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Economic Institute
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Contents

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.

JEL codes: F21, F41, O1

Key words: capital flows, foreign direct investment, foreign portfolio investment, VECM

October 2013

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[1]. 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, a strong output growth of EMEs prospects, giving investors an opportunity to get a relatively high rate of return. However, the major external factors (also called *push factors*) capture, *inter alia*, a loose monetary policy 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 financial account liberalization 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.

These two forms of investment differ, *inter alia*, in terms of motivation and time horizon, but seem to come in pairs to some extent. The question is whether in the contemporary globalized world FDI and FPI should be treated as components of a common investment strategy or two separate modes of foreign capital. Thus, in this paper we analyse 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 underwent the transition to an open market economy two decades ago and we observe a continuous inflow of foreign capital. Poland is now considered by many investors as a core

[1] 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.

market and many multinational firms located their headquarters for Central and Eastern Europe in it. Secondly, we focus particularly on country-specific issues as we are aware that general conclusions drawn from studies based on panel data might sometimes not be easily applicable to a given country being a part of an analyzed group of economies. The main reason behind this is that standard panel data analysis is used to examine cross-sectional variability rather than to explain the changes within one country.

The paper is organized as follows. Section 1 discusses the empirical literature on the determinants of FDI and FPI. Section 2 presents theoretical models that deal with the mutual relationship between these two forms of capital flows. Section 3 introduces the data and presents the statistical analysis. Section 4 outlines the research hypothesis, presents the estimation methodology and discusses the results. Section 5 concludes the paper and gives some policy recommendations.

2. MODELLING THE INVESTOR'S DECISIONS: LITERATURE REVIEW

Since the early 1980s capital flows between developed countries and towards developing economies have been growing as a result of, *inter alia*, the reduced controls on financial transactions as well as the evolution of the financial system and information technologies. 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.

The question is what drives the different types of investment flows to the host country. 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 interest is higher – this is called the "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 (i.e. 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 (see e.g. Bloningen 2005) shows that the effect of the aforementioned factors on inward foreign investment is rather ambiguous and fragile statistically.

Now moving on to CEE countries, the main determinants of inward FDI are notably, according to Bevan and Estrin (2004), 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 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 an adjustment process going on.

While determinants of FDI flows into developing and emerging economies are well described in the literature, factors driving FPI are less so. 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*) factors and country-specific (*pull*) factors played a role in explaining the large FPI inflow in these regions. The *push* factors capture, *inter alia*, 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). They analyze the push and pull factors of capital flows (bonds, equity and syndicated loans) to 32 developing countries applying the VECM regression. They first propose a theoretical model that bases on Fernandez-Arias and Montiel (1996), according to which there exists an equilibrium level of capital flows, and then they adjust the model to test it empirically with the VECM regression. Mody et al. (2001) conclude that there are long-term and contemporary factors affecting the capital flows, thus one needs to analyse the long-term equilibrium relationship between capital flows and economic factors as well as the short-term adjustments.

We now go into the details on the difference between FDI and FPI and on why international investors choose the one or the other form of capital to invest abroad. Historically, 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 channel their funds through FDI and FPI. Modelling the investor's decision, we treat the rest of the world as a single investor or a group of investors who behave identically. 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. We consider the first steps as given and describe the latter two in more details. We analyse the long-run investment strategy as well as short-run adjustments.

An important 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 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. Pfeffer 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. This confirms the theoretical model and its empirical findings of Goldstein et al. (2010).

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 (see Razin and Sadka 2007; Kirabaeva and Razin 2011). Thus, FDI is more safe and desirable by host countries than FPI, which is treated as "hot money" that is prone to destabilize the economy (Claessens et al. 1995). This has significant implications for both the economy and the stability of the financial system of the host country.

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 (see UNIDO, 2009 for more details). 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.

Despite the fact that in the literature FDI and FPI have been considered as two distinct forms of capital flows, we want to investigate whether they share common determinants. Our research question is what makes FDI a stable source of capital flows while FPI is hot money. To answer this question, we first investigate which factors determine the FDI and FPI inflow in case of Poland. Secondly, we test whether there are any interactions between those two types of capital inflow and whether they are complements or substitutes.

3. EMPIRICAL FRAMEWORK: ASSUMPTIONS AND DATA PROPERTIES

Although the empirical literature on determinants of FDI and FPI is quite substantial, it still does not give satisfactory and consistent answers to the question concerning drivers of these two forms of foreign investment. This stems from the fact that different theoretical assumptions lead to different model specifications and inconsistent conclusions on FDI/FPI determinants. However, the reason why many econometric models differ doesn't lay only in different assumptions.

Firstly, 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, for instance, 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 CEE. Even though FDI flows into Poland, which constitute a significant share of total flows to CEE 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 critique towards some of the panel regressions.

Secondly, most of empirical analyses deal rather with capital flows than stocks of foreign investment. This approach focuses solely on the short-run determinants and does not allow, even if large and long panels are applied, to capture the long-run properties. We want to analyse the short, medium and long-run relationships, thus we use the stock of foreign capital, but this brings another problem. For emerging economies and especially for the CEE catching-up countries, many of the stock variables may exhibit not only I(1) properties, but they also may be driven by the stochastic trends integrated of order two or by the I(1) trends with very strong I(2) properties in the analysed periods. All in all, the lack of detailed cointegration analysis would mean that we disregard the differences between the persistence of several shocks affecting host-country economies and thus it may lead to a misinterpretation of estimated parameters. It should be underlined that the studies using FDI/FPI stocks within the standard cointegration procedures do not exclude the short-term analysis of adjustments in capital flows.

Problems associated with the application of over-differencing variables are the main reason why we decided to build a model of the long-term determinants of the cumulative FDI and FPI. This approach is in line with the theoretical literature, according to which the key pull-factor of FDI is the growth rate of the host country's GDP. In particular, we base on the theoretical model developed by Barrel and Pain (1996). Their model formalizes the statement by Jun (1990,

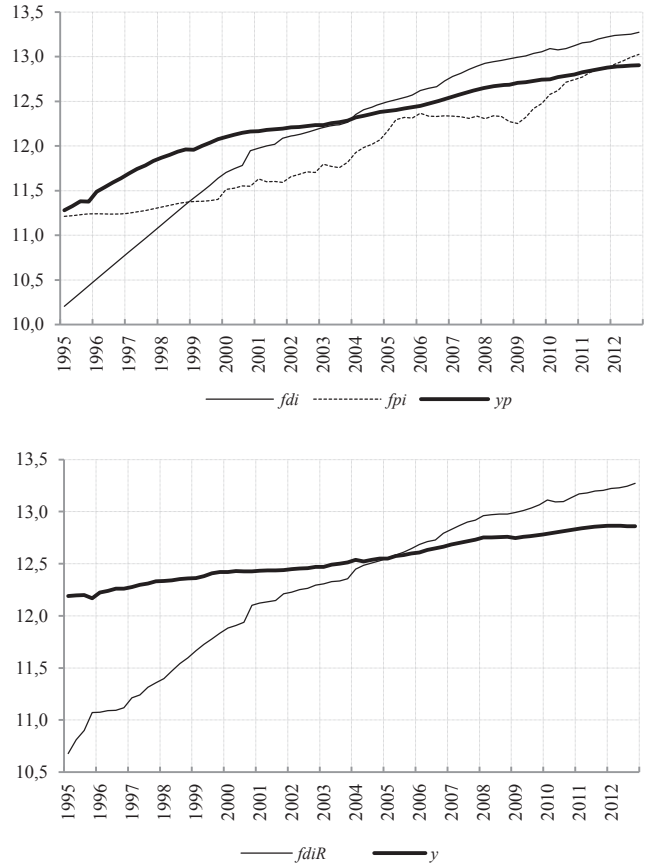
p. 56) that "the profit-maximizing international firm will try to optimize over the capital allocation between the parent and the subsidiaries, given different rates of returns and sources of funds between countries". In the Barrel and Pain (1996) model the multinational firm can produce domestically 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 (see also 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 approach was adopted in case of FPI, as we assume that there exists a certain level of the FPI-to-GDP ratio, which is consistent with a long-run equilibrium.

We implement the abovementioned facts by considering the GDP as the main long-run determinant of the FDI and FPI stocks, and assume that there exists a long-term homogeneity of FDI and GDP as well as a long-term homogeneity of FPI and GDP. However, in order to augment our specification with more explanatory variables and to test empirically our working hypothesis, we have to solve the two following problems. We need to find the time series which appropriately represent the stock of foreign liabilities in the form of FDI and FPI and also to decide whether to use all variables in nominal or real terms.

We use cumulative capital flows (from the BoP statistics) instead of stocks of foreign liabilities (from the IIP statistics), as the latter is determined not only by financial flows recorded during a given period, but also by so-called *valuation effects* (Tille 2003, Higgins et all. 2005, Lane and Milesi-Ferretti 2005, Gourinchas and Rey 2007). Firstly, the valuation effect reflects exchange rate fluctuations. On the one hand, an appreciation of the national currency reduces the value of assets owned by residents abroad (mostly denominated in foreign currency) when expressed in the national currency, but on the other hand it leaves virtually unchanged the value of foreign liabilities owed to nonresidents that are mostly denominated in the national currency. Secondly, valuation effect comes from changes in asset prices. Again, in case of falling stock prices abroad the value of residents' holdings of foreign assets becomes lower. Finally, other valuation effects are related to statistical adjustments including, *inter alia*, the change of a valuation method of foreign assets and liabilities (i.e. market value, book value, historical cost) and the broadening of the sample of firms covered in BoP and IIP statistics. To sum up, in the

absence of aforementioned valuation effects the change in the value of the international investment position of a country must equal the value of financial flows into this country recorded in a given period.

Graph 1. FDI, FPI and GDP in Poland, 1995-2012, current and constant prices (natural logarithms)



Source: own calculations based on NBP Balance of Payments statistics

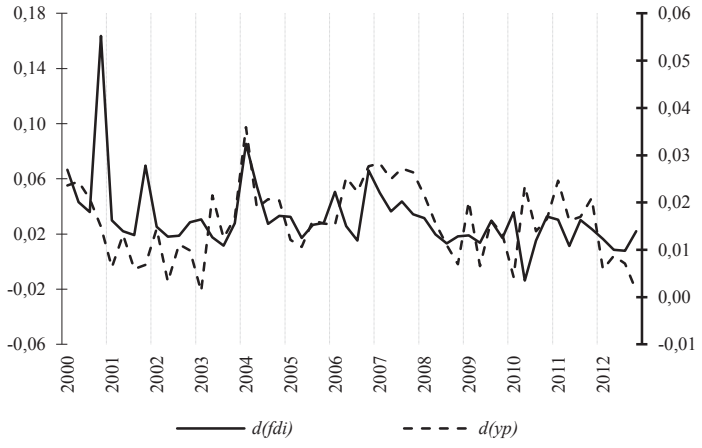
Moreover, we use data in current prices, due to two reasons. Firstly, we look at FDI/FPI to GDP ratios and find that it does not matter whether we apply current or constant prices, as inflation basically cancels out. Secondly, the choice of price deflators for both types of capital inflows is not straight forward, and could introduce additional dynamics into the data. Especially, it remains an open question how to deflate the FPI. No matter how we deflate the FDI stock, its changes are so significant, that the deflation method has nearly no impact on the final result.

The effective sample of data covers the period 2001q1-2012q4. We could not use the full sample, because it contains significant structural changes. Especially, the exchange rate regime shifted from a crawling band towards a free float. One could expect that the appreciation of the Polish zloty in the mid-1990s would trigger a strong FDI inflow, but such a fact was not

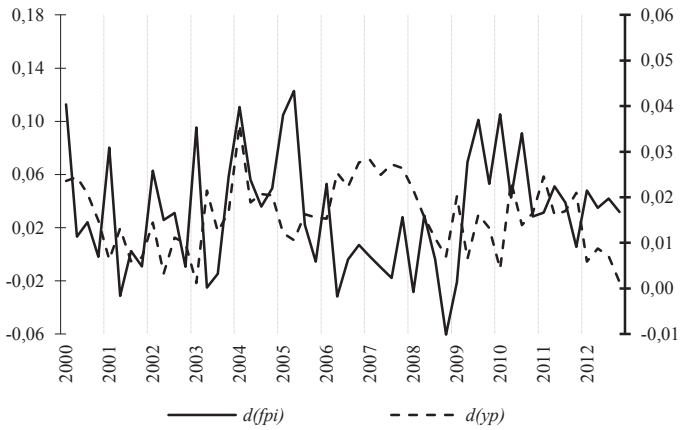
observed. The reason was quite different and is related mainly with the country's authorities policy in that period, aimed at enhancing the production potential of Poland's economy. First of all, the decision to embark on capital liberalization, allowed for the inflow of FDI and then other forms of foreign investment. Moreover, a significant reduction in CIT rate in 2004 made firms show profits in Poland and led to significant reinvested earnings, enhancing the FDI inflow. Besides this, the initial difference between the volume of inward FDI and FPI resulted also from the fact that at the beginning of the transition period the Polish financial market was still underdeveloped and the country's assets were perceived as relatively risky by foreign investors.

We perform an initial analysis of the data, applying a battery of standard univariate unit root tests[2]. The results of the UR tests appeared to be symptomatic, as they *almost* unambiguously indicated I(1)-ness of almost all variables. The one exception was FDI, which we identify as a variable integrated of order two (without deterministic trend) regardless of the fact whether data were in current or constant prices. The test results of the nominal GDP I(2)-ness (against difference-stationarity) were borderline whereas the FPI appeared to be intergrated of order one. This initial analysis led us to two cointegrated VAR scenarios (for example see Juselius (2006)). According to the first CVAR scenario, FDI and GDP 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 the difference-stationarity of the GDP, the system of the three variables remains "open", as there is no variable that may cointegrate them and some suitable model's extensions are needed.

Graph 2. FDI, FPI and GDP in Poland, growth rates 2000-2012 (natural logarithms)



[2] We employed standard Dickey-Fuller 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.



Source: own calculations based on NBP Balance of Payments statistics

Limitations of the univariate UR tests in short samples are well known, thus we perform also a visual inspection of the quarterly growth rates of the three nominal variables (see Graph 2). Comparing both GDP and FDI growth rates in the period 2000q1-2012q4 (excluding outliers in the fourth quarters of 2000 and 2001) allows to point out sub periods of similar dynamics. This fact strengthens our assumption that there is the same I(2) stochastic trend in the GDP and FDI. However, the volatility of FPI is much higher than that of FDI, which allows to question the assumption of the difference-stationarity of FPI. This concern is severe, as we can point out the subperiod 2000-2004, which was characterized by large issuances of treasury bonds in the first quarters of each year, which undermines the reliability on the UR test results on FPI.

The above-discussed findings leads us to make the following assumptions. Firstly, the presence of variables integrated of order two or variables that exhibit strong I(2) properties calls for full VEC system with I(2) variables. Secondly, taking the long-term homogeneity of the FDI and GDP and the FPI and GDP as a starting point, we need to include variables that explain the FDI and FPI medium-term deviations from their long-term equilibrium paths. Thirdly, the limited length of the usable time series restricts the list of potential explanatory variables to the most important ones.

The effects of FDI on the host economy have been widely studied. Under a reasonable amount of absorption capacity (schooling, institutions, stable government, etc.), FDI helps to boost economic growth to a large extent (Borenstein et al. 1998). Moreover, FDI leads to strong technological spill-over effects in the same and other industries, which finally is beneficial for economic growth (Smarzyńska-Javorcik 2004). However, a recent analysis by Cazzavillan and Olszewski (2012) for several CEE countries, that FDI in the manufacturing sector crowds out

domestic investment in the same sector. The reason is that multinational firms have the power to invest in the most profitable objects, thus less is left for domestic investors.

To our best knowledge, the literature on the effects of FPI on growth is scarce. Shen et al. (2010) find, controlling for other factors, a quite mixed evidence. While FDI enhances growth nearly on any continent and any level of income, FPI can be negative for growth, especially in high-income countries. However, for medium-income countries, which also have a well-developed the capital market, FPI has a similar positive effect as FDI.

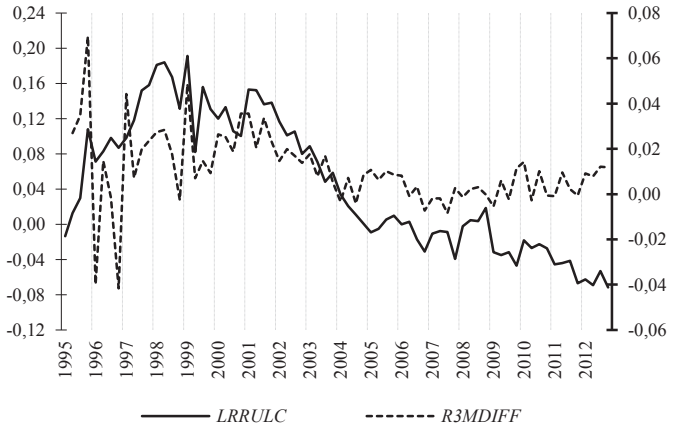
We should bear in mind that FDI investors and FPI investors can differ significantly. A firm is very likely to invest trough FDI in order to gain control over the host country firm. On the other hand, an investment fund is interested in pure profits, thus will most likely prefer FPI over FDI. However, in our analysis we are not able to distinguish the origin of flows, even at country level. We look thus at a representative investor. In order to capture the different needs of both kinds of investors, we use a common set of long-term determinants and also individual determinants. The common determinants describe the long-run equilibrium, while short-term adjustments that fill the equilibrium gap are unique to each kind of investment and respond to the investor's needs. It should be noted that portfolio flows of foreign investors are highly persistent, as Froot et al. (2001) find. This allows us to assume that a long run relationship between FPI and GDP or other important economic variables, like FDI exists.

4. WHAT MAY DRIVE FDI AND FPI IN POLAND: WORKING HYPOTHESES

The analysis of the main drivers of the capital inflow to Poland was conducted within the VEC framework allowing for the I(2)-ness of selected variables. As our research is country-specific, some other problems have appeared. The most important one resulted directly from the limited length of available time series, which constrained the final set of 'explanatory' variables to the proxy of the host-country market size (domestic GDP) and – in line with the Barrel and Pain (1996) recommendation – differences of the real unit labour costs (RULC hereafter) at home and abroad and the real interest rate differential (RIRD hereafter).

A preliminary analysis of the properties of the RULC and RIRD gave a mixed picture. The ADF and KPSS tests results unambiguously indicate that both relative RULC and RIRD should be treated as I(1) variables. On the other hand, the DF-GLS clearly suggests I(2)-ness of relative RULC, whereas the ERS test results are borderline. Similar conclusions may be drawn with respect to the stochastic properties of the real IR differential. A visual inspection of both variables does not change the picture although it seems to support the hypothesis that, at least, FDI and relative RULC may share the same stochastic trends in the 2000s.

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



Source: own calculations based on NBP Balance of Payments statistics

We test three general working hypotheses:

(i) the FDI inflow to Poland is determined by the market size and lower RULCs;

(ii) the FPI inflow is enhanced by domestic GDP and the real interest rate disparity;

(iii) there is an interdependence between FDI and FPI flows and we cannot exclude *a priori* that (a) the increased FDI flows may be coupled with either unchanged or rising FPI flows or (b) that both FDI and FPI tend to substitute for each other

during an economic downturn or in periods of greater risk aversion on financial markets.

Summing up, we assume that the equilibrium conditions of the Polish FDI-FPI model are defined by the following cointegrating relations:

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

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

where: f^{DI}, f^{PI} are logs of the cumulative nominal FDI and FPI inflows in Poland, x is the log of the nominal GDP in Poland, r_{ULC}, r^*_{ULC} are real unit labour costs in Poland and the euro zone (ULCs deflated by GDP deflators), r_{3M}, r^*_{3M} the real short-term interest rates in Poland and in the euro zone (WIBOR 3M, EURIBOR 3m).

We also consider some linear combinations of the above two cointegrating vectors. For instance, the long-term properties of the VEC system 'spanned' by the equations (1)-(2) can be equivalently described by the 'reduced' relation:

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

and equation (1) or (2).

5. ESTIMATION RESULTS

The starting point for the estimation was the standard vector error correction model (VEC model, hereafter) allowing for I(2)-ness of selected variables (for a detailed description of the full I(2) system see Johansen (1995a), Juselius (2006)) and references therein):

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

where: Π are long-term multipliers, Γ are medium-term multipliers, Φ_s are short-term parameters, $ST_{(m)}$ represents the short-term part of the VEC and the error term is $\varepsilon_{(m)} \sim n.i.d.$

The equilibrium conditions of the VEC model (4) are defined by the polynomial cointegration relationships $\beta' y_{(m)t-1} + \delta' \Delta y_{(m)t-1} \sim I(0)$ (whereas $\beta' y_{(m)t-1} \sim I(1)$, CI(2,1) cointegration) and the medium-term equilibrium conditions $\tau' \Delta y_{(m)t-1} \sim I(0)$. The dimensions of the matrices of the equilibrium parameters β, δ, τ and adjustment parameters α and ζ depend on the number of the model variables (M) and the numbers of the I(2) and 'autonomous' I(1) stochastic trends driving the model's variables (S_2 and S_1, respectively).

The model (4) can be expressed equivalently in a common stochastic trend (CST) representation:

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

where: $C_2 = \beta_{\perp 2}(\alpha'_{\perp 2} \Psi \beta_{\perp 2})^{-1} \alpha'_{\perp 2} = \widetilde{\beta}_{\perp 2} \alpha'_{\perp 2}$ is the matrix of the parameters of twice cummulated innovations $\varepsilon_{m,j}$ (i.e. I(2) stochastic trends), C_1 the matrix of the I(1) parameters and $\mathrm{T}_0(t)$ the deterministic component, with $e_{(m)t} \sim I(0)$.

The CST representation is very useful in empirical estimations, because it allows to identify the sources of the I(2) shocks and to determine the directions, in which they move in the analysed system. The model (4#a) can be expressed equivalently:

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

with $u_{(m)i} = \alpha'_{\perp 2} \varepsilon_{(m)i}$. The matrices $\alpha_{\perp 2}$ and $\widetilde{\beta}_{\perp 2}$ allow to analyse the sources and the directions in which the trends I(2) work.

The VEC model (4)-(5) was employed to analyze the relationships between the components of the vector in the quarterly sample 2001q1-2012q4, covering also the period of the

subprime crisis. During the empirical investigation the following three steps were performed: (i) test of cointegration, (ii) structurization of the long-term relationships $\beta' y_{(m)t-1}$ and (iii) identification of the potential I(2) sources as well as identification of the I(2) shock absorbers. **Table 1** reports the results of the cointegration test proposed by Johansen (1995) and Paruolo (1996). The conclusions are clear-cut: there are some premises to consider a VEC model with two equilibrium conditions, however the assumption on the presence of three multi-cointegrating relationships finds unambiguously stronger support. Because an acceptably high p-value is obtained when assuming two pushing I(2) stochastic trends (results marked with an asterisk), we further analyse the VEC model with three multicointegrating relationships $\beta' y_{(m)t-1} + \delta' \Delta y_{(m)t-1} \sim I(0)$, without medium-term relationships.

Table 1. Rank Test Statistics (*p*-values in brackets, *R* – number of cointegrating vectors)

I(2) ANALYSIS

Rank Test Statistics (P-Values in brackets)

		s2 = p-r-s1					
p-r	**r**	**5**	**4**	**3**	**2**	**1**	**0**
5	**0**	257.84314	218.84780	180.43528	152.15316	134.85367	131.26282
		(0.00000)	(0.00001)	(0.00007)	(0.00015)	(0.00006)	(0.00000)
4	**1**		157.08814	123.16598	98.52926	83.82855	80.10439
			(0.00334)	(0.01397)	(0.02296)	(0.01208)	(0.00088)
3	**2**			89.39195	**61.60129**	**46.79319**	**38.65678**
				(0.04672)	**(0.19404)**	**(0.19668)**	**(0.12521)**
2	**3**				**37.42933**	**23.11728**	21.06542
					(0.40036)*	**(0.54141)**	(0.17915)
1	**4**					9.65000	7.35491
						(0.69023)	(0.31828)

Approximate 95% Fractiles

5	0	206.05524	174.29155	146.63610	123.11168	103.74662	88.55389
4	1		141.53085	115.81837	94.24294	76.84088	63.65940
3	2			89.02033	69.37638	53.92124	42.76969
2	3				48.52002	34.98375	25.73103
1	4					20.01814	12.44780

The estimates of the equilibrium parameters β, adjustment parameters α, weights $\alpha_{\perp 2}$, loadings $\widetilde{\beta}_{\perp 2}$ and the most important diagnostics of the final VEC model are summarized in table 2. The estimation results of β and α support the following conclusions.

1. In the long-term, both foreign direct investment and foreign portfolio investment are driven by the increasing size of the Polish economy (i.e. they positively react to the GDP growth).

The long-term homogeneity $f^{DI} + \beta \cdot f^{PI} = (1+\beta)x + \ldots$ finds an empirical confirmation (p-value = 0.340) thus 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. On the other hand, the long-term homogeneity of f^{DI}, f^{PI} and x indirectly supports the working hypothesis on the substitutability between FDI and FPI.

2. It is possible to identify a cointegrating vector with the 'reduced' structure (3) that combines the structural vectors (1)-(2):

$$(f^{PI} - x) + \underset{(3.2)}{0.402}(f^{DI} - x) = -\underset{(10.9)}{7.06}(r_{ULC} - r^{*}_{ULC}) + \underset{(24.5)}{42.9}(r_{3M} - r^{*}_{3M}) + \underset{(25.9)}{0.0086}t + \delta' \Delta y_{(m)t-1} \qquad (6)$$

According to a slightly simplified interpretation the estimated parameter for the FDI/GDP ratio supports the hypothesis that FDI and FPI are indeed 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. In particular, the structure of the cointegrating equation (6) resembles an implicit function without a clear-cut causality relation between RULC and FPI, as well as between FDI and RIRD. On the other hand the α loadings' estimates clearly identify the cointegration relationship (6) as an FPI's attractor.

Table 2. FDI-FPI vector error correction model for Poland: estimates and diagnostics

TEST OF RESTRICTED I(2)-MODEL: CHISQR(1) = 0.07569 [0.78322]

A. BETA Normalized (transposed)

	fdi	fpi	x	rulc-rulc*	r3m-r3m*	trend
Beta(1)	**1.00000**	0.00000	-1.00000	0.00000	4.53960	-0.00839
	(.NA)	(.NA)	(.NA)	(.NA)	(10.26812)	(-25.94341)
Beta(2)	0.40225	**1.00000**	-1.40225	7.05837	-42.93728	0.00000
	(3.22150)	(.NA)	(.NA)	(10.93093)	(-24.51118)	(.NA)
Beta(3)	0.22051	0.00000	-0.31512	0.08608	**1.00000**	0.00000
	(47.39329)	(.NA)	(-67.03311)	(10.71953)	(.NA)	(.NA)

B. [ALPHA,ALPHA_1,ALPHA_2]

	Alpha(1)	Alpha(2)	Alpha(3)	Alpha_2(1)	Alpha_2(2)
DD(fdi)	**-0.22319**	0.00257	0.46513	0.00000	**1.00000**
	(-1.11628)	(0.14553)	(0.38700)	(.NA)	(.NA)
DD(fpi)	1.54655	**-0.25093**	-7.55962	0.30177	-0.36822
	(2.45475)	**(-4.51423)**	(-1.99614)	(1.87429)	(-1.82476)
DD(x)	-0.37922	0.02771	2.59145	**1.00000**	-0.00000
	(-5.25213)	(4.34992)	(5.97075)	(.NA)	(.NA)

DD(rulc-rulc*)	0.63075	-0.04819	-3.06864	-1.05780	**2.02127**
	(2.51480)	(-2.17786)	(-2.03534)	(-1.56123)	**(2.38020)**
DD(r3m-r3m*)	0.44738	-0.00231	**-2.74549**	**1.29460**	-1.07522
	(7.50187)	(-0.43935)	**(-7.65874)**	**(2.21512)**	(-1.46785)

C. BETA_2(tilde) (transposed)

	fdi	fpi	x	(rulc-rulc*)	(r3m-r3m*)
Beta_2(1)	-0.02254	**0.48447**	0.08681	0.09597	0.02402
Beta_2(2)	0.08371	**-0.57664**	0.08005	0.08795	-0.00080

D. RESIDUAL ANALYSIS

Tests for Autocorrelation

LM(1):	ChiSqr(25) =	29.63104 [0.23840]
LM(2):	ChiSqr(25) =	35.91847 [0.07285]
LM(3):	ChiSqr(25) =	31.81316 [0.16349]
LM(4):	ChiSqr(25) =	34.66403 [0.09446]
Test for Normality:	ChiSqr(10) =	12.24492 [0.26900]
Test for ARCH:		
LM(1):	ChiSqr(225) =	231.83390 [0.36306]

Notice: t-ratios in parenthesis, p-values in brackets

3. The interpretation of the second cointegrating equation:

$$(f^{DI} - x) = \underset{(10.3)}{-4.54}(r_{3M} - r^*_{3M}) + \delta' \Delta y_{(m)t-1} \tag{7}$$

is also conditional and depends on the other results. In particular, one can argue that the RIRD's negative influence on the FDI can be considered a proof of the substitutability between both types of the capital flows: the increase of domestic real interest rates translates into a growth of portfolio investments and this, in turn, impedes the FDI inflow. However, the latter interpretation of the cointegrating vector (7) in terms of the long-term FDI equation is, at least, problematic. The estimates of the adjustment parameters suggest a weak exogeneity of the f^{DI} and only the joint analysis of the loadings in the equations $\Delta^2 f^{DI}$ i $\Delta^2 f^{PI}$ (–0.223 and –0.251 respectively) allows indirectly to consider equation (7) as an attractor of the FDI inflow.

4. The interpretation of the last cointegrating vector:

$$r_{3M} = r^*_{3M} + \underset{(67.0)}{0.315}\, x - \underset{(47.4)}{0.221}\, f^{DI} - \underset{(10.7)}{0.086}(r_{ULC} - r^*_{ULC}) + \delta' \Delta y_{(m)t-1} \tag{8}$$

is not straightforward either. Due to the 'open structure' of almost every VEC system, one has usually to allow at least one cointegrating vector to capture the cumulated 'net effects' of mechanisms that are not analysed in the model explicitly. In particular, equation (8) can be

roughly interpreted in line with an empirical Taylor rule: an increase of demand (*via* GDP growth) forces monetary authorities to increase the central bank's interest rate whereas an increase of the potential output (*via* FDI) closes the output gap.

Summing up, the estimates of the long-term equilibrium parameters give a mixed picture. The only two results that do not give raise to serious doubts are those about (i) the one-to-one transmission between GDP and two types of capital inflows and about (ii) the potential substitutability between FDI and FPI. However, in the latter case the finding that an increase in FDI decreases FPI flows seems rather surprising, whereas the opposite (and much more intuitive) hypothesis on the deceleration of FDI inflows due to fiscal expansion does not find (almost) any empirical support.

The analysis of the parameters of the CST clearly confirm the conclusions about the direction of the causality-effect which links FDI and FPI. The estimates of the $\alpha_{\perp 2}$ weights and $\widetilde{\beta}_{\perp 2}$ loadings allow quite precisely to point-out the sources of the two stochastic I(2) trends that steer the FDI-FPI system and show the variable which cumulates the results of those shocks. The estimates of the first column of the $\alpha_{\perp 2}$ matrix suggest that the first I(2) trend has essentially demand-side sources, whereas the second I(2) trend (the second column of the $\alpha_{\perp 2}$ matrix) originates from the FDI and ULC shock and it may be interpreted in terms of the technology or supply-side mechanisms. Accepting this perspective one arrives at a little bit puzzling result, according to which the portfolio investment is the 'most reacting' variable in the system – the estimates of the adjustment parameters of the FPI are the largest and they have the intuitively accepted signs (increase/decrease due to a positive demand/supply shock). In general, the latter conclusion applies also to the other components of the $\widetilde{\beta}_{\perp 2}$ matrix, but the most striking result is, however, the much weaker responses of the FDI flow, production and the relative unit labor costs to both cumulated shocks.

We performed also a robustness analysis and applied several alternative specifications of the model. For example, we replaced the short-term interest rates with their long-term counterpart, as well as we took into account FDI, FPI and GDP in constant prices. 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 FX 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[3]. It seems 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.

[3] 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.

6. 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 complements rather than 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's play a 'residuality' role in the modeled system.

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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