

European integration and international M&As: The case of Poland

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Abstract

This paper studies determinants of international mergers and acquisitions (M&As) in Poland using the predictions of the knowledge capital model of multinational enterprise. The empirical implementation of the theory is based on the negative binomial model and the bilateral dataset covering 143 countries over the period 1995-2015. Our estimation results indicate that M&As in Poland are explained by both differences in relative factor endowments and in market size which confirms the importance of both market seeking and efficiency seeking motives. Moreover, the efficiency seeking motive is losing its importance over time while the market seeking motive becomes more important.

Key words: Count data, M&As, negative binomial model, Poland

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Abstract

This paper studies the determinants of international mergers and acquisitions (M&As) in Poland using the predictions of the knowledge capital (KC) model of multinational enterprises (MNEs). The empirical implementation of the theory is based on the negative binomial model and the bilateral dataset covering 143 countries over the period 1995-2015. Our estimation results indicate that M&As in Poland are explained by both differences in relative factor endowments and in market size which confirms the importance of both market seeking and efficiency seeking motives. Moreover, the efficiency seeking motive is losing its importance over time while the market seeking motive becomes more important.

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JEL Classification codes: F23, P33

1. INTRODUCTION

In the last decades foreign direct investment (FDI) has become one of the fastest growing economic activities around the world. Most FDI occurs between developed countries and takes the form of mergers and acquisitions (M&As) rather than investments in new plants (i.e. greenfields). According to the latest World Investment Report 2022 (Table I.2., p. 6) the value of cross-border M&A deals in 2021 in developed countries amounted to 615 billion US \$ while the value of greenfield projects to 401 billion US \$ compared to 113 and 259 billion US \$ in developing countries, respectively.

After its accession to the European Union (EU) in 2004 Poland has emerged as one of the most attractive host countries for the location of FDI among the new EU member countries. For example, in 2019 the net FDI inflow into Poland amounted to 10.9 billion US \$ (National Bank of Poland, 2021). The vast majority of FDI in Poland originated from other EU countries (8.9 billion \$). The biggest net inflows of FDI in 2019 came from Germany (3.1 billion \$), the Netherlands (2.8 billion \$), and Luxembourg (1.5 billion \$).

The main purpose of this paper is to validate the predictions of the knowledge capital (KC) model of multinational enterprises (MNEs) and identify the main reasons for international M&As in Poland using bilateral dataset covering the periods before and after Poland's accession to the EU. To the best of our knowledge, this study is the first to analyze M&A activity in Poland from the perspective of the KC model to explain the drivers of cross-border M&As.

Our contribution to the literature is threefold. First, we introduce a novel general equilibrium perspective from which to study M&A activity. The majority of previous studies that focus on explaining the determinants of cross-border M&As use simple gravity equations borrowed from the early international trade literature as their analytical frameworks. Although this approach can explain a part of cross-country variation in M&A activity, it lacks solid

microeconomic underpinnings explaining optimal behaviour of both consumers and firms. Therefore, the key innovation of this paper is the use of the formal general equilibrium model of MNEs, which is well-established in the international economics literature (Markusen, 2013, Davies and Markusen, 2020). This model is often employed as an analytical framework in many empirical studies summarized in the literature review section. This model is used to derive the estimating equation that allows accommodating both horizontal and vertical investment motives, and alleviating some of the aforementioned concerns. Hence, we contribute to the discussion on the relative importance of horizontal versus vertical motives of M&As.

Second, given the data availability, we estimate the KC model for two different subsamples to determine whether the M&A motives differ before and after Poland's accession to the EU. The sustained GDP growth in Poland has led to a substantial expansion of market size while elimination of tariffs and construction of modern transportation infrastructure lead to a significant reduction in trade costs. At the same time the accession to the EU reduced the differences between Poland and the old EU member countries in terms of unit labor costs. Therefore, a decrease in the inflows of vertical M&As and increase inward horizontal M&As from the founding European Union members to the countries that joined the community in the year 2004 and afterwards can be expected.

We show that in Poland both horizontal and vertical motives are important in general, but the vertical motive become less important after Poland's entry into the EU. Finally, this paper uses actual data on human capital endowments obtained from the recent Penn World Table (PWT)¹. This is in contrast to prior studies that relied on proxy variables for relative factor endowments. We contribute to the literature by showing that variables derived directly

¹ The Penn World Table is a large set of cross-country comparable data developed and maintained by scholars at the University of California, Davis and the Groningen Growth Development Centre of the University of Groningen. The details are explained in Feenstra et al. (2015).

from the KC model, such as differences in human capital endowments and market size, are important drivers of M&A activity, and should not be omitted from empirical studies.

The remainder of this paper is organized as follows. In the next section we survey the relevant literature on the mainstream economic models of MNEs and describe competing analytical frameworks. Subsequently, we describe our analytical framework and discuss the research hypotheses. Then, we present definitions and sources of our explanatory variables and describe the empirical methodology. Finally, we discuss our estimation results. Concluding remarks and directions for future research are provided in the last section.

2. LITERATURE REVIEW

There is an extensive finance and management literature on the determinants of international M&As². For example, early studies documented that M&A volume increased with better accounting standards and stronger shareholder protection (Rossi and Volpin, 2004; Bris and Cabolis, 2008). Chari et al. (2009) stressed the importance of sharing better institutional and corporate governance standards by matching acquirers from developed countries with targets from emerging economies. Erel et al. (2012) showed that the probability of M&A transactions between the target and acquirer countries increased when they were geographically proximate, demonstrated higher accounting disclosure quality, and were involved in bilateral trade. Geographic proximity, culture, and investment environment were found to be related to M&A volume, profitability, and premiums (Kedia et al., 2008; Ahern et al., 2015; Maung et al., 2019).

Prior attempts to explain the cross-country M&As were mostly based on a variety of simple gravity equations borrowed from the early international economics literature. Despite

² Summarizing this enormous literature goes beyond the scope of this paper. Therefore, only some recent examples of this strand in the literature are given.

their substantial empirical success in explaining international trade flows, these early gravity equations were not free from criticism regarding their lack of microeconomic foundations such as consumer and firm optimization problems which are the key elements of general equilibrium models³. In particular, the validity of their use in contemporary empirical studies of international M&As remains questionable. At the same time, the international economics literature developed a number of general equilibrium models of MNEs which allow deriving more precise estimating equations compared to simple gravity equations that have been used to study the determinants of international M&As.

According to general equilibrium models MNEs arise endogenously in response to country-pair characteristics such as differences in relative factor endowments, relative economic size, as well as trade and investment costs. Initially, these models were assigned to two main groups. The first group concentrated on horizontally-integrated MNEs that followed the market seeking strategy. The second group focused on vertically-integrated MNEs that followed the efficiency seeking strategy. Later, an integrated approach that combined these two approaches called the knowledge-capital model emerged. This more general model allows both horizontally- and vertically-integrated MNEs to coexist in equilibrium.

In the models of horizontally-integrated MNEs, firms choose between concentrating production in the home country and serving foreign markets through exporting to benefit from economies of scale, and producing abroad to be close to consumers. These models predict that, given moderate to high trade costs, MNEs' activity would occur if countries are similar in terms of both relative factor endowments and market size. The examples of this approach include early models developed by Krugman (1983) and Markusen (1984). These models were later extended by a number of authors, including Horstmann and Markusen (1987),

³ Over time several formal theoretical studies attempted to derive the gravity equation directly from formal models of international trade. The examples of such studies include Deardorff (1998), Feenstra et al. (2001), Evenett and Keller (2002), Anderson and van Wincoop (2003), Helpman et al. (2008) and Cieřlik (2009). The development of this literature is summarized in Head and Mayer (2014).

Brainard (1993a), Markusen and Venables (1998, 2000), Helpman, Melitz, and Yeaple (2004) Cieřlik and Ryan (2012) and Cieřlik (2013, 2018).

An alternative approach was used to explain MNEs' activity that took place between countries that differed in their levels of economic development. This approach postulates that MNEs exploit cross-country differences in production costs by fragmenting vertically integrated production processes into separate blocs that are located in various countries according to their comparative advantages. The models of vertically integrated MNEs suggest that bigger differences in relative factor endowments between countries result in increased MNE activity (Helpman, 1984; and Helpman and Krugman, 1985; Zhang and Markusen, 1999; Markusen and Venables, 2000; and Markusen, 2002).

Initially, horizontal and vertical models of multinational enterprise were regarded as two completely disjoint strains of the literature. Markusen (2002) merged both approaches into a single framework called the knowledge capital model.⁴ According to Markusen (2013, p. 247): "The knowledge capital model is a general equilibrium approach that incorporates both horizontal and vertical motives for multinationals". This model allows to derive a number of empirically testable hypotheses concerning the relationships among the various types of MNE activities and country-pair characteristics. For example, horizontally-integrated MNEs would dominate when trade costs are high and countries are similar in terms of their relative factor endowments and economic size. Alternatively, when trade costs are low and countries are dissimilar in their relative factor endowments but of similar size, vertically-integrated MNEs would dominate.

Early attempts to validate the hypotheses derived from the general equilibrium theories of MNEs started in the 1990s. Initially, they focused on U.S.-based MNEs, and little attention was paid to multinationals originating from other countries. These attempts were

⁴ The full definition of the KC model can be found in Markusen (2002), although elements of this model can already be found in several working papers in the mid-1990s that were left unpublished (Markusen, 2013).

pioneered by Brainard (1993b, 1997), who tested both the market-seeking hypothesis for horizontally integrated MNEs, and the efficiency-seeking hypothesis for vertically integrated MNEs. She found that the majority of U.S. MNEs were integrated horizontally and not vertically.

In order to verify her findings, Carr, Markusen, and Maskus (2001) estimated the specification derived directly from the more general KC model, and demonstrated that U.S. MNEs were integrated both horizontally and vertically. Although a further study by Bloningen et al. (2003) called their results into question, subsequent studies by Braconier et al. (2005) and Davies (2008) supported the importance of both horizontal and vertical integration.

More recently, Camarero et al. (2019) and Becker and Cieřlik (2020) studied the determinants of German FDI and reported that horizontal FDI appeared to be dominant in developed countries while in the group of developing economies vertical FDI motives played a more important role. Cieřlik and Tran (2019) estimated the KC model for a group of emerging economies to find that both horizontal and vertical reasons for outward FDI were important. The KC model was also recently used as an analytical framework by Nguyen and Cieřlik (2021) and Cieřlik and Ghodsi (2021) to study the determinants of European outward FDI and supported both horizontal and vertical investment motives.

The opening of the economies of Central and East European (CEE) countries to FDI in the early 1990s stimulated interest in studying determinants of FDI into those countries as well. Initially, empirical studies for those countries were conducted treating countries in the whole region jointly. Examples of such studies include Cieřlik (1996), Lansbury *et al.* (1996), Brenton *et al.* (1999), Benacek *et al.* (2000), Resmini (2000), Garibaldi *et al.* (2001), Bevan and Estrin (2004), Carstensen and Toubal (2004), Cieřlik and Ryan (2004), Baniak *et al.* (2005), Gorbunova *et al.* (2012), Wach and Wojciechowski (2016), Ascani *et al.* (2017),

Stack *et al.* (2017), Tang (2017), Becker and Cieřlik (2020), Ghodsi (2020) and more recently also by Cieřlik and Gurshev (2021). The majority of the aforementioned studies relied, however, on simple gravity frameworks and basic estimation methods such as ordinary least squares.

There is also a limited number of studies for particular CEE countries. For example, determinants of inward FDI in Ukraine and the Baltic states were studied by Cieřlik and Gurshev (2020, 2021) who found that FDI was mostly vertical. The determinants of inward FDI in Poland were previously studied by several authors including, Gorynia *et al.* (2007), Cieřlik (2017; 2019; 2020a,b; 2021), while determinants of Polish outward FDI by Kowalewski and Radlo (2014). These studies based on a variety of empirical approaches showed the combinations of different investment motives.

None of the aforementioned studies, however, focused on cross-border M&As in Poland. Also, little attention was given to studying the effect of Poland's accession to the EU on cross-border M&As. Comprehensive studies on the factors affecting M&As are still lacking. Therefore, further empirical research on the determinants of cross-border M&As in Poland would definitely be of interest as the process of integration into the EU should have a significant impact on the pattern of cross-border M&As in Poland.

3. THEORETICAL FRAMEWORK AND HYPOTHESES DEVELOPMENT

In this section we describe our theoretical framework which is based on the knowledge capital model and specify the research hypotheses derived from this model that are validated empirically using the data on cross-border M&A transactions in Poland in the next section. The KC-model is regarded as the milestone in the development of the modern MNE theory as it combined horizontal and vertical investment motives in a single integrative framework (Markusen 2013, Davies and Markusen 2020). In this model three types of entities can arise

endogenously in the equilibrium: national exporting firms, horizontally-integrated MNEs and vertically-integrated MNEs depending on combinations of various trade and investment partner countries' characteristics.

The model assumes two countries (i and j) that produce two goods (X and Y) using unskilled and skilled labor (L and S). Good Y is produced under perfect competition and constant returns to scale and is used as a numeraire. Good X is produced under oligopolistic Cournot competition under increasing returns to scale production that involve firm-level and plant-level scale economies. The production process of good X can be split into particular stages that differ in terms of their factor intensity. In particular, it is assumed that plant activities are less skilled-labor intensive compared to the headquarter activities. Moreover, it is assumed that production of good Y is less skilled-labor intensive compared to production plant activities.

In addition, it is assumed that the fixed costs of a horizontally-integrated multinational firm are lower than the double of fixed costs of a national firm. Moreover, it is assumed that the fixed costs of a vertically-integrated multinational firm are lower than the costs of a horizontally-integrated multinational firm, but higher than the costs of a national firm. Moreover, because national firms and vertically-integrated multinational firms have to pay transportation costs, their markup revenues are smaller compared to those of horizontally-integrated multinational firms. Finally, free entry and free exit of firms is assumed. There are four market structures: 1) only horizontally-integrated firms are in the market 2) the mixed structure of horizontally- and vertically-integrated firms 3) vertically-integrated firms 4) only national exporting firms operate in the market.

Unfortunately, the KC-model does not have an analytical solution and the majority of results need to be obtained from numerical simulations. The simulations generate a number of predictions on the relationship between the degree of MNEs activity and parent and target

countries' characteristics. For example, national exporting firms dominate when countries are similar in terms of their economic size and relative factor endowments, and when trade costs are low. Horizontally-integrated multinational firms are the dominant type when countries are similar in terms of market size and factor endowments and barriers to trade are high. However, if countries differ in terms of market size or/and factor endowments one country is preferred as a location of both headquarters and production activities or one of these two activities giving rise to vertically-integrated multinational firms.

Although the majority of findings are based on numerical simulations, the KC-model yields a number of research hypotheses that can be validated empirically using country-pair data. These hypotheses relate the extent of multinational activity measured by number of M&A deals to country-pair characteristics. Our research hypotheses on cross-border M&As in Poland obtained on the basis of the KC-model that can be tested empirically are formulated as follows:

Hypothesis 1: The larger the joint market size and bigger similarity in market size between the target and the acquirer countries the larger number of M&A deals due to the market seeking reason.

Hypothesis 2: The larger differences in skilled-labor endowments between the target and the acquirer should result in increased number of M&A transactions due to the efficiency seeking reason.

Hypothesis 3: The lower trade costs between the target and the acquirer have an ambiguous effect on the number of M&A deals as they encourage vertical M&As but at the same time discourage horizontal M&As.

4. MATERIALS AND METHODS

The theoretical models of MNEs discussed in the previous sections predict how cross-border M&As can be related to combined market sizes, differences in economic country size, relative factor endowments and trade costs. Both horizontal and vertical reasons for cross-border

M&As can be nested into and regarded as two special cases of the more general KC model and estimated using cross-country observations for Poland over the period 1995-2015. The same country characteristics determining the cross-border M&As in horizontal and vertical models appear also in the KC model although their expected impact may differ across models. Therefore, testing whether the market access motive or the efficiency seeking motive better explains the cross-country pattern of M&As in Poland can be done by evaluating the signs and statistical significance of the estimated coefficients on various country-pair characteristics.

The two key variables that allow distinguishing between competing reasons are the measures of similarity in relative factor endowments and in market size between the home and the host countries. In particular, the horizontal model predicts that M&As in the host country would decrease with increasing differences in relative factor endowments while the vertical model predicts an opposite relationship. Therefore, if the estimated coefficient on the measure of differences in relative factor endowments between the home and the host countries turns negative then the market access motive should be more important, while if it turns positive then the efficiency seeking motive should be more important.

In order to calculate cross-country differences in relative factor endowments we use the actual factor data on human capital. The differences in human capital endowments (HLDIFF) are calculated using the human capital index, based on years of schooling and returns to education. The data necessary to calculate differences in relative factor endowments come from the PennWorld Table (PWT) 9.0 available at www.ggd.net/pwt.

The second key explanatory variable is the squared difference in market size between the home and the host countries $GDPDIFF^2$. Both the horizontal and the knowledge capital models predict a negative relationship between differences in the country size and M&As in the host country, while in the vertical model differences in country size should not play any

role. Therefore, we can expect a negative sign of the estimated coefficient on this variable if the market access motive is important. To measure differences in country size we use the absolute value of the difference in output-side real GDP at chained PPPs and expressed in constant 2011 US dollars between Poland and particular source countries. This data also comes from the PennWorld Table (PWT) 9.0 available at www.ggdcc.net/pwt.

In addition to the measures of differences in relative factor endowments and similarity in economic size that are used for model identification we also include a number of additional variables in our estimating equation in order to control for other effects. First, in order to control for the combined market size of investment partners we include the sum of Poland's and the source country's GDP (GDPSUM). In all the theoretical models that were surveyed in the previous section the combined market size of investment partners is positively related to M&As in the host country. Therefore, a positive sign on the GDPSUM variable should be expected. To calculate the sum of investment partners' GDP we use the same data on GDP that was used previously to calculate the measure of similarity in GDP which comes from the PennWorld Table (PWT) 9.0 available at www.ggdcc.net/pwt.

Moreover, in the KC model, there is some non-monotonicity in the relationship between M&As in the host country and differences in relative factor endowments. The increase in human capital per worker in the human capital-scarce country, that reduces differences in relative factor endowments between countries, leads to a fall in M&As in the host country for a relatively similar countries but increases M&As when the host country is very human capital-scarce. The theory cannot exactly predict where the turning point is. Therefore, we include the interaction term between the differences in relative factor endowments and differences in country size $HLDIFF \times GDPDIFF$. We anticipate a negative coefficient on this term as the number of M&As should be the highest when the source country is small and very human capital abundant.

In order to control for differences in trade costs (TC) and investment costs (IC) we include also trade and investment freedom indices compiled by the Heritage Foundation for Poland and its partner countries (TC_{parent} , TC_{Poland} , IC_{Poland}). These indices are available online at www.heritage.org/index. We also include the EU dummy measuring the membership of the investment partner country in the European Union with which Poland signed in 1991 the association agreement that was in force until Poland's accession to the EU in 2004 (EU_{parent}).

In order to control for the effects of transport and other distance related costs such as communication and monitoring we include geographic distance (DISTANCE) between the home country and Poland. The KC model, however, does not yield clear predictions about the exact impact of distance on the extent of foreign involvement in the host country. On the basis of previous empirical studies we should expect rather a negative sign of the estimated coefficient on the DISTANCE variable. We choose to measure distance in the simplest possible way by calculating a “as the crow flies” distance between source country capitals and the capital city of Poland - Warsaw and express it in kilometers. This data is available on line at: <http://www.indo.com/distance>.

Finally, to control for business cycle and policy changes effects we include also individual time effects for specific years. The definitions of dependent and explanatory variables and their signs predicted by competing models of FDI are summarized in Table 1.⁵

Table 1. Definitions, summary statistics and expected signs

Explanatory variable	Definition	Mean	Std. dev.	min	Max	Expected signs		
						Horizontal model	Vertical model	Hybrid model
M&As	Number of cross-border M&As from parent country in Poland	0.41	1.46	0	16	na	Na	na
HLDIFF	Human capital per worker difference between Poland and	-0.707	0.680	-2.135	0.640	-	+	+/-

⁵ The calculated values of the correlations between the variables used in the empirical study are reported in Table A1 in the Appendix.

	parent country							
HLDIFFxGDPDIFF	Interaction term between human capital per worker difference and GDP difference between Poland and parent country	344425.2	1052081	-1.38e+07	7397852	-	-	-
GDPDIFF ²	Squared value of GDP difference between Poland and parent country	2.38e+14	1.80e+15	1645287	2.59e+16	+	0	+
GDPSUM	Sum of parent country and Poland's GDPs	1117777	1566322	377861.2	1.81e+07	+	+	+
TC _{Parent}	Trade freedom index for parent country	68.802	15.404	0	95	0	-	-
TC _{Poland}	Trade freedom index for Poland	77.438	11.711	49.6	88	+	-	+/-
IC _{Poland}	Investment freedom index for Poland	63.095	8.089	50	70	-	-	-
EU _{Parent}	EU membership of parent country	0.148	0.355	0	1	+	+	+
DISTANCE	Geographic distance of each parent country's capital city from Warsaw	5734.72	3722.75	365	17682	+/-	+/-	+/-

Our measure of the extent of MNEs' activity in Poland's economy is the number of foreign M&As with a change in ownership greater than 50%. The data on M&As are from the Thomson One SDC database. We count the number of cross-border deals by the location of the acquirer. The top three countries with the largest number of investors are, respectively, the United States with 189 M&A deals, Germany with 188 M&A deals, and the United Kingdom with 143 M&A deals.

Our dependent variable assumes non-negative integer values and the distribution of cross-border M&As is skewed towards a few developed source countries. The preponderance of zeros and small values in the sample, as well as the discrete nature of the dependent variable, suggest that we can improve on traditional estimation techniques, such as OLS for example, with a specification that accounts for these features. Therefore, the use of count models in this

study seems to be the most suitable choice. The Poisson and negative binomial (NB) models are two most popular count models. In the Poisson model the probability of observing a count of M&As from country i y_i in Poland is:

$$\Pr(y_i | x_i) = \frac{e^{-\lambda_i} \lambda_i^{y_i}}{Y_i!} \quad y_i = 0, 1, 2, \dots, N. \quad (1)$$

where λ_i is the expectation of the number of M&As from country i in Poland, assumed to be log-linearly dependent on the vector of country characteristics x_i :

$$\ln \lambda_i = \beta' x_i \quad (2)$$

and β is a parameter vector that needs to be estimated.

The crucial assumption of the Poisson model is the equality of conditional variance and conditional mean. However, count data very often exhibits overdispersion. This problem can be avoided by using the NB model which is a generalized version of the simple Poisson model that introduces an individual unobserved effect into the conditional mean:

$$\ln \lambda_i = \beta' x_i + \varepsilon_i \quad (3)$$

where ε_i reflects either a specification error or some cross-sectional heterogeneity with $\exp(\varepsilon_i)$ having a gamma distribution with a unit mean and variance α .

The expected value y_i in the negative binomial model is exactly the same as in the Poisson model but the variance is bigger than the mean and equals:

$$\text{var}[y_i|x_i] = E[y_i|x_i] \{1 + \alpha E[y_i|x_i]\} \quad (4)$$

The negative binomial model approaches the Poisson model as overdispersion approaches zero. When the estimated parameter α is not statistically different from zero, the conditional mean becomes equal the conditional variance and the negative binomial model simplifies to the Poisson model. Hence, the Poisson model can be nested in the negative binomial model. In order to make the comparison between these two models the standard

likelihood ratio test can be used. In this study we estimated both the Poisson and NB models. However, it turned out that in all cases the estimated parameter α was statistically different from zero and the likelihood ratio test always favored the NB model versus the Poisson model. Therefore, in the next section we report only the negative binomial model estimates.

5. ESTIMATION RESULTS

In this section we report two sets of our estimation results. First, in Table 2 we report estimation results obtained for the full sample covering the entire period 1995-2015. Then, in Table 3 we report estimation results obtained separately for the periods before and after Poland's accession to the EU: 1995-2004 and 2005-2015, respectively.

Table 2. Estimates of the NB model for the period 1995-2015.

(z-stats)

	M&A DEALS 1995-2015					
	Coeff. (1)	z-stat (2)	Coeff. (3)	z-stat (4)	Coeff. (5)	z-stat (6)
HLDIF	1.874***	(11.98)	1.706***	(10.95)	1.537*	(1.89)
HLDIF*GDPDIF	-0.004	(-0.10)	-0.012	(-0.32)	-0.153	(-0.91)
GDPDIF ²	-0.023***	(-5.52)	-0.025***	(-6.24)	0.008	(1.03)
GDPSUM	0.525***	(9.76)	0.557***	(10.79)	-0.200	(-1.03)
IC _{Poland}	-0.000	(-0.03)	0.063	(1.10)	0.001	(0.17)
TC _{Parent}	0.025***	(2.95)	0.038***	(4.03)	0.004	(0.35)
TC _{Poland}	-0.011*	(-1.96)			0.020***	(3.25)
EU	1.888***	(13.47)	1.815***	(13.14)	1.213***	(4.05)
DISTANCE	-0.000***	(-3.30)	-0.000***	(-3.56)	0.000	(0.00)
TIME FE	NO		YES		NO	
COUNTRY FE	NO		NO		YES	
OBS	3003		3003		3003	

Notes: Dependent variable: the number of multinational enterprises; ** significant at the 5% level of significance, *** significant at the 1% level of significance.

The baseline estimates of the model parameters obtained via the NB approach for the full sample covering the entire period 1990-2015 without controlling for individual time and country effects are shown in column (1) while the corresponding z-statistics are reported in

column (2) of Table 2. It turns out that almost all estimated coefficients are statistically significant and display the expected signs. In particular, the positive sign of the estimated parameter on the measure of differences in human capital endowments, which is statistically significant already at the 1% level, and the negative sign on the measure of differences in market size, which is also statistically significant at the 1% level, suggest that both vertical and horizontal reasons are important for M&As in Poland.

In column (3) we report estimation results obtained from the specification in which we control for individual time specific effects by including dummy variables for particular years of our sample. The corresponding z-statistics are reported in column (4). However, it turns out that the majority of estimated coefficients on time effects are not statistically significant. Hence, the inclusion of individual time effects does not affect the statistical significance of the key explanatory variables: HLDIFF and GDPDIFF² which both remain statistically significant at the 1 % levels and display the expected signs. Therefore, our previous conclusions regarding the role of differences in relative factor endowments and market size remain unchanged.

In column (5) we report estimation results obtained from the specification in which we control for individual country specific effects by including dummy variables for particular source countries. The corresponding z-statistics are reported in column (6). The inclusion of country specific fixed effects affects, however, the statistical significance of our key explanatory variables. The estimated parameter on the HLDIFF variable becomes now statistically significant only at the 10 % level while the estimated parameter on GDPDIFF² variable loses completely its previous statistical significance.

In Table 3 we study the robustness of our estimation results reported by splitting the sample into two sub-periods that correspond to the periods before and after Poland's accession to the EU: 1995-2004 and 2005-2015, respectively.

Table 3. Estimates of the NB model for the sub-periods: 1995-2004 and 2005-2015.

Panel A. 1995-2004 and 2005-2015 without time effects

(z-stats)

	M&A DEALS 1995-2004		M&A DEALS 2005-2015	
	Coeff.	z-stat	Coeff.	z-stat
HLDIF	2.203***	(9.12)	1.487***	(6.93)
HLDIF*GDPDIF	-0.365***	(-3.03)	0.048	(0.99)
GDPDIF ²	-0.006	(-0.70)	-0.030***	(-5.33)
GDPSUM	0.491***	(6.12)	0.626***	(8.29)
IC _{Poland}	0.026***	(3.11)	-0.028**	(-2.12)
TC _{Parent}	0.046***	(3.67)	0.035**	(2.29)
TC _{Poland}	0.004	(0.50)	0.003	(0.07)
EU	1.850***	(10.31)	1.890***	(8.94)
DISTANCE	-0.000***	(-2.85)	-0.000**	(-2.00)
TIME FE	NO		NO	
COUNTRY FE	NO		NO	
OBS		1430		1573

Panel B. 1995-2004 and 2005-2015 with time effects

(z-stats)

	M&A DEALS 1995-2004		M&A DEALS 2005-2015	
	Coeff.	z-stat	Coeff.	z-stat
HLDIF	2.186***	(9.17)	1.456***	(6.82)
HLDIF*GDPDIF	-0.365***	(-3.09)	0.054	(1.10)
GDPDIF ²	-0.005	(-0.72)	-0.031***	(-5.52)
GDPSUM	0.492***	(6.29)	0.641***	(8.52)
IC _{Poland}	0.016	(1.09)	0.070	(1.14)
TC _{Parent}	0.046***	(3.69)	0.036**	(2.40)
TC _{Poland}				
EU	1.838***	(10.34)	1.886***	(8.90)
DISTANCE	-0.000***	(-2.89)	-0.000**	(-2.07)
TIME FE	YES		YES	
COUNTRY FE	NO		NO	
OBS		1430		1573

Notes: Dependent variable: the number of multinational enterprises; ** significant at the 5% level of significance, *** significant at the 1% level of significance.

First, in Panel A of Table 3 we compare the estimates obtained for the sub-periods 1995-2004 and 2004-2015 without controlling for individual time effects. It turns out that in both cases the estimated parameters on differences in human capital endowments are statistically significant at the 1% level and display expected positive signs. However, the magnitude of the estimated parameter is lower for the more recent period. In contrast the estimated parameter on the $GDPDIFF^2$ variable is statistically significant at the 1 % level only for the more recent period which suggests the increased importance of horizontal M&As.

Then, in Panel B of Table 3 we compare the estimates obtained for the sub-periods 1995-2004 and 2004-2015 having controlled for individual time effects. The estimation results obtained for both periods are very similar to the results reported in Panel A. Summing up, both horizontal and vertical motives turn out to be important for undertaking cross-border M&As in Poland during the post EU accession sample period. In addition, vertical M&As seem to be losing importance after Poland's accession to the EU while horizontal M&As have become more important.

CONCLUSIONS

The main purpose of this paper was to validate the relative importance of the competing reasons for cross-border M&As using bilateral data on Poland and 143 investment partner countries before and after Poland's accession to the EU. The assembled empirical evidence for the entire period of the study points to both horizontal and vertical motives for undertaking M&As in Poland which is in line with the early case study evidence provided by Gorynia et al. (2007). However, vertical M&As seem to be losing importance at the expense of horizontal M&As after Poland's accession to the EU in 2004. Hence, our paper reveals the different nature of M&A deals in Poland before and after its accession to the EU.

Finally, in this paper, we also demonstrated that the KC model could be a preferred alternative to simple gravity equations, which are widely used in the literature but lack formal microeconomic underpinnings. In an M&A context, the KC model seems more appropriate, because it allows for deriving a specification of the estimated equation directly from the general equilibrium model of MNEs, and also distinguishes among the various reasons for undertaking international investments. Our findings make an important contribution to the M&A literature theoretically as they indicate that differences in relative factor endowments and market size, are important drivers of M&A activity, and thus should not be omitted from empirical studies.

Our empirical results have several important policy implications. In particular, the main reasons for M&As in Poland are becoming more similar to the reasons in other West European countries where horizontally-integrated MNEs dominate. Moreover, the increased importance of horizontally-integrated MNEs following the EU accession have important implications for both labor markets and competition policies in the target and acquirer countries. On the one hand, horizontally-integrated MNEs create demand for local labor and intermediate inputs that may in turn translate into rising wages and stimulate further target country economic development. On the other hand, horizontal M&As are usually associated with increased competition with indigenous firms in product markets in the host country and the fear that these firms would be driven out of the market by more productive MNEs. At the same time, the horizontally-integrated MNEs do not transfer jobs abroad and do not exert downward pressure on wages in the acquirer country.

The limited support for vertical M&As in the period following Poland's accession to the EU does not mean that the efficiency seeking reason is not important. Therefore, in future studies it would be desirable to perform a sectoral level analysis using disaggregated M&A data to validate whether the reasons for M&As differ across particular sectors of the Polish

economy. The special attention should be devoted to high value added and technologically advanced sectors that are essential for building host country's innovation potential and stimulating its economic development.

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Appendix

Table A1. Correlations between explanatory variables

Variable	GDPSUM	GDPDIFF ²	HLDIFF	HLDIFFx GDPDIFF	TC _{Parent}	TC _{Poland}	IC _{Poland}	EU _{Parent}	DISTANCE
GDPSUM	1.000								
GDPDIFF ²	0.900	1.000							
HLDIFF	0.219	0.126	1.000						
HLDIFFx GDPDIFF	-0.039	0.110	-0.196	1.000					
TC _{Parent}	0.145	0.069	0.517	-0.018	1.000				
TC _{Poland}	0.155	0.046	-0.022	0.047	0.360	1.000			
IC _{Poland}	-0.008	-0.003	0.003	-0.002	-0.091	-0.236	1.000		
EU _{Parent}	0.056	-0.037	0.245	0.079	-0.122	0.000	-0.000	1.000	
DISTANCE	0.002	0.035	0.416	-0.107	0.380	0.082	-0.042	-0.509	1.000