Doctoral School of Economics and Business Informatics

COLLECTION OF THESES

László János Tőkés

Chapters from foreign direct investment
Empirical analysis of economic effects and cyclical behavior

Ph.D. dissertation

Supervisor:

Eszter Szabó-Bakos, Ph.D
professor

Budapest, 2021

Department of Economics

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Contents

1. Motivation and previous research

An important aspect of globalization is the movement of capital across national borders, i.e. foreign direct investment (FDI). Foreign direct investment flows gained momentum in the second part of the 1990s, and huge amounts of FDI have been spreading ever since. Hungary started to be a participant of FDI activities after the regime change in 1989. In the past three decades a great amount of FDI has flowed into Hungary, and so today the relevance of foreign-owned companies in the Hungarian macroeconomy is beyond question. So, analyzing FDI is important not only from a scientific, but also from a policy point of view.

As the value of cross-border capital flows increased, related economic research has also gained momentum. There are two main strands in the literature. First, the economic motives of FDI is studied, why and how firms choose their foreign location, and how economic policy can attract foreign capital. Second, the effect of FDI on

the economy of the recipient country is also studies. My research contributes to these two strands.

Many motives of foreign capital flows have been identified by researchers. A non-exhaustive list of the most important ones: the size of the market, inflation, trade and economic openness, size, cost and quality of the workforce, taxation system, exchange rates, yields, economic freedom, economic confidence, development of money markets, productivity, political institutions, political stability, corruption, property rights, cultural differences, and geographical distance. So, researches focus mainly on persistent factors. Most empirical studies ignore the role of short-term economic fluctuations despite the fact that some theoretical models suggest procyclical behavior, see for example Bernanke et al. (1999) or Cavallari (2010). Only some empirical studies are available, and there is no conclusion: evidence for both procyclical and countercyclical behavior is found. The last chapter of my dissertation focuses on this topic.

Studies analyzing the economic effects of FDI are also diverse. The majority of the papers suggest that FDI has a

positive effect on the economy of the recipient country. Although, many papers document that these positive effects are conditional, depending on the characteristics of the recipient country: insufficient economic development, quality of human capital, money market deepness, political environment can all hinder the positive effects.

One potential problem is that the literature considers FDI as a homogenous unit and does not distinguish based on the characteristics of the host country. Based on the literature, the positive effects apply through the so-called technological transmission: FDI brings advanced technology with itself to the recipient country, which directly, and through spillover effects, indirectly as well, increases the recipient country's technology level and productivity. If we apply these results, then it is necessary to distinguish between FDI flows based on the host country's characteristics, especially on its development: countries with obsolete technologies cannot export superior technology. I analyzed this question in the 2nd and 3rd chapter of my dissertation.

2. Applied methods

Foreign direct investment: definitions and trends

In this chapter I presented the definition of foreign direct investment (FDI) based on the United Nations Conference on Trade and Development (UNCTAD) and the Organization for Economic Co-operation and Development (OECD). On the other hand, I depicted the most important trends in FDI flows using historical data. First, I focused on world-level phenomena, then I presented data on country groups. Finally, I also described the Hungarian trends in itself, and compared to the data of the countries of the Visegrád Group, as well. I also articulated the most important research subfields and the relevance of the topic.

The effect of foreign direct investment on the Hungarian economy – a macro-level analysis

In this chapter I analyzed the effect of inward foreign direct investment on the Hungarian economic growth using the so-called ARDL (autoregressive distributive

lag) model. The ARDL model is used to check long-run relationship between time series, like standard cointegration tests (see Engle – Granger, 1987; Phillips – Ouliaris, 1990; Engle – Yoo, 1991; and Johansen, 1991), although the ARDL technique is more flexible with less restrictions: can be used when time series are integrated in different orders, the results are reliable with small samples as well, and t-tests are valid in the case of autocorrelation and endogeneity. ARDL stems from the standard AR model, although the dependent variable is not only explained by its lagged values, but with other variables as well. The ARDL(p,q) model is the following:

$$y_t = c_0 + c_1 \cdot t + \sum_{i=1}^{p} \alpha_i \cdot y_{t-i} + \sum_{i=0}^{q} \beta_i \cdot x_{t-i} + \varepsilon_t$$

Two specifications of the previous equation were estimated. Specification 1 tests the standard hypothesis of the literature, whether inward FDI fosters economic growth, i.e. increases the growth rate of constant-price GDP:

$$growth_t = c_0 + c_1 \cdot t + \sum_{i=1}^{p} \alpha_i \cdot growth_{t-i} + \sum_{i=0}^{q} \beta_i \cdot lnFDI_{t-i} + \varepsilon_t$$

Specification 2 tests heterogeneity: FDI is divided into two groups based on the productivity of the investing country. According to the literature, FDI's positive effects stem from technological transmission. Although, this interpretation is based on the implicit assumption that the investing country has more developed technology that can be transmitted and used by the recipient country to foster economic growth. So, if the investing country is not technologically advanced, so there is no productivity advantage, then technology transmission cannot happen, and so growth-fostering effects cannot be achieved either. Due to this argument I divided FDI into two groups: FDI that comes from countries with aggregate productivity higher than the productivity of Hungary, and FDI coming from countries with lower productivity. The estima-

tion equation of this specification is the following:

$$growth_t = c_0 + c_1 \cdot t + \sum_{i=1}^{p} \alpha_i \cdot growth_{t-i} + \sum_{i=0}^{q} \beta_i \cdot lnFDI_{t-i}^{largeTFP} + \sum_{i=0}^{r} \gamma_i \cdot lnFDI_{t-i}^{smallTFP} + \varepsilon_t$$

The existence of the long-run relationship is tested using the bound test described in Pesaran et al. (2001). According to Kripfganz – Schneider (2018) the bound test is valid if residuals are normally distributed, homoscedastic and not autocorrelated, and coefficients are stable. The fulfillment of these assumptions was tested with several formal tests.

The effect of majority foreign acquisition on labor productivity of the acquired firm: Does the country of origin of the acquirer matter – a micro-level analysis

In this chapter firm-level data was used to estimate the effect of majority foreign acquisition on labor productivity using fixed-effect regression technique with Difference-in-Differences and matching algorithm. If panel data is available, the causal effect of an exogenous shock

can be estimated in a Difference-in-Differences (DiD) context. DiD divides observations into two categories: observations that are affected by the shock, i.e. treatment (treated units) and observations that are not (control units). The value of the variable of interest is measured before the shock both for the control and treated units, and their difference is calculated (first difference). Then the same is done for the post-shock period (second difference). Finally, the difference of these two above-mentioned differences are calculated. Applying this technique to this specific context, treated (acquired by foreign owners) and control (owned by domestic owners throughout the whole period) firms were identified, and causal effect was measured using the following equation:

$$\ln(LP_{it}) = \beta_0 + \beta_1 \cdot FDI_{it-1} + \beta_2 \cdot dfd3_{it} + \boldsymbol{\beta_3} \cdot \boldsymbol{X_{it}} + YI_t + \alpha_i + \varepsilon_{it}$$

where *i* refers to the firm and *t* refers to the year, *FDI* is a dummy variable which equals to 1 if the firm in the particular year is owned by foreigners and 0 otherwise, so β_1 measures the effect of the foreign acquisition. *dfd3* is also a dummy variable which equals to 1 if the previously

foreign-owned firm is re-acuired by a domestic owner, and 0 otherwise, so β_2 captures the difference in labor productivity before acquisition and after divestition. $\boldsymbol{X}$ is a vector of control variables, containing firm-specific characteristics. YI_t is the interaction of industry and year dummies, capturing industry-specific shocks, α_i is the firm fixed effect, while ε_{it} is the error term.

The estimation equation presented above tests the standard question of the literature: Does foreign acquisition foster labor productivity? Measuring heterogeneities in the effect other specifications were also introduced: the FDI dummy variable was replaced by other variables:

- *Specification 2: GDP distance* is a continuous variable measuring whether the effect of acquisition depends on the size of the development gap (indicated by the difference between the Hungarian GDP and the GDP of the investor's home country)

$$GDP\ distance = \begin{cases} \ln\left(\dfrac{\frac{GDP}{capita}\ of\ the\ investor}{\frac{GDP}{capita}\ of\ Hungary}\right), if\ FDI = 1 \\ 0\ otherwise \end{cases}$$

- *Specification 3: Poor FDI* and *Rich FDI* are two dummy variables measuring the effect of foreign acquisition separately for high-income (GDP per capita is higher than in Hungary) and low-income (GDP per capita is lower than in Hungary) investors.

$$FDI_{it} = Poor\ FDI_{it} + Rich\ FDI_{it}$$

- *Specification 4:* Integrating Specifications 2 and 3, two continuous distance measures are constructed, catching the relevance of the GDP gap withing the two above-mentioned investor groups.

$$Poor\ GDP\ distance = \begin{cases} GDP\ distance, if\ Poor\ FDI = 1 \\ 0\ otherwise \end{cases}$$

$$Rich\ GDP\ distance = \begin{cases} GDP\ distance, if\ Rich\ FDI = 1 \\ 0\ otherwise \end{cases}$$

Gertler et al. (2016) note that factors affecting the chance of treatment can also affect the outcome variable. This is called selection bias, which can distort the estimation results. A possible solution for the selection bias could be the use of matching methods, when only those control and treated observations are used which are similar enough to each other. In this chapter propensity score matching was used, based on Rosenbaum – Rubin (1983). First, a probit model is estimated, where the propensity score is estimated using many independent variables:

$$\begin{aligned} \Pr(ACQ_{it}) = \Phi\{&\beta_0 + \beta_1 \cdot \ln(LP)_{it-1} + \beta_2 \\ &\cdot \ln(avgw)_{it-1} + \beta_3 \cdot \ln(emp)_{it-1} + \beta_4 \\ &\cdot \ln(CapIns)_{it-1} + \boldsymbol{\beta_5} \cdot \boldsymbol{Dyear}_{\boldsymbol{it-1}} + \boldsymbol{\beta_6} \\ &\cdot \boldsymbol{Dind}_{\boldsymbol{it-1}} + + \boldsymbol{\beta_7} \cdot \boldsymbol{Dage}_{\boldsymbol{it-1}}\} \end{aligned}$$

where *LP* is labor productivity, *avgw* is the average wage, *emp* is the number of employment, *CapIns* is capital intensity, ***Dyear*** is a vector of year dummy variables,

Dind is a vector of industry dummy variables, and ***Dage*** is a vector of firm age dummy variables. The dependent variable of the model, ACQ_{it} is a dummy variable equals to 1 if firm *i* was acquired in time *t*, and 0 otherwise. Second, based on the estimated propensity scores, a common pool was constructed. Finally, a mixed matching was executed: (1) kernel propensity score matching was applied with (2) year and industry exact matching. The quality of the matching was tested using the normalized differences (described in Wooldridge, 2009).

Cyclical behavior of the Hungarian inward foreign direct investment flows

In this chapter I analyzed the cyclical behavior of the inward FDI flows using simple statistical methods like ordinary least squares regression. Cyclical components of the time series were identified using the standard Hodrick-Prescott filter. In the identification progress a $\{t_1, t_2, \dots, t_T\}$ trend of a $\{y_1, y_2, \dots, y_T\}$ time series is defined, which trend (1) fits the best and (2) is the smoothest. Formally, the following minimization process is executed:

$$\min_{t}\left(\sum_{i=1}^{T}(y_i - t_i)^2 + \lambda\sum_{i=2}^{T-1}[(t_{i+1} - t_i) - (t_i - t_{i-1})]^2\right)$$

Cyclical components of the examined time series were analyzed using simple statistical techniques: correlation and OLS regression models.

3. Results of the thesis

Foreign direct investment: definitions and trends

- The value of world-level current-price FDI flows was only several billion dollars per year before 1985. In the next ten years FDI flows increased moderately, and then started to skyrocket in the middle of the 1990s. Since then a trend growth can be observed with high volatility. Measuring FDI inflows as a proportion of GDP, or as a percentage of gross fixed capital formation, the trends before 2000 are the same as in absolute terms, although, after 2000 we can observe a declining trend in contrast to the absolute figures.

- Hungary became an FDI-recipient after the regime change in 1989. Since then net inflows have been realized in almost all years. In 2018, the FDI stocks in Hungary were equal to the 63% of the GDP. Although, the proportion of foreign-owned companies in Hungary is really low (only a few percent of the operating firms owned by foreign-

ers), their economic importance is highly significant: between 2008 and 2017 their average contribution to the production of value added was cca. 50%, their contribution to the total gross investment was around 50% as well, and 25% of total employment are also related to them.

- Foreign-owned companies are important in the economies of the other three countries of the Visegrád Group as well. Some bigger differences can be observed in the statistics only in the case of Poland.

- Economic significance of FDI flows is also increasingly studied in economic literature. There are two main strands of the literature: (1) motives for international investment flows, and (2) economic effects of FDI.

The effect of foreign direct investment on the Hungarian economy – a macro-level analysis

- Considering the results of the literature, one cannot identify a clear message. Many papers conclude that FDI fosters economic growth, although the size of the effect varies on a wide range. Moreover, many papers show evidence that positive effects occur only under specific circumstances: above a given level of development, or human capital, or banking system etc. Other papers cannot find any effects, or even negative effects of FDI on growth.

- Special purpose vehicles (SPV) are a special form of FDI. The connection of these firms to the economy is extremely weak, the firms are established mainly with the aim of tax optimization. Using data from five countries that publish FDI time series both with and without SPVs, I articulated that the effect of these firms on empirical regression models can be significant. Estimating a basic model, I showed that FDI with SPVs had no

effect on economic growth, while the effect of FDI without SPVs was positive and statistically significant.

- According to my results, there is a long-run relationship, i.e. co-integration between the growth rate of Hungary's constant-price GDP and inward FDI flows. All the diagnostics tests confirm the validity of the model.

- Although, there is a heterogeneity behind the average effect. Dividing the total FDI time series into two components – (i) FDI from countries with lower productivity than Hungary's, and (ii) FDI from countries with higher productivity than Hungary's – heterogeneity was observed. The estimated effect for the FDI from low-productivity countries is 0.008, and the one for the FDI from countries with high productivity is 0.028. All the diagnostics tests confirmed the validity of the model.

The effect of majority foreign acquisition on labor productivity of the acquired firm: Does the country of origin of the acquirer matter – a micro-level analysis

- The literature has evolved spectacularly since its start, although the main, majority message remained. Early papers using cross-sectional data showed the superiority of foreign-owned companies: they are more efficient, more productive, and pay higher wages. Although, the reliability of these papers is questionable, since the limited availability of data and rudimentary econometric techniques. Later, the advances in the quality and quantity of data made it possible for researchers to use advanced econometric techniques, so result became more robust. The majority conclusion is that foreign owners can foster productivity.

- Following the logic of the previous chapter, first I checked the standard hypothesis of the literature, whether foreign acquisition foster labor productivity. I found a positive and statistically signifi-

cant effect, with the estimated coefficient of 0.171.

- Income status of the acquirer's home country is a relevant factor: the variable, which showed the difference in GDP per capita between the acquirer's home country and Hungary, has a positive and statistically significant coefficient of 0.141. That means that the higher the income of the acquirer's home country, the higher the effect of the acquisition.

- Dividing acquirers into two categories, i.e. (i) acquirers from countries which have higher GDP per capita than Hungary, and (ii) acquirers from countries which have lower GDP per capita than Hungary, I found that the acquisition effect is significantly different for the two groups: 0.179 for the first group, and 0.119 for the second one. Moreover, effect of the first group depends positively on the income gap, while the income gap is irrelevant for the second group (the coefficient is insignificant).

- The matching process showed some evidence on selection bias: targets of foreign acquisitions are more productive, pay higher wages, employ more staff, and use more capital-intensive production processes. So, I re-estimated the models using the matched sample. Although, the size of the coefficients changed, but the main results of the full sample remained: there was a positive acquisition effect, which was heterogenous, the higher the income gap, the higher the effect was.

- Testing the robustness of the results I used two definitions of the labor productivity. The main definition was the total net sales per capita, but the main messages remained using the labor productivity defined as value added per capita.

Cyclical behavior of the Hungarian inward foreign direct investment flows

- Considering Hungarian macro-level data evidence on the procyclicality of investment is found. Fur-

thermore, investment is more volatile and less persistent as the GDP.

- Since FDI can be considered as a special form of investment, the null hypothesis of this chapter was that FDI was also procyclical.

- Hungary's inward FDI flows are acyclical both from the host country's and Hungary's point of view. So, inward FDI flows show co-movement neither with the business cycles of Hungary, nor with the business cycles of the host country.

4. Publications in the topic of the thesis by the candidate

Articles in referred journals in Hungarian

- Tőkés, L. (2017): Stilizált tények a magyar üzleti ciklusokról. Statisztikai Szemle 95(3): 230-255.

- Tőkés, L. (2019): A Magyarországra áramló külföldi működőtőke ciklikus viselkedése. Statisztikai Szemle 97(4): 387-408.

- Tőkés, L. (forth.): A külföldi közvetlentőke-beáramlás hatása a magyar gazdasági növekedésre – küldő ország szerinti heterogenitás. Accepted manuscript.

Books and book chapters in Hungarian

- Tőkés, L. (2017): Bevezetés a Stata használatába. Budapest, Magyarország: Akadémiai Kiadó. ISBN: 9789634541134.

Other pieces in Hungarian

- Tőkés, L. (2018): A külföldi működőtőke hatása a vállalati termelékenységre. Számít-e, hogy honnan jön az FDI? Közgazdász Doktoranduszok és Kutatók IV. Téli Konferenciája: Konferenciakötet. Budapest, Magyarország: Doktoranduszok Országos Szövetsége.

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- Tőkés, L. (2018): Relationship between Foreign Direct Investment and Economic Growth – A Critique: The Role of Special Purpose Entities. Empirical Economics Letters 17(12): 1483-1488.

- Tőkés, L. (2019): The Effect of Foreign Direct Investment on Firm Labor Productivity: Does the Country of Origin of the FDI Matter? Society and Economy 41(2): 227-243.

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