FDI BETWEEN EU MEMBER STATES:
GRAVITY MODEL AND TAXES

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Abstract

Gravity models utilize the attractive force concept as an analogy to explain volume of trade, capital flows and migration among the countries of the world. A fundamental goal of my paper is to prove that direct investment flows between EU Member States are determined by standard variables included in gravity models such as: gross domestic products (total and per capita) of home and host economy and distance between them.

In my gravity model of FDI I include not only geographic distance but also variables illustrating economic distance, namely: membership in euro area, cultural similarity, duration of membership in the EU (EC). Additionally, my model encompasses variables linked with tax policy of EU Member States. I prove that differences in corporate tax burdens determine FDI flows. States with simpler and lower taxes allure more direct capital. Especially, model confirms that European offshore financial centers: Cyprus, Luxembourg and Malta play a significant role in intra-EU direct capital flows.

On one hand, my model includes time invariant variables, so the model with fixed effects is not proper. On the other hand, as individual effects might be correlated with some independent variables, model with random effects can be also not adequate. Consequently, I use Hausman-Taylor estimator. My FDI gravity model is based mainly on OECD and WDI databases concerning two last decades.

Keywords: FDI, gravity model, the European Union, corporate taxes

JEL codes: F14, F15, F21

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1. Background studies on gravity models of foreign direct investments

Gravity models appear as an adaptation of the law of universal gravitation\(^3\) for socioeconomic phenomena. For the first time the law of gravitation was applied to social science by Carey [1858, pp. 42, 88–90, 371–373, 465]. According to Carey phenomena in physics and in social science are determined by similar laws and the gravitational attraction is also present as a “molecular gravity in a society”. He claimed that more people in some area means stronger “social attractive force” which is directly proportional to the “mass of people” and inversely proportional to the distance (not only geographic, but also social or psychological distance) between persons. Carey launched studies based on gravity models which focused on determinants of masses’ behaviour, especially interdependence between size of population, distance and attractive force between people. Gravity models became tools in analyzing: size of migrations and trade, number of phone calls and number of passengers and goods in transport. These studies concerned the attractive force between masses of people living in different regions of single country\(^4\).

In 1960s gravity models were applied to analyzing international trade flows. Pioneers in these studies were: Linemann [1963], Pöyhönen [1963], Pullainen [1963] and Tinbergen [1962]. They were conducting independent and simultaneous studies which brought similar results. However the most known is study proposed by Tinbergen who was announced as a discoverer of gravity law (gravity equation) in international economics (see equation (1)).

\[
X_{ij} = C \frac{Y_i^a Y_j^b}{D_{ij}^d}
\]

where notation is defined as follows:

\(X_{ij}\) – international flow from reporter \(i\) (origin country) to partner \(j\) (destination country) or the sum of the flows in both directions (for example: export, import or sum of export and import values; size of migration, foreign direct investment, tourism),

\(Y_{i(j)}\) – economic sizes of the two locations (for example: GDP, population, endowment of labour, land or capital),

\(D_{ij}\) – distance between the locations (usually between their economic centres),

\(^3\) In 1687, Newton proposed the law of universal gravitations which states that every point mass in the universe attracts every other point mass with a force that is directly proportional to the product of their masses and inversely proportional to the square of the distance between them.

\(^4\) See for example: Ravenstein [1885], Reilly [1929], Stewart [1948], Converse [1949], Zipf [1949], Dodd [1950], Hammer and Ikle [1957].
G – gravitational constant,
a, b and d – elasticity of $X_{ij}$ to change in $Y_i$, $Y_j$ and $D_{ij}$.

Since Tinbergen’s study the gravity equation has been one of the most popular empirical equations that has been successfully used to analyze the wide spectrum of interactions in international economics. The gravity equation postulates that the amount of flow between two locations increases in their economic sizes and decreases in the cost of transportation between them as measured by the distance between economic centres of locations.

However, there are many variables which can embody economic masses of locations. In studies of bilateral trade and direct investment flows the economic size of the exporting and importing countries are usually measured by gross domestic product. However economic size can be also measured by: gross national product, gross domestic product and population, gross domestic product per capita or endowment of production factors (absolute value or per capita). Therefore, there are a number methods of measuring gross domestic products: in current prices, in constant prices or in purchasing power parity. It is debatable which measure is the most adequate for gravity models. In my opinion, as international flows of trade or capital are measured in current prices, gross domestic product in current prices is the most proper. Additionally, gross domestic products in PPP distort the difference between countries, as their values are higher for developing countries and lower for developed economies [Czarny, Folfas 2011, pp. 5–6].

Distance in the law of universal gravitation illustrates resistance to attractive force between point masses. In international economics resistance to gravity force between locations is embodied by all factors which hamper international flows of goods, services, capital, labour and technology. These factors can be divided in two groups: economic and noneconomic. The first group encompasses: geographic distance between economic centres of locations, adjacency, characteristics of geographic location (island, landlocked country), cultural similarity (common languages, colonial links), volatility of exchange rates (common currency, exchange rate regime), tariffs and nontariffs trade barriers, membership in international organizations (free trade areas, custom unions, common markets, economic and monetary unions) and the quality of infrastructure. The second group includes: regulations, political conflicts and environmental barriers [Head 2000, pp. 5–10].

Moreover, there are a few candidates for dependent variable in gravity models. Bilateral international flows can be illustrated by: export, import or sum of both of them. In
the case of international trade, exports value is not distorted by tariffs, nontariffs barriers and cost of transport and insurance. However data concerning imports are more precise thanks to the registration linked with customs duties (data concerning exports are usually based on tax returns). Taking into consideration a sum of export and import is the most complete method, however it meets difficulties with gaps in data. In the case of foreign direct investments and other capital flows data concerning inflows are more precise than data concerning outflows, which usually are riddled with gaps [Czarny, Folfas 2011, p. 7].

Popularity of gravity models in empirical studies concerning international trade in goods and services and international movements of production factors has encouraged economist to create theoretical foundations of gravity law, especially gravity model of international trade. To the most important belong studies conducted by: Anderson [1979], Bergstrand [1985, 1989], Helpman [1987], Deardoff [1998], Anderson and van Wincoop [2003], Feenstra [2004], Haveman and Hummels [2004], Debaere [2005], Helpman, Melitz and Rubinstein [2008]. The majority of mentioned authors conducted empirical studies of bilateral trade based on different version of gravity models.

Generally, gravity model is a kind of short-hand representation of supply and demand forces. If \( X_{ij} \) represents exports and if the country \( i \) is the origin, then \( Y_i \) represents the amount it is willing to supply. Meanwhile \( Y_j \) represents the amount destination \( j \) demands, in other words the amount of income country \( j \) spends on all goods from any source \( i \). Big economies with high income usually spend a lot of money on import. They are also able to allure quite big share of other economies’ expenditures (so they are able to export a lot of goods) because they produce goods in wide variety. Consequently, the amount of export is higher due to big economic size at least of one partner [Head 2000, p. 3; Krugman, Obstfeld 2007, pp. 25–29].

Gravity model has become one of the most popular and successful analytical tool in international economics, especially due to its high explanatory power and easily available data in studies concerning international trade of goods. However, recently gravity model has become very popular analytical tool also in explaining bilateral flows of capital, especially in explaining determinants of foreign direct investments (FDI). Unfortunately construction of FDI gravity models meets a number of additional obstacles. Firstly, the values of bilateral FDI flows are available only for selected countries, mostly for developed countries (OECD, UE) or countries from one region. Consequently, construction of FDI gravity models for all (even the majority) countries of the world seems to be not possible. Secondly, FDI flows are

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5 Studies based on gravity model of trade conducted by Polish economist – see for example Cieślik [2009], Cieślik, Michalek, Mycielski [2009] and Czarny, Śledziewska [2009].
vulnerable to single events (for example large cross-border mergers and acquisitions) what may lead to irregularities disturbing gravity law. Instead of FDI flows, FDI stocks can be used. However in my opinion FDI stocks as cumulative data are not adequate for independent variables in model which describe values of GDPs or endowments of production factors only in one year. Thirdly, there are negative values of FDI (disinvestments) which can also disturb the regularity of gravity law. In my opinion these negative cannot be excluded from the sample because it may lead to falsifying the results of empirical studies (disinvestments account for 10–20% of all observations).

Despite of all mentioned difficulties, in the last ten years gravity models of FDI have become very popular. Apart from standards variables describing GDPs of host and home country and geographic distance between economic centres of two locations, independent variables in FDI gravity models illustrates issues such as:

- endowment of physical and human capital (see Egger, Pfaffermayr [2004a]),
- endowment pf labour force (see Bevan, Estrin [2004], Egger, Pfaffermayr [2004a, b], Milner et al. [2004]),
- quality of legal system (see Milner et al. [2004], Lada, Tchorek [2008]),
- infrastructure – transport networks, number of phone calls (see Egger, Pfaffermayr [2004b], Roberto [2004], Portes, Rey [2005]),
- investment risk and barriers, protection of foreign investors (see Bevan, Estrin [2004]),
- cultural similarity – common language, similarity in legal systems (see Buch et al. [2003]),
- taxation (see Egger, Pfaffermayr [2004b], Milner et al. [2004]),
- bilateral trade, openness of economies (see Stone, Jeon [1999], Szczepkowska, Wojciechowski [2002], Kumar, Zaje [2003], Bevan, Estrin [2004], Portes, Rey [2005], Lada, Tchorek [2008]),
- unemployment rate (see Roberto [2004], Szczepkowska, Wojciechowski [2002]),

6 Apart from gravity model bilateral FDI relations has been also scrutinized in other contexts. Desbordes, Vicard [2009] investigates the effect of implementation of bilateral investment treaties on bilateral stocks of foreign direct investment. They show that the effect of entry into force of bilateral treaty crucially depends on the quality of political relations between signatory countries; it increases FDI more between countries with tense relationships than between friendly countries. Therefore, Benassy-Quere, Coupet and Mayer [2007] investigate institutional determinants of FDI and find that the similarity of institutions between the host and home country raises bilateral FDI flows. Additionally, Choi [2004] examines the role of FDI in convergence of income level and growth. Panel analysis brings conclusion that income level and growth gaps between source and host countries decreases as bilateral FDI increases. Finally, UNCTAD [2007, pp. 19–22] includes studies concerning bilateral FDI relationships based on FDI intensity index – see also my paper from previous edition of ETSG [Folfas 2010b].
• membership in international organizations (see Brenton et al. [1999], Buch et al. [2003], Kumar, Zajc [2003], Lada, Tchorek [2008]),
• education of labour force (see Kajmar, Zajc [2003], Eggger, Pfaffermayr [2004b], Lada, Tchorek [2008]),
• unit labour costs, average wages (see Szczepkowska, Wojciechowski [2002], Bevan, Estrin [2004], Lada, Tchorek [2008]),
• interests rates (see Bevan, Estrin [2004]),
• development of financial markets (see Portes, Rey [2004], Lada, Tchorek [2008]),
• bilateral investments treaties (see Egger, Pfaffermayr [2004b]),
• exchange rates, common currencies (see Szczepkowska, Wojciechowski [2002], Lada, Tchorek [2008])
• expenditures on R&D (see Lada, Tchorek [2008]),
• inflation rate, GDP deflator (see Szczepkowska, Wojciechowski [2002], Lada, Tchorek [2008]).

The wide spectrum of independent variables appears as a symptom of high potential of FDI gravity models and the perspective of their further development. As my empirical studies focuses on FDI bilateral flows between EU–27 Member States, I pay attention to two groups of determinants of FDI: investment creation effect (due to processes of integration in the old continent) and corporate taxation. Firstly, investment creation effect means intensification of FDI flows between countries participating in regional integration (see for example Baldwin, Forslid and Haaland [1996], Motta, Norman [1996]). It is possible that membership in the EU and in the euro area intensify flows of direct capital between EU Member States. Secondly, there are significant disparities in corporate taxation between EU Member States. Differences in taxes especially in corporate tax rates allure transnational corporations to use transfer pricing in order to minimize total tax payments. Transfer pricing is directly linked with flows of direct capital, especially to and from offshore financial centres\(^7\) (tax havens) such as:

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\(^7\) Traditionally, tax haven is a country or territory where certain taxes (especially direct taxes such as: income taxes or inheritance taxes) are levied at a low rate or not at all. Tax havens allow non-residents to escape higher taxes in their country of residence. Particularly, liberal tax jurisdictions allure to establish foreign affiliates of transnational corporations (TNCs) originating from developed countries, where corporate taxes are much higher. According to the traditional approach tax havens can be divided into two groups: no-tax havens and low-tax havens. The first group encompasses: Bermuda, British Virgin Islands, Cayman Islands, Montserrat, Nauru and Turks and Caicos Islands. These tax havens impose nil taxes generally or impose taxes only on domestic incomes (the rule of no-tax-on-foreign-income). Low tax havens include: Andorra, Anguilla, Antigua and Barbuda, Aruba, Bahamas, Bahrain, Barbados, Belize, Cook Islands, Dominica, Gibraltar, Grenada, Guernsey, Hong Kong (SAR of China), Isle of Man, Jersey, Liberia, Liechtenstein, Macau (SAR of China), Maldives, Marshall Islands, Mauritius, Monaco, Netherland Antilles, Niue, Panama, Samoa, Saint Lucia, Saint Kitts and Nevis, Saint Vincent and the Grenadines, Samoa, Seychelles, Tonga, US Virgin Islands, Vanuatu. However,
Cyprus, Luxembourg and Malta. Consequently, it is possible that differences in corporate tax rates also intensify direct capital flows between EU Member States.

2. Data and methodology

In my study, I use bilateral direct investments flows between EU–27 Member States based on data concerning FDI inflows into host economy (i) from home economy (j). The sample covers the period 1990–2009. My gravity model is estimated in terms of natural logarithms (ln) – see equation (2).

\[
\ln FDI_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln D_{ij} + \xi Z_{ijt} + c_{ij} + \eta_{ijt},
\]

where notation is defined as follows:

- \(i, j, t\) – indexes respectively for: host economy, home economy and year,
- \(FDI_{ijt}\) – FDI inflow into host economy coming from home economy in year t,
- \(GDP_{ijt}\) – Gross Domestic Product of host economy (home economy) in year t,
- \(D_{ij}\) – geographic distance between economic centres of host and home economy (constant for EU Member States during 1990–2009),
- \(Z_{ijt}\) – vector of other variables which determines bilateral FDI flow;
- \(c_{ij}\) – individual location-pair specific effect,
- \(\eta_{ijt}\) – error term.

Including in my specification individual location-pair specific effect suggests application one of the typical panel data based estimators, namely fixed or random effects approach. However, the fixed effects approach is not adequate for models including time invariant variables – for example distance, which is one of the fundamental variable. On the contrary, random effects approach is available also for models with time invariant variables. Additionally, this approach needs zero correlation between the individual effects and the traditional approach of tax haven is not enough. Contemporary name of tax havens is offshore financial centres (OFCs) and mean jurisdictions that make their living mainly by attracting foreign financial capital. They offer foreign business and well-heeled individuals not only low or no taxes, but also: economic and political stability, business-friendly regulation and laws, well-developed sector of services (especially in finance, banking and insurance), lack of constraints in capital flows and above all discretion. OFCs includes traditional tax havens but also countries (territories) such as: Costa Rica, Cyprus, Malta, Dublin (Ireland), Labuan (Malaysia), Lebanon, Luxembourg, Singapore, Switzerland which has not been perceived as traditional tax havens. Geographically, OFCs can be divided into three groups: European OFCs, American OFCs and Asian (with Oceania) OFCs – see more The Economist [2007], Folfas [2008], Folfas [2010a].

Before 1990s new EU–12 Member States had been cut off from substantial FDI inflows, consequently the first included year is 1990. Therefore, data for 2010–2011 has not been available yet (apart from some partial data).
independent variables in the model. Unfortunately, in my specification this assumption does not hold. My model encompasses independent variables which characterize pair of host and home economy (for example difference in corporate tax rates or simultaneous membership in euro area). These kinds of variables are potentially correlated with individual effect, consequently approach based on random effects is also not proper. In this situation there is still one solution to be applied – Hausman-Taylor [1981] estimation method. It allows using of both time-varying and time invariant variables and some of them can be endogenous in the sense of correlation with individual effects, but remain exogenous with respect to error term [Czarny et al. 2010, pp. 10–12].

Additional variables in my specification encompass variables linked with European integration and corporate taxation in EU–27 Member States (a few of them are dummy variables) – see equation (3).

\[
\ln FDI_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln D_{ij} + \xi_1 \ln \left| gdp_{it} - gdp_{jt} \right| + \xi_2 EU_{ijt} + \xi_3 EA_{ijt} + \\
+ \xi_4 Accession_{ij} + \xi_5 Culture_{ij} + \xi_6 \ln \left| Tax_{it} - Tax_{jt} \right| + \xi_7 OFC_{ij} + \epsilon_{ijt} + \eta_{ijt}
\]

where notation is defined as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>FDI</td>
<td>Foreign direct investments inflows (current prices, USD)</td>
<td>OECD and Eurostat</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product (current prices, USD)</td>
<td>The World Bank, WDI</td>
</tr>
<tr>
<td>D</td>
<td>Geographic distance between capitals (km)</td>
<td>CEPII</td>
</tr>
<tr>
<td>gdp</td>
<td>Gross Domestic Product per capita (current prices, USD)</td>
<td>The World Bank, WDI</td>
</tr>
<tr>
<td>EU</td>
<td>Dummy variable: 1 if both states belong to the EU and 0 otherwise (this variable incorporates EU enlargements)</td>
<td>Eurostat</td>
</tr>
<tr>
<td>EA</td>
<td>Dummy variable: 1 if both states use euro as legal tender and 0 otherwise</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Accession</td>
<td>Dummy variable: 1 if both states join the EU in the same year and 0 otherwise</td>
<td>Eurostat</td>
</tr>
<tr>
<td>Culture</td>
<td>Dummy variable: 1 if both states belong to the same group and 0 otherwise</td>
<td>Own classification including groups of EU Member States: (1) Celtic (IE, UK); (2) Mediterranean (CY, EL, IT, MT, PT); (3) Francophone and Benelux (BE, FR, LU, NL); (4) German (AT, DE, HU); (5) Slavonic (CZ, PL, SI, SK); (6) Baltic (EE, LT, LV); (7) Scandinavian (DK, FI, SE); (8) Other (BG, RO)</td>
</tr>
<tr>
<td>Tax</td>
<td>Corporate tax rate (part of profit; if progressive tax average rate)</td>
<td>Eurostat</td>
</tr>
<tr>
<td>OFC</td>
<td>Dummy variable: 1 if host or home economy is offshore financial centre (CY, LU, MT)</td>
<td>OECD and The Economist [2007] (list of tax havens/offshore financial centres)</td>
</tr>
</tbody>
</table>
Therefore I conduct empirical analysis for smaller sample which covers the period 2005–2009, however with additional independent variables linked with taxation\(^9\) - see equation (4).

\[
\ln FDI_{ijt} = \alpha_0 + \alpha_1 \ln GDP_{it} + \alpha_2 \ln GDP_{jt} + \alpha_3 \ln D_{ij} + \xi_1 \ln (gdp_{it} - gdp_{jt}) + \xi_2 EU_{ijt} + \xi_3 EA_{ijt} + \\
+ \xi_4 Accession_{ij} + \xi_5 Culture_{ij} + \xi_6 \ln (\text{Tax}_{it} - \text{Tax}_{jt}) + \xi_7 OFC_{ij} + \\
+ \xi_8 \ln (\text{TaxTime}_{it} - \text{TaxTime}_{jt}) + \xi_9 \ln (\text{TaxPayments}_{it} - \text{TaxPayments}_{jt}) + \xi_{10} \ln (\text{TaxTotal}_{it} - \text{TaxTotal}_{jt}) + \epsilon_{ijt}
\]

where notation is defined as follows:

<table>
<thead>
<tr>
<th>Abbreviation</th>
<th>Description</th>
<th>Data source</th>
</tr>
</thead>
<tbody>
<tr>
<td>TaxTime</td>
<td>Total time required to fulfill all tax payments (hours)</td>
<td>The World Bank, WDI</td>
</tr>
<tr>
<td>TaxPayments</td>
<td>Number of tax payments</td>
<td>The World Bank, WDI</td>
</tr>
<tr>
<td>TaxTotal</td>
<td>Total costs due to tax payments (part of profit)</td>
<td>The World Bank, WDI</td>
</tr>
</tbody>
</table>

3. Estimation results

The estimated parameters on variables derived from basic version of gravity equation are statistically significant and have expected signs (see table 1).

<table>
<thead>
<tr>
<th>Table 1. Estimation results (part 1)</th>
</tr>
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<tbody>
<tr>
<td><strong>Period:</strong> 1990–2009</td>
</tr>
<tr>
<td><strong>Equation (3)</strong></td>
</tr>
<tr>
<td><strong>Number of pairs (host and home economy): 696</strong></td>
</tr>
<tr>
<td><strong>Number of observations: 8404</strong></td>
</tr>
<tr>
<td><strong>Significant codes: 0 * * * 0.001 * * * 0.01 * 0.05 * 0.1</strong></td>
</tr>
<tr>
<td><strong>Variable</strong></td>
</tr>
<tr>
<td>ln GDP(_i)</td>
</tr>
<tr>
<td>ln GDP(_j)</td>
</tr>
<tr>
<td>ln D(_{ij})</td>
</tr>
<tr>
<td>ln (\text{gdp}<em>{it} - \text{gdp}</em>{jt})</td>
</tr>
<tr>
<td>EU(_{ij})</td>
</tr>
<tr>
<td>EA(_{ij})</td>
</tr>
<tr>
<td>Accession(_{ij})</td>
</tr>
<tr>
<td>Culture(_{ij})</td>
</tr>
<tr>
<td>ln (\text{Tax}<em>{it} - \text{Tax}</em>{jt})</td>
</tr>
<tr>
<td>OFC(_{ij})</td>
</tr>
<tr>
<td>Constant</td>
</tr>
</tbody>
</table>

Source: Own study based on computations in R-package

\(^9\) Data for these variables have been available since 2005.
The positive values of the estimated parameters on the GDP of both host and home economy show that FDI flows are bigger between larger economies. However the estimated coefficients are lower than in typical gravity model of international trade (values between 0.7 and 1.1). It can be caused by disinvestments and fluctuations in FDI inflows caused by single events (for example large M&A). Therefore, the value of estimated parameter on the GDP of home economy is much higher than value on the GDP of host economy. It suggests the higher magnitude of home economy in bilateral FDI flows. As expected distance has negative impact on bilateral FDI flows and also the impact of difference in GDP per capita is negative. It proves that between similar economies FDI flows are more intensive.

**Figure 1. FDI inflows into the EU–27 Member States vs. global FDI inflows (1990–2009, Mio. USD)**

Source: Own study based on UNCTAD’s and Eurostat’s data

All three variables linked with the European integration processes are not statistically significant. There is no positive impact on FDI inflows when both host and home economy belong to the EU, euro zone or both joined the EU (EC) in the same year. Firstly, it may suggest that individual characteristics of host and home economies are more important for bilateral FDI flows than participation in regional integration (weak investment creation effect). Secondly, dummy variable might not be enough adequate for illustrating the results of integration processes which is continuous, not discrete. Consequently, investment creation effected linked with the EU-enlargement in 2004 and 2007 could have occurred earlier – for example when new EU Member States joined free trade area, started accession negotiations and so on. The share of FDI inflows to the EU–27 Member States coming from EU–27 Member States increased in early 1990s – probably due to intensive FDI flows from EU–15
Member States to associated CEE countries which opened their markets for foreign direct capital – and also increased in late 1990s during the finish of accession negotiations (see figures 1 and 2). Thirdly, it is possible that since 2004 new EU Member States has allured more foreign capital from economies outside of the EU–27. In consequence, investment diversion effect can be stronger than investment creation effect. The insignificance of variables describing the same year of accession suggests that “fresh”, flourishing markets can allure more foreign capital than “old”, saturated markets.

**Figure 2. The geographic structure of FDI inflows into the EU–27 Member States (1990–2009)**

Moreover, the cultural similarity has positive impact on bilateral FDI inflows. Similarity in business mentality, law in book, law in action and common language and customs lead to stronger FDI relationships between host and home economy. Finally, differences in corporate tax rates have also positive impact on flows of foreign direct capital. It proves that tax avoidance including transfer pricing remains one of the most significant tool in maximizing of total net profit. Transnational corporations use also offshore financial centres, consequently FDI flows between Cyprus, Luxembourg, Malta and other EU–27 Member States are more intensive (the variable OFC is also statistically significant). Homogeneous corporate tax rate in the EU, especially at relatively high level (for example incumbent rate in Germany or France) may lead to decrease in FDI flows between EU Member States and might intensify capital relationships with offshore financial centres (tax havens) located outside of the EU. Corporate tax rate appears as an extremely significant
instrument not only in domestic, but also in foreign economic policy. Therefore, it seems to be a symbol of economic sovereignty within the EU.

Table 2. Estimation results (part 2)

| Variable                  | Coefficient | Standard Error | t-value | P>|t| |
|---------------------------|-------------|----------------|---------|--------|
| ln GDPi                   | 0.201054    | 0.112678       | 1.7843  | 0.074369 * |
| ln GDPj                   | 0.767659    | 0.110482       | 6.9483  | 3.697e-12 *** |
| ln Dij                    | -0.643572   | 0.223238       | -2.8829 | 0.003940 ** |
| ln |gdp|_i-gdp|_j| | 0.075379     | 0.250517       | 0.3009  | 0.763496 |
| EUij                      | -0.268919   | 0.433840       | -0.6199 | 0.535351 |
| EAij                      | -0.245080   | 0.621024       | -0.3946 | 0.693109 |
| Accessionij               | 0.098786    | 0.543694       | 0.1817  | 0.855823 |
| Cultureij                 | 1.063568    | 0.490245       | 2.1695  | 0.030048 * |
| ln|Taxi|_i-Tax|_j| | 0.200297     | 0.178924       | 1.1195  | 0.262946 |
| OFCij                     | 2.035610    | 0.637526       | 3.1930  | 0.001408 ** |
| ln|TaxTime|_i-TaxTime|_j| | -0.064335    | 0.097594       | -0.6592 | 0.509763 |
| ln|TaxPayments|_i-TaxPayments|_j| | -0.088111    | 0.093801       | -0.9393 | 0.347554 |
| ln|TotalTax|_i-TotalTax|_j| | -0.082067    | 0.226195       | -0.3628 | 0.716742 |
| Constant                  | -6.393546   | 3.993103       | -1.6011 | 0.109344 |

Source: Own study based on computations in R-package

According to the estimation of second model covering period 2005–2009 and including additional variables linked with taxation, basic variables (GDPs and distance) are statistically significant and the parameters display expected values (see table 2). Again variables illustrating participation in regional integration are not statistically significant and cultural similarity has positive impact on bilateral FDI flows. Therefore, in period 2005–2009 apart from transactions with OFC, all other taxation issues are not statistically significant for flows of direct capital. These results confirms only up to a point the importance of tax disparities and role of transfer pricing, however it is possible that the relatively small size of sample has impact on estimation results. Additionally, disparities in corporate tax rates were lower during period 2005–2009 than during last two decades.
4. Conclusions

Using gravity model I prove that direct investment flows between EU–27 Member States are determined by variables such as: gross domestic products (total and per capita) of home and host economy and distance between them. Therefore, other characteristics of individual economies are more important for bilateral FDI flows than participation in the regional integration. My estimation results confirm the sense of the EU motto In varietate concordia. In the case of FDI the variety appears to be more significant, especially disparities in corporate tax rates intensify flows of direct capital. Moreover, cultural similarity within groups of EU–27 Member States has also positive impact on FDI, what confirms the magnitude of not strictly economic factors. To sum up, gravity model seems to be very useful analytical tool and the further research based on it seems to be very lucrative.

References


10 United in diversity.
15. Czarny E., Ślędziewska K. [2009], *Polska w handlu światowym*, PWE, Warszawa
17. Czarny E., Folfas P. [2011], *Modele Grawitacji jako Narzędzie Analityczne w Ekonomii Międzynarodowej*, Konferencja PITWIN, Kielce, mimeo


34. Krugman P. R., Obstfeld M. [2007], *Ekonomia międzynarodowa: teoria i polityka*, Vol. 1, PWN, Warszawa


36. Lada K., Tchorek G. [2008], *Przepływy bezpośrednich inwestycji zagranicznych a utworzenie strefy euro*, www.nbpnews.pl/r/nbpnews/Pliki_PDF/NBP/Publikacje/analityczne/LadaP.pdf


44. Reilly W. J. [1929], *Methods for the Study of Retail Relationships*, “University of Texas Bulletin”, No. 2944

45. Roberto B. [2004], *Acquisition Versus Greenfield Investments: the Location of Foreign Manufactures in Italy*, „Regional Science and Urban Economics”, Vol. 34, No. 1, s. 3–39

46. Stewart J. Q. [1948], *Demographic Gravitation: Evidence and Applications*, „Sociometry”, Vol. 11, s. 31–58


