Swietokrzyska Street 11/21, 00-919 Warsaw, Poland
e-mail: krzysztof.olszewski@nbp.pl

## 1 Introduction

Over the last two decades the financial integration of emerging market economies (EMEs) with international markets has gained momentum. In the 1980s and early 1990s, net private capital inflows to EMEs were still relatively low, but they began to grow more rapidly in the mid-1990s[2]. This phenomenon has been influenced by a number of factors reflecting, on the one hand both the expected profitability and the perceived investment risk of EMEs assets, and on the other hand, the changing external environment. These host-country specific factors (also called *pull factors*) include, particularly, an ongoing capital flow liberalization and a strong output growth of EMEs, giving investors an opportunity to get a relatively high rate of return. However, the major external factors (also called *push factors*) capture, *inter alia*, low interest rates and expected low returns on financial assets in the developed countries.

Since the early 1980s capital has been flowing to EMEs primarily in the form of foreign direct investment (FDI). This resulted from the fact that historically FDI has been considered as a safe source of external financing and a factor stabilizing the financial system of the recipient countries. The abovementioned view has been reflected in the EMEs approach to as they have lifted, in the first place, restrictions on long-term flows and then gradually on short-term flows. Along with the development of local financial markets in EMEs and their greater openness to foreign investors, the composition of capital inflows has shifted towards the rising share of foreign portfolio investment (FPI) in total flows. An increase in the volume of FPI flows to EMEs has been also connected with the growing importance of institutional investors (insurance companies, pension funds, mutual funds, hedge funds, sovereign wealth funds, private equity funds, etc.), as they added liquidity to global securities markets.

Foreign direct and portfolio investment differs, *inter alia*, in terms of motivation and time horizon, but seems to come in pairs to some extent. The choice of the investment form is not only important for the investor, but also for the recipient country. While older studies have made a clear cut between the two types of investment, our observations indicate that both forms of investment should be analysed jointly. Thus, this paper analyses the mutual relationship between FDI and FPI and investigate empirically, on data for Poland, whether these two forms of investment complement or rather substitute for each other.

We perform the empirical analysis on Polish data due to the following reasons. Firstly, Poland is the biggest country in Central and Eastern Europe (CEE) which successfully underwent the transition to an open market economy two decades ago and saw a continuous inflow of foreign capital. Secondly, Poland is considered by investors as a core market in the region, thus many multinational firms located their headquarters for CEE just in it. This is also confirmed by the international investment position data showing that Poland attracts one third of all FDI coming to the whole region.

[2] According to the Institute of International Finance, the size of net private capital inflows to EMEs grew from about 30 billion US dollars during the 1980s to around 320 billion of US dollars during 2000-2005, before reaching an all-time high of 1.2 trillion US dollars in 2007.

Despite the fact that in the literature FDI and FPI have been considered traditionally as two distinct forms of capital flows, we investigate whether they share common determinants. The research question is whether those two modes of foreign investment complement or substitute for each other from a investor's point of view. To answer this question, we first investigate which factors determine FDI and FPI inflow in case of Poland. Secondly, we analyse the long-run and short-run relationships between those two types of capital inflows running VECM regressions on data for Poland.

The paper is organized as follows. Section 1 discusses the empirical literature on the determinants of FDI and FPI, and presents the theoretical models on the mutual relationship between these two forms of investment. Section 2 introduces the data, outlines the research hypothesis and describes the estimation methodology. Section 3 discusses the empirical results. Section 4 concludes the paper and gives some policy recommendations.

## 2 Modelling the investor's decisions: literature review

Since the early 1980s capital flows[3] between developed countries and towards developing economies have been growing as a result of the reduced controls on financial transactions as well as the evolution of the financial system and information technologies. The question is what drives the different types of investment flows to the host country (Hattari and Rajan 20111). The majority of international investment takes place between highly developed countries (Alfaro et al. 2005). This fact might be at odds with the general economic theory according to which capital should flow where the rate of return on capital is higher ("Lucas Paradox"). Alfaro et al. (2005) find empirically that this paradox can be explained, *inter alia*, by the difference in the quality of institutions among rich and poor countries (e.g. protection of property rights, law and order, government stability, etc.).

Empirical studies on the determinants of international capital flows usually focus only on FDI. The starting point of analysing this type of foreign investment is the well-known framework proposed by Dunning (1993), according to which there are three main sets of motives for FDI decisions: i) *market-seeking* (e.g. size of the host country market, GDP growth rate and its outlook), ii) *resource-seeking* (e.g. natural resources, human capital) and iii) *efficiency-seeking* (e.g. taxes, unit labour costs). However, a critical review of the empirical literature on FDI determinants (Bloningen 2005) shows that the effect of the aforementioned factors on inward foreign investment is rather ambiguous and fragile statistically.

For Central and Eastern European countries the main determinants of inward FDI are notably, according to Bevan and Estrin (2004) and Jonhson (2006), the market size of both the host and source country, their geographic proximity and unit labor costs. Surprisingly, they find that the impact of host country risk on capital inflows is insignificant. Carstensen and Toubal (2004) perform a similar analysis as

[3] These flows can be divided into three major categories, FDI, FPI and the so-called other investment. According to international standards (OECD, IMF), foreign investment which accounts for more than 10% of shares or voting rights is considered as FDI. In case it is below 10%, it is classified as FPI. The remaining forms of capital, such as trade loans, bank loans and deposits are considered as other investment.

Bevan and Estrin (2004), including the lagged FDI flow and controlling for endogeneity of the explanatory variables. Their empirical analysis shows that FDI is determined by the market size, relative unit labor costs, the share of secondary and tertiary educated workers in total labor force and relative capital endowments, measured as investment per worker in the source and host country. Moreover, they find that the current FDI inflow depends on its lagged value, which indicates that there is inertia in the capital flows.

While determinants of FDI flows into developing and emerging economies are well-known, factors driving FPI are less so (Brennan and Cao 1997; Froot et al. 2001). Taylor and Sarno (1997) analyse data on capital flows for Latin America and Asia during late 1980s and early 1990s and conclude that both global (*push*) and country-specific (*pull*) factors played a role in explaining the large FPI inflow in these regions. The *push factors* capture the changing conditions in the world economy and in international financial markets (e.g. the US output growth, the US short- and long-term interest rates, etc.). On the other hand, the *pull factors* reflect both profit-taking opportunity and the perceived investment risk of the host country (e.g. local labour force and raw materials, openness, rate of return, country's credit rating, etc.). Moreover, according to Fernandez-Arias and Montiel (1996) these domestic determinants include, *inter alia*, the country's GDP output growth and its outlook, its investment climate and credit rating, financial openness, the level of external debt and foreign exchange reserves, interest rates, etc.

The long-run and short-run adjustments in international capital flows are also studied by Mody et al. (2001). Basing on the Fernandez-Arias and Montiel (1996) model they analyze the *push* and *pull factors* of capital flows (bonds, equity and syndicated loans) to 32 developing countries applying the vector error correction method.

In the initial decades of globalization, as Goldstein et al. (2010) point out, multinational corporations chose FDI while private equity funds, mutual funds and hedge funds focused on FPI. Recently also funds invest directly in FDI and thus compete with multinational corporations. This fact allows us to assume that quite similar investors[4] channel their funds through FDI and FPI.

The fundamental question is how investors decide whether to engage in FDI or FPI or in both types of investment. Goldstein and Razin (2006) analyse this question from the investor's point of view. The main difference between FDI and FPI origins from a trade-off between *profitability* and *liquidity*. FDI allows investors to make decisions in the firm as they are not only the owner, but also the manager of it. Thus, in relation to portfolio investors, FDI investors have a higher control over the firm and more information about its fundamentals that enables them to run it more efficiently and to maximize profits. However, the privileged position of FDI investors comes with a cost. Because FDI is less liquid than FPI, investors might find it difficult to sell their project prematurely when faced with a liquidity shock. Even if FDI investors manage to find a potential buyer, they might sell their shares at a lower price than they are indeed worth. An important assumption in the Goldstein and Razin (2006) paper is that market participants

[4] The investors' decision-making process consists of many steps. Firstly, investors decide how much they invest at all. Secondly, they decide how much to invest abroad, and then in which region to allocate their capital. Finally, they decide to invest in one particular country and choose the proportions of FDI and FPI.

know that the FDI investor has insider knowledge about the firm he owns. If FDI investors decide to exit the investment project, potential buyers assume that there are some risks concerning the investment or that it generates only limited returns. However, as Goldstein and Razin (2006) point out, potential buyers will be more willing to pay the full price if they know that the sale is a fire-sale caused by the owner's liquidity needs. The authors show also that investors with a sound liquidity position prefer to invest in FDI. In general, FDI is the domain of multinational corporations, while FPI are the choice of firms that are subject to liquidity shocks, like global investment funds. Goldstein and Razin (2006) conclude that investors prefer FDI over FPI if the transaction and entrance cost is low, if production costs abroad are low and if they have a sound liquidity position. This helps to explain, why FDI are more dominant in developing or emerging countries, where transaction and production costs are much lower than in developed countries.

Another study that deals with the question whether to invest in FDI or FPI was performed by Pfeffer (2008). According to the author, the decision depends on whether the investor wants a high-yield, but less liquid asset or one that is less profitable, but allows to withdraw money quite fast. She finds that international investors prefer to have a mix of FDI and FPI. This strategy combines the best aspects of both kinds of investment and leads to a relatively high yield and a good liquidity position of the investors. The investors are able to deal with liquidity problems by selling FPI, thus FPI is used to stabilize the FDI investment position.

The theoretical model of Goldstein and Razin (2006) is empirically tested by Goldstein et al. (2010). They assume that liquidity shocks of individual investors are caused by aggregate shocks in the source country. This assumption reflects the fact that usually aggregate liquidity problems force individual investors to sell their assets, but it does not reveal to the market what has caused the need to sell. The information asymmetry persists and buyers think that sellers have some additional information about the state of the investment project. Goldstein et al. (2010) find for a broad set of countries that whenever liquidity problems seem to be likely in the source country, the ratio of FPI to FDI increases. Thus, their empirical findings confirm their theoretical model.

While Goldstein et al. (2010) focus on the source country, Daude and Fratscher (2008) investigated the determinants of FDI and FPI flows from the host country perspective. They find, using a broad set of bilateral capital stocks for 77 countries, that FDI reacts stronger to information problems than FPI. On the other hand, the quality of institutions in the host country has little effect on FDI, but a quite strong impact on FPI.

There exists a consensus that, in relation to other forms of foreign capital, FDI is a relatively stable and long-term form of foreign capital inflow (Razin and Sadka2007; Kirabaeva and Razin 2011), while FPI is treated as "hot money" that is prone to destabilize the economy (Claessens et al. 1995). Among developed countries FPI has a higher share than FDI in the capital inflow, while it is the opposite for developing economies. The reason can be different investment strategies which investors pursue and also the size of the host economies. Investors from a developed country usually want to control a firm in a remote location, thus choose FDI (UNIDO, 2009). Moreover, the relatively small size of firms in

developing countries make it simple for a developed country's investors to take a big share, while they might find it difficult to get even 10% of a firm in a developed country. FDI has a lion's share in investment in developing economies and Albuquerque (2003) provides two main motivations. Because FDI uses also a lot of intangible assets, it cannot be easily expropriated by the host country government. The investor considers it thus as relatively safe. The second motivation concerns the host country, which prefers and enforces FDI as it is a much more stable source of financing than other forms of capital flows.

## 3 Empirical framework: assumptions, working hypotheses and data properties

Although the empirical literature on determinants of FDI and FPI is quite substantial, it still does not give unequivocal answers to the question concerning drivers of these two forms of foreign investment – different theoretical assumptions justify different model specifications comprising rich sets of explanatory variables and often lead to 'heterogeneous' conclusions on FDI and FPI determinants. Therefore, in the paper we focus on relatively general theoretical model developed by Barrell and Pain (1996). The model formalizes the statement by Jun (1990, p. 56) that "the profit-maximizing international firm will try to optimize over the capital allocation between the parent and the subsidiaries, given different rates of returns and sources of funds between countries". In the Barrell and Pain (1996) model the multinational firm can produce domestically and abroad, and additionally the production abroad can be financed through FDI as well as by lending from third parties. The firm chooses an optimal production function taking into account the different labor and capital costs as well as the exchange rate (Cushman 1995).

Using the above model we make the quite common assumption that the accumulation and diffusion of the FDI and a higher TFP dynamics in the European catching-up economies is driven mostly by differences in unit labour costs. In the long-term the accumulation of FDI leads to 'saturation' of the economy with new technologies, closes the ULC gap and brings down the host country's price competitiveness. Finally, the FDI-to-GDP ratio stabilizes at a level that may be intuitively interpreted in line with some of the stylized Kaldor facts. The same reasoning is adopted in the case of FPI modelling – it is assumed that there exists a certain level of the FPI-to-GDP ratio, which is consistent with a long-run equilibrium and that the deviations from this equilibrium are caused by varying relative capital costs.

Three hypotheses are tested in the paper. Firstly, we assume that the FDI inflows to Poland is determined by the host market size and/or differences of the real unit labor costs (RULC hereafter) at home and abroad. Secondly, we verify hypothesis about the existence of cause-effect relations linking the FPI inflows with the host country GDP and the relative real interest rates. Thirdly, we check if both FDI and FPI tend to substitute for each in periods of greater risk aversion or – conversely – if the increased FDI inflows is coupled with rising FPI inflows. To sum up, we hypothesize that the long-term equilibrium conditions of the FDI-FPI model are defined by the following equilibrium (cointegrating) relations:

$$f^{DI} = \varphi_1 x - \varphi_2 (r_{ULC} - r^{*}_{ULC}) \pm \varphi_3 f^{PI} + \varphi_4 t + \ldots, \qquad (1)$$

$$f^{PI} = \phi_1 x \ + \phi_2 (r_{3M} - r_{3M}^{*}) \pm \phi_3 f^{DI} + \phi_4 t + \ldots, \tag{2}$$

where: $f^{DI}$, $f^{PI}$ are logs of the cumulative nominal FDI and FPI inflows in host country, $x$ is the log of the nominal GDP in host country, $r_{ULC}$, $r_{ULC}^{*}$ are real unit labor costs at home and abroad (ULCs deflated by GDP deflators), $r_{3M}$, $r_{3M}^{*}$ – the real interest rates, $\varphi_k$, $\phi_k$ – equilibrium parameters. In the empirical investigations we also allow for some linear combinations of the above two cointegrating vectors. For instance, the long-term properties of the FDI-FPI model with cointegrating vectors (1)-(2) can be equivalently described by the vector error correction model (VEC model) with the 'mixed' relation:

$$(1+\phi_3) f^{DI} + (1+\varphi_3) f^{PI} = (\varphi_1 + \phi_1) x - \varphi_2 (r_{ULC} - r_{ULC}^{*}) + \phi_2 (r_{3M} - r_{3M}^{*}) + (\varphi_4 + \phi_4) t + \ldots \tag{3}$$

and equation (1) or (2).

The empirical analysis discussed in the paper is country-specific and it focuses on the outstanding amounts of FDIs and FPIs and encompasses a relatively 'new' quarterly sample 2001q1-2013q4. There are several reason for carrying out a such predefined analysis. The vast majority of empirical work is based on some form of panel regressions, which gives a broader picture, but is usually of limited use for the economic policy of a single country. A good example of the consequences of panel heterogeneity is the analysis performed by Jevčák et al. (2010), who find that both external (e.g. interest rates, business cycle and risk sentiment in the euro area) and domestic factors (e.g. host-country's output growth, interest rates, house price growth and its perceived risk) influence FDI inflows to CEECs. Even though FDI flows into Poland, which constitute a significant share of total flows to CEECs is included in the regression, none of domestic variables is found to significantly attract foreign investment into Poland. Such a finding can be at least regarded as a criticism towards some of the panel regressions.

The data on FDI and FPI inflows into Poland as well as the data on the Polish GDP and other potential FDI and FPI drivers is available since 1995 yet. Using the entire sample in the estimation of the model parameters and in the relevant statistical tests is, however, problematic due to several structural changes in the Polish economy during transition period. The history of foreign investment in Poland started in 1996, after Poland managed to agree with the Paris and London clubs to reduce its external debt. Restoring foreign debt solvency and capital flow liberalization were the most important reasons why Poland could attract foreign direct investment that was growing with a pace of about 5.2% (quarterly rate, USD, current prices) until 2000. In the next period Poland was preparing for the EU accession. As the still relatively high CIT rate was hindering FDI inflows improvements in the law and the tax systems attracted other forms of foreign investment. After Poland joined the EU in May 2004 and lowered the CIT significantly an increase of FDI inflow was observed; reinvested earnings started to grow too. A visual inspection of outstanding amounts of FDI in Poland reaffirms heterogeneity of the entire sample 1995-

2013[5] (see **Fig. 1** and **Fig. 2**). FPI's heterogeneity is more pronounced. It should be underlined that more than 90% of the FPI inflow to Poland takes the form of the Treasury debt securities and, therefore, an overall increase in the liabilities reflects permanent disequilibria in the Polish fiscal sector. The supply of government debt securities was limited in the period 2006-2008 only, when a strong GDP growth and rising tax incomes were observed. The reason why Poland reduced the scale of the Treasury debt securities issuances in the abovementioned period, compared with the previous years, was, among other things, a prepayment of a part of Poland's debt to the Paris club in 2005. This was an element of the new strategy of external debt restructuring introduced by the Polish government.

**Fig. 1** here about

**Fig. 2** here about

Last but not least, most of empirical analyses deal rather with capital flows than stocks of foreign investment and, therefore, they focus solely on the short-run determinants and do not allow, even if large and long panels are applied, to capture the long-run properties of the modelled system. Using capital stocks brings another problem, however. For emerging economies and especially for the CEE catching-up countries, many of the stock variables may show not only "habitual" I(1) properties, but they also may be driven by the stochastic trends with strong I(2) properties in the analysed periods. All in all, the lack of detailed cointegration analysis would mean that one disregards the differences between the persistence of several shocks affecting host-country economies and thus it may lead to a misinterpretation of estimated parameters.

In the initial analysis of the properties of the data generating process a battery of standard univariate unit root tests (URT) was employed[6]. The results of the tests appeared to be symptomatic, as they *almost* unambiguously indicated I(1)-ness of almost all variables. The one exception was FDI, which was identified as a variable integrated of order two regardless of the fact whether data were in current or constant prices. The test results of the nominal GDP I(2)-ness were borderline whereas the FPI appeared to be intergrated of order one. This part of the analysis prompted us to formulate two cointegrated VAR scenarios. According to the first scenario, FDI and GDP might share the same I(2) stochastic trend, whereas an autonomous I(1) trend drives FPI as well as FDI and GDP. In the second scenario, which assumes FDI's *I*(2)-ness and the difference-stationarity of the GDP, the three variables do not cointegrate and some suitable model's extensions are needed. A preliminary analysis of the properties of the relative real ULCs and the spread of the real interest rates gave a mixed picture. The ADF and KPSS tests results unambiguously indicated that both RULC and RIRD should be treated as I(1) variables. On the other hand, the DF-GLS test clearly suggests I(2)-ness of relative RULC, whereas the ERS test results are borderline.

[5] Nominal variables are used in the research for three reasons. Firstly, the choice of deflators for both types of capital inflows is not obvious, and could introduce additional dynamics into the data. Secondly, FDIs' and FPIs' dynamics unequivocally dominate price inflation and the deflation method has nearly no impact on the estimation results. Thirdly, the long-term homogeneity restriction is positively verified in the paper. It means that we finally model FDI-to-GDP and FPI-to-GDP ratios and the "price bias" shrinks.

[6] We employed standard Dickey-Fuller-type tests, i.e. ADF (Dickey and Fuller 1981), DF-GLS and ERS (Elliot et al. 1996) as well as KPSS test (Kwiatkowski et al. 1992) with different sets of the deterministic variables.

Similar conclusions may be drawn with respect to the stochastic properties of the real interest rates differential (see **Fig. 3**).

**Fig. 3** here about

Limitations of the univariate unit root tests in short samples are well known so we interpreted the tests' results with an extreme wariness. For example, a visual inspection of the quarterly growth rates of the GDP and FDI (see **Fig. 2**) allows to point out sub-periods of similar dynamics of the variables. Both dynamics seem to exhibit moderate and 'non-stationary' persistence and this fact informally strengthens our working hypothesis that the GDP and FDI might be driven by a common I(2) stochastic trend. The same working hypothesis may be formulated with respect to the processes driving FDI (or FDI-to-GDP ratio) and relative real ULCs (Fig. 1 and Fig. 3). It is also easy to notice that a large part of the volatility of the FPI's growth rate results from large issuances of treasury bonds in the first quarters in the period 2000-2005. This property of the FPI may decide on the rejection of the (true) null hypothesis assuming FPI's I(2)-ness against the (false) alternative hypothesis about FPI's difference-stationarty. Juselius (2013) shows that the ADF-type univariate unit root tests fail to detect moderate I(2) components in time series with low signal-to-noise ratios and that the presence of the double unit roots should be investigated within a broader framework of the VEC models. In the next section we follow this recommendation.

## 4 Estimation results and discussion

The starting point for the estimation was the vector error correction model[7]:

$$\begin{aligned}\Delta^2 y_{(m)t} &= \Pi y_{(m)t-1} + \Gamma \Delta y_{(m)t-1} + \sum\nolimits_{s=1}^{S-2} \Phi_s \Delta^2 y_{(m)t-s} + \mu_{(m)} + \varepsilon_{(m)t} \\ &= \alpha(\beta' y_{(m)t-1} + \delta' \Delta y_{(m)t-1}) + \zeta \tau' \Delta y_{(m)t-1} + ST_{(m)t} + \varepsilon_{(m)t},\end{aligned} \tag{4}$$

where: $\Pi$ - long-term multipliers, $\Gamma$ - medium-term multipliers, $\Phi_s$ - short-term parameters; $ST_{(m)}$ stands for the short-term part of the VEC model, $\varepsilon_{(m)} \sim n.i.d.$

The equilibrium conditions of the VEC model (4) are defined by the polynomial cointegrating relations $\beta' y_{(m)t-1} + \delta' \Delta y_{(m)t-1} \sim I(0)$ ( $\beta' y_{(m)t-1} \sim I(1)$ ) and the medium-term equilibrium conditions $\tau' \Delta y_{(m)t-1} \sim I(0)$. The dimensions of the matrices of the equilibrium parameters $\beta$, $\delta$, $\tau$ and adjustment parameters $\alpha$ and $\zeta$ depend on the number of the model's variables ( $M$ ) and the numbers of the I(2) and 'autonomous' I(1) stochastic trends ( $S_2$ and $S_1$, respectively). The model (4) can be expressed in a equivalent common stochastic trend form (CST):

$$y_{(m)t} = C_2 \sum\nolimits_{i=1}^{t} \sum\nolimits_{j=1}^{i} \varepsilon_{(m)j} + C_1 \sum\nolimits_{i=1}^{t} \varepsilon_{(m)i} + \mathrm{T}_0(t) + e_{(m)t}, \tag{5a}$$

[7] For a detailed description of the I(2) system see Johansen (1995a), Juselius (2006) and references therein.

where: $C_2 = \beta_{\perp 2}(\alpha'_{\perp 2}\Psi\beta_{\perp 2})^{-1}\alpha'_{\perp 2} = \tilde{\beta}_{\perp 2}\alpha'_{\perp 2}$ is the matrix of the parameters of twice cumulated innovations $\varepsilon_{m,j}$ (i.e. I(2) stochastic trends), $C_1$ is matrix of the I(1) parameters and $\mathrm{T}_0(t)$ stands form the deterministic components, $e_{(m)t} \sim I(0)$. The CST representation allows to identify the sources of the I(2) shocks ($\alpha_{\perp 2}$ matrix) and to determine the directions, in which they diffuse in the analyzed system ($\tilde{\beta}_{\perp 2}$ matrix):

$$y_{(m)t} = \tilde{\beta}_{\perp 2}\sum_{i=1}^{t}\sum_{j=1}^{i} u_{(m)j} + C_1\sum_{i=1}^{t}\varepsilon_{(m)i} + \mathrm{T}_0(t) + e_{(m)t}, \tag{5b}$$

where $u_{(m)i} = \alpha'_{\perp 2}\varepsilon_{(m)i}$.

The model (4)-(5) was employed to analyze the relationships between the components of the vector $y_{(m)} = [f^{DI}, f^{PI}, x, r_{ULC} - r^*_{ULC}, r_{3M} - r^*_{3M}; t]'$ in the quarterly sample 2001q1-2013q4. Empirical investigation consisted in three steps: (i) cointegration test, (ii) structuralization of the long-term relations $\beta' y_{(m)t-1}$ and their economic interpretation and (iii) identification of the potential I(2) sources as well as identification of the I(2) shock absorbers. **Tab. 1** reports the results of the cointegration test proposed by Johansen (1995) and Paruolo (1996). The conclusions are clear-cut: there are two relations $\beta' y_{(m)t-1} + \delta'\Delta y_{(m)t-1} \sim I(0)$ in the system and the model's variables are driven by two I(2) common trends and one autonomous I(1) trend.

**Tab. 1** here about

**Tab. 2** here about

Even though the cointegration test results were unequivocal, the estimation results of the VEC model with two multi-cointegrating vectors turned out unacceptable. In particular, it was impossible to impose structuralizing restrictions which would even roughly be similar to the restrictions in the long-term relations (1)-(3). The estimates of the long-term parameters were very sensitive to any restrictions' revision. Therefore, the VEC model with three multi-cointegrating vectors was considered as well. The estimates of equilibrium parameters $\beta$, adjustment parameters $\alpha$, weights $\alpha_{\perp 2}$, loadings $\tilde{\beta}_{\perp 2}$ and the most important diagnostics of the model are summarized in **Tab. 2**. The interpretation of the first relation:

$$f^{DI} = \underset{(11.8)}{1.042}\,x + \underset{(8.2)}{0.008}\,t + \delta'\Delta y_{(m)t-1} \tag{6}$$

is straightforward: there is nearly one-to-one mapping between FDI and domestic GDP (with a 'moderate' mark-up approximated by the deterministic trend) and it is not possible to find any stable relation between FDI and the ULC differential. The structure of the second cointegrating vector:

$$(f^{PI} - x) + \underset{(4.2)}{0.450}(f^{DI} - x) = \underset{(13.0)}{-7.41}(r_{ULC} - r^*_{ULC}) + \underset{(27.4)}{41.1}(r_{3M} - r^*_{3M}) + \delta'\Delta y_{(m)t-1} \tag{7}$$

corresponds to the 'mixed' relation (3). According to a slightly simplified interpretation the estimated parameter by $f^{DI}$ supports the hypothesis that FDI and FPI are substitutes whereas the portfolio investment are strongly related to interest rates; there is also a long-term dependence of FDI flows on the relative real ULC. However the long-term estimation results should be interpreted with caution because the relation (7) resembles an implicit function without a clear-cut causality relation between $r_{ULC} - r^*_{ULC}$ and $f^{PI}$ as well as between $f^{DI}$ and $r_{3M} - r^*_{3M}$. The interpretation of the last cointegrating vector:

$$r_{3M} = r^*_{3M} + \underset{(50.3)}{0.341}\, x - \underset{(35.5)}{0.237}\, f^{DI} - \underset{(6.3)}{0.098}(r_{ULC} - r^*_{ULC}) + \delta' \Delta y_{(m)t-1} \qquad (8)$$

that closes the system is not straightforward either. It should be underlined here that due to the 'open structure' of almost every VEC model, one has often to allow at least one cointegrating vector to capture net effects of mechanisms that are not analysed in the model explicitly. If so, the equation may be interpreted in terms of an empirical Taylor rule that is 'concentrated-out' of the first two cointegrating vectors and according to which an increase of demand (*via* GDP) forces monetary authorities to increase the central bank's interest rate whereas an increase of the potential output (*via* FDI) closes the output gap.

**Fig. 4** here about

The estimates of the long-term equilibrium parameters give a bit mixed picture. There are two results that do not raise serious doubts, however. Firstly, both FDI and FPI are driven by the increasing size of the Polish economy. The long-term homogeneity $f^{DI} + \beta \cdot f^{PI} = (1+\beta) \cdot x + \ldots$ finds an empirical confirmation ($p$-value = 0.340 in the homogeneity test) and the assumption on the one-to-one mapping between both kinds of capital inflows and GDP may be perceived as a default reference point in the structuralization of the cointegrating vectors. Secondly, the analysis of the second multi-cointegrating vector (7) suggests that there is a relatively strong (and statistically significant) substitutability between FDI and FPI in the analyzed period. Finally, a visual inspection of the deviations from the cointegrating trajectories (see **Fig. 4**) does not provide serious arguments against the stationarity of the linear combinations (6)-(8). However, the above conclusions may seem to be premature if we confront them with the outcomes of the analysis of the adjustment parameters $\alpha$. In fact, the estimates of the adjustment parameters formally confirm weak exogeneity of $f^{DI}$. On the other hand, an estimated speed of $f^{DI}$ adjustments to the equilibrium path is well over zero (8.8% of the deviation observed in the preceding quarter). Thus one can argue that the lack of the estimate accuracy may be symptomatic for the relatively short sample used, and, in our opinion, it should not lead to 'automatic' conditioning the VEC model on $f^{DI}$. An interpretation of the loadings' in $\Delta^2 f^{PI}$'s equation is not simple because the FPI-to-GDP ratio adjusts to all identified cointegrating vectors. An excess of FPI inflow decelerates FPI in the next quarter (parameter's estimate of -0.336) and this property of the model does not rise reservations – cointegrating vector (7) can be given interpretation of the 'core' long-term relation describing foreign portfolio

investments. An estimate of the adjustment parameter by the first cointegrating vector (estimate of 0.551) suggests an occurrence of an error equilibrium increasing mechanism (Juselius 2010). More precisely, a positive deviation of $f^{DI}$ from the equilibrium path (6) accelerates $f^{PI}$ what pushes FPI away from the trajectory (7) and induces 'normal' counterbalancing along the trajectory (6)[8]. The last loading's estimate (-5.12) may be given a similar interpretation.

The analysis of the CST representation confirms the conclusions about the direction of the causality-effects which link FDI and FPI. The estimates of the $\alpha_{\perp 2}$ weights and $\tilde{\beta}_{\perp 2}$ loadings allow quite precisely to point-out the sources of the two stochastic I(2) trends that steer the FDI-FPI system and to identify the variables which cumulate those shocks. The estimates of $\alpha_{\perp 2}$ matrix suggest that the first I(2) trend originates from the FDI shock and it may be interpreted in terms of the technology or supply-side mechanisms, whereas the second I(2) trend has essentially demand-side sources (GDP and interest rates' shocks). Accepting this perspective, one can arrive at a result, according to which the portfolio investment is the 'most reacting' variable in the system – the estimates of the adjustment parameters by FPI are the largest and have the intuitively accepted signs. In particular a positive demand shock induces FPI inflow (estimate of 3.816) whereas a positive supply shock has a weaker, opposite effect (-0.595). This result confirms FDI's and FPI's substitutability. FDI's and GDP's responses to both shocks have positive signs and similar scales. Such a direction of the shocks' propagation allows to identify FDI's and GDP's trends as a cause of the presence of the I(2) trends in the model.

In the last stage of the investigation the model's robustness analysis was performed and several alternative specifications of the model were considered. In particular, the short-term interest rates were replaced with their long-term counterpart; FDI, FPI and GDP in constant prices were used as well. In all considered cases the general conclusions appeared to be analogous to the ones presented above. We also verified the potential importance of the exchange rate or its volatility as a proxy for the risk premium, both in the host country and abroad. The results appear to be disappointing (and slightly surprising) as the risk proxies did not enrich the model with any significant information. The latter outcome seems to be in line with the hypothesis that in a small open economy, like Poland, one should bear in mind that the exchange rate is mainly affected by the rest of the world and is correlated with GDP growth and foreign investment. Grossman et al. (2009) present a broad literature overview on this topic and conclude that in case of developed countries the wealth effect, which could result from a weakened host country exchange rate, is weak and the profit-orientation dominates, thus a strong currency attracts foreign capital[9]. It seems

[8] A simultaneous presence of the error correction and error equilibrium increasing confirms a presence the I(2) common trends in the model.

[9] We refer to the literature overview presented by Grossman et al. (2009) and sketch only the main streams. According to Froot and Stein (1991) investors prefer to invest when the host country currency is low, thus the wealth effect plays an important role. Investors can buy more foreign assets with the same amount of money. The other theory, as proposed by Goldberg (1993) or Campa (1993), focuses on a profit- and production oriented investor, who wishes to repatriate the profit which his firm generates. The stronger the host country currency, the more profit he will be able to receive in his home currency. Finally, Goldberg and Kolstad (1995) and Amuendo-Dorantes and Pozo (2001) do not find that the exchange rate affects the FDI inflow.

plausible that also for Poland and similar emerging markets the wealth effect that originates from a weak currency plays no particular role. The wealth effect is already captured in the significant differences in capital stocks. Even if the host country currency is strong, foreign investors will easily buy assets. Thus, the exchange rate can be expected to have a marginal role or be completely meaningless and indeed its inclusion did not improve the regression results.

## 5 Conclusions

The aim of this paper is to identify the most important factors that induced the huge inflows of foreign direct and portfolio investment in Poland in the first decade of the 21st century. We test the empirical relevance of our working hypothesis, according to which the main FDI determinant are ULC differences, while those of FPI are the real interest rates differentials between Poland and euro area. Controlling for the main FDI and FPI drivers, we formulate hypothesis that both forms of capital flows are rather complements than complements substitutes for each other. Moreover, taking into account a very quick increase in the Polish governmental debt over the last years we formulate another hypotheses, according to which the fiscal expansion may be followed by the 'crowding-out' effect of FPI. Under such scenario the FDI inflow slows down, which in consequence leads to lower TFP growth rates.

We conduct the empirical analysis in the standard vector error correction model and cointegration analysis framework. As the available quarterly sample is relatively short, the results should be treated as the first approximation, at most. Nonetheless, at this stage of investigation we arrive at some interesting results that may be a good starting point for the future research. We show that there exists a stable long-run equilibrium relationships between FDI, FPI, the size of the Polish market, the relative real unit labor costs and the real interest rate differential. An identification of the economically interpretable relationships turned out to be problematic, but the structure of the cointegrating vectors unambiguously supports the hypothesis on the potential trade-off between FDI and FPI.

The analysis of the stochastic trends propagation delivers a complementary (but also slightly surprising) information: both forms of foreign capital inflow are driven by the same two stochastic I(2)-trends, however portfolio investment appears to be much more sensitive to the demand- and supply-side shocks. Moreover, FDI shocks appear to be the dominant ingredients of the I(2) stochastic technological trend, that cumulates in the FPI. This result leads to the rejection of the working hypothesis of the FPI's 'crowding-out' effect in favor to the alternative hypothesis that FPI is 'residual' in the modeled system.

**Tab. 1** The cointegration test in the FDI-FPI model, 2000:1-2013:4

| $v$ / $s_2$ | 5 | 4 | 3 | 2 | 1 | 0 |
|---|---|---|---|---|---|---|
| 0 | 259.1 (0.000) | 216.1 (0.000) | 176.8 (0.000) | 149.0 (0.000) | 134.3 (0.000) | 130.0 (0.000) |
| 1 | - | 151.2 (0.010) | 114.4 (0.062) | 92.0 (0.073) | 78.7 (0.035) | 74.4 (0.004) |
| 2 | - | - | 85.3 (0.095) | **57.5** (0.335) | 44.3 (0.288) | 36.1 (0.204) |
| 3 | - | - | - | **32.5** (0.677) | 20.6 (0.709) | 18.1 (0.345) |
| 4 | - | - | - | - | 9.0 (0.751) | 5.0 (0.609) |

Notice: $v$ – number of cointegrating vectors, $s_2$ – number of I(2) trends; $p$-values in parentheses

**Tab. 2** The estimation of FDI-FPI model ($V=3$, $S_1=0$, $S_2=2$), 2001:1-2013:4

| | $f^{DI}$ | $f^{PI}$ | $x$ | $r_{ULC}-r^*_{ULC}$ | $r_{3M}-r^*_{3M}$ | $t$ |
|---|---|---|---|---|---|---|
| $\beta_1'$ | **1** | 0 | –1.042 (11.8) | 0 | 0 | –0.008 (8.2) |
| $\beta_2'$ | 0.460 (4.2) | **1** | –1.460 (-) | 7.407 (13.0) | –41.1 (27.4) | 0 |
| $\beta_3'$ | 0.237 (35.5) | 0 | –0.341 (50.3) | 0.098 (6.3) | **1** | 0 |
| $\alpha_1'$ | **–0.088** (1.2) | 0.551 (2.6) | –0.126 (4.0) | 0.219 (2.2) | 0.170 (7.1) | - |
| $\alpha_1'$ | . | **–0.336** (5.8) | 0.035 (4.1) | . | –0.016 (2.4) | - |
| $\alpha_1'$ | . | –5.120 (2.9) | 1.316 (5.1) | . | **–1.440** (7.3) | - |
| $\beta'_{\perp 2,1}$ | 0.081 | –0.595 | 0.077 | 0.085 | –0.010 | |
| $\beta'_{\perp 2,2}$ | 0.446 | 3.816 | 0.428 | –0.153 | 0.055 | |
| $\alpha'_{\perp 2,1}$ | 1 | . | 0 | . | . | |
| $\alpha'_{\perp 2,2}$ | 0 | 0.095 (2.9) | 1 | . | 0.575 (2.6) | |

LR = 0.264

AR(1) = 0.272 AR(2) = 0.291 DH = 0.383

AR(3) = 0.106 AR(4) = 0.451 ARCH(1) = 0.259

Notes: $t$-ratios are reported in parentheses. Dots stand for the parameters with $t$-ratios smaller than 2. $P$-values are reported for LR, AR, DH and ARCH tests; LR – over-identifying restrictions test, AR($s$) – test of the errors autocorrelation of order $s$, DH – Doornik-Hansen normality test, ARCH($s$) – test of the ARCH effect of order $s$

**Fig. 1** FDI, FPI and GDP in Poland (PLN, current prices, natural logarithms)

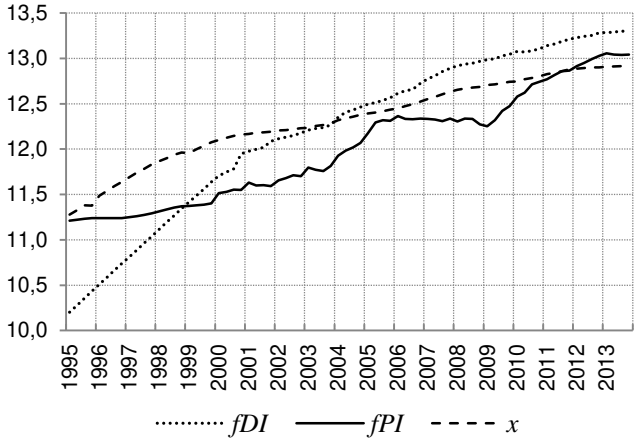



**Fig. 2** FDI and FPI inflows and GDP in Poland (PLN, current prices, growth rates)

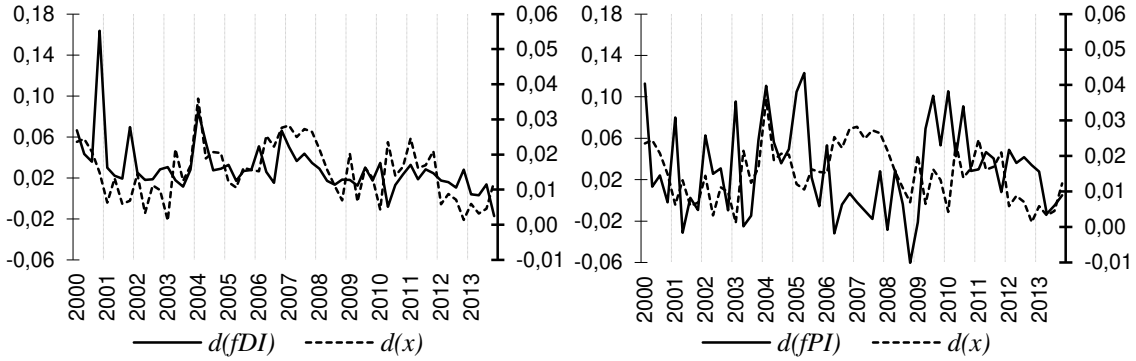



**Fig. 3** Real ULC differential and real interest rates differential (natural logarithms)

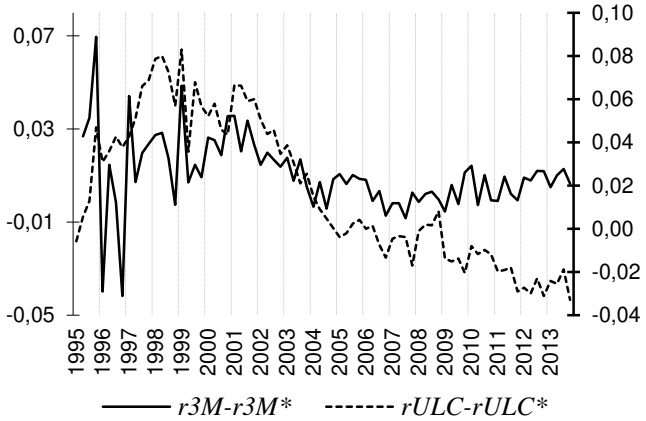
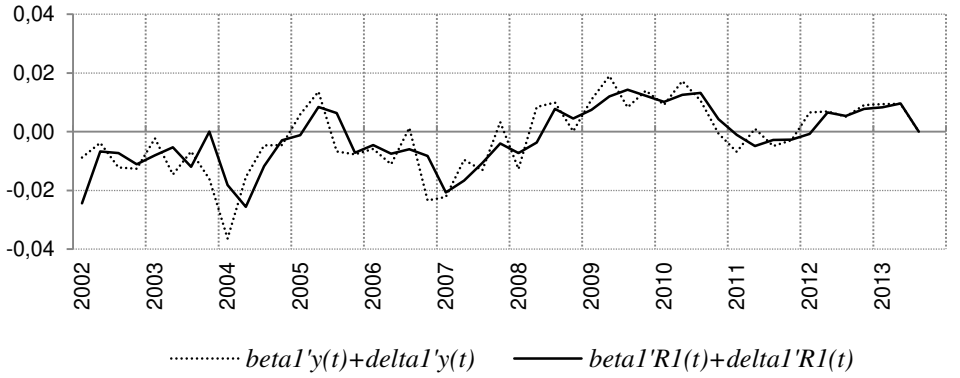
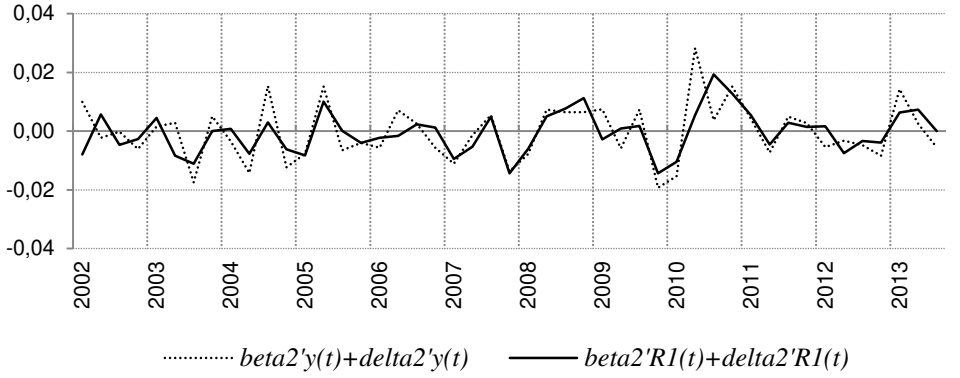
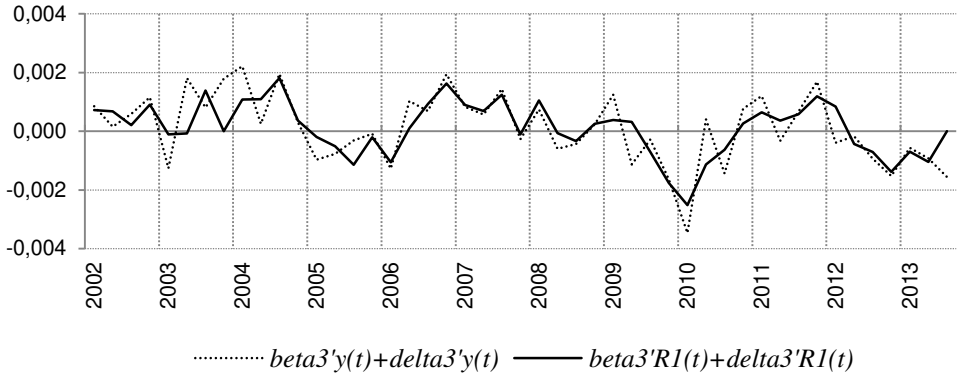


**Fig. 4** $\beta'_{v(m)} y_{(m)t} + \delta'_{v(m)} y_{(m)t}$ and $\beta'_{v(m)} R_{1t} + \beta'_{v(m)} R_{1t}$ deviations from the relations (6)-(8)



**Data Appendix**

The data sources and construction of the time series is presented here in detail. The data used in this paper origin both from the National Bank of Poland Balance of Payments and International Investment Position statistics, and the Eurostat database. The time series used in this study cover the period 2000Q1-2012Q2. All variables are expressed in natural logarithms and in Polish zlotys. The data set is available upon request.

| Variable | Description | Transformation | Source |
|---|---|---|---|
| $f^{DI}, f^{PI}$ | Foreign Direct Investment and Foreign Portfolio Investment stock in Poland | Estimated stock of Poland's foreign liabilities as a sum of the International Investment Position for 1994 and quarterly flows from Poland's Balance of Payments (both FDI and FPI) since 1995 | Own calculations based on NBP BoP and IIP statistics |
| $x$ | Nominal Poland's GDP | No transformation | Eurostat |
| $r_{3M} - r_{3M}^*$ | Difference between real 3-month interest rates both in Poland and in the euro area | Nominal 3-month interest rates deflated by GDP deflator (2005=100) both in Poland and in the euro area | Own calculations based on Eurostat data |
| $r_{ULC} - r_{ULC}^*$ | Difference between real unit labour costs (in total economy) both in Poland and in the euro area | Nominal unit labour costs in total economy deflated by GDP deflator (2005=100) both in Poland and in the euro area | Own calculations based on Eurostat data |

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