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There is evidence in the literature that FDI impact on enterprises' performance across three large sectors, i.e. primary, secondary and services, differs substantially. We suggest that these disparities may be due to two factors. First, the weak inter- and intra-sectoral links may prevent the FDI spillovers. Second, sector entry restraints can limit the foreign technology diffusion.

Using firm-level data covering 80% of population in all three sectors we provide some evidence supporting these hypotheses. In particular, horizontal and vertical spillovers a found to have very different impact on firms by sectors. There is an overall positive horizontal spillover effect which is mostly driven by impact in the manufacturing due to the level of competitiveness of that sector. Vertical spillovers are working in the opposite direction and their influence is pronounced for domestic companies in the service sector and for foreign enterprises in the primary sector. Most importantly, the direct FDI effect is the largest in the most restricted primary sector and falls with time in services where substantial liberalization has been undertaken.

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1. INTRODUCTION

FDI attraction is perceived by most developing countries and countries in transition as an important development mechanism. Such policy is based on the expectation that FDI will positively affect the economy, bring new technologies, open new markets, and improve management and administration. These outcomes are indeed observed by many researches. At the same time, there is an issue that received little attention in this literature. Strength of the linkages between foreign companions and domestic enterprises vary significantly across sectors[1]. So does the return to FDI. Thus, FDI attraction policy should account for the intra- and enter-sectoral linkages.

While horizontal spillovers are often included in FDI studies (Schoors, 2002; Harris, 2002; Ayyagari, 2006; Sasidharan, 2007, Wang, 2008), vertical spillovers are typically overlooked due to the lack of data. However weak linkages between some sector and the rest of the economy can limit spillover effects both from and to this sector. Agriculture can arguably serve as an example here. The production process in these industries is very hard to divide into parts and requires a lot of efforts and capital. Investment here mostly takes the form of large amounts of capital, and foreign investors often consider them as intercompany loans or money export due to restrictions on the ownership for the foreigners (UNSTAD, 2001). Contrary, numerous linkages between the manufacturing and services can reinforce FDI impact in each sector. The development of the secondary sector implies the raise in the demand for services (education, banking, transportation, trade), which in its turn affects the performance of the secondary sector (Chan and Park, 1989). On the other hand the growth of service sector is subject to the expansion of the secondary sector inputs. Hence there are backward and forward linkages between these two sectors. However, the direction of the linkages matters as well: industries in manufacturing sector may depend on the services sector inputs to a greater extent than services sector industries depend on secondary.

This paper empirically investigates the variety of FDI impacts on different sectors using firm level data. In particular, the unique dataset (which represents about 80% of the firms' population) enables us to analyze whether linkages between sectors can explain the difference in the impact of FDI on firm's productivity as well as spillovers across sectors.

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[1] The World Investment Report 2001 (UNCTAD, 2001)

As a post Soviet country, Ukraine provides several grounds for this study. The World Bank classifies Ukraine as a lower middle-income state. This is a country with underdeveloped infrastructure and transportation, corruption and bureaucracy, and a lack of modern-minded professionals despite the large number of universities. At the same time, the rapidly growing Ukrainian economy has a very interesting emerging market, a relatively big population, and large profits associated with the high risks[2]. Level of domestic saving and investment has been rather low. According to the investment council of the Ukrainian National Committee of the International Chamber of Commerce the overall Ukrainian need in investments nowadays is about US$ 80-100 bln[3]. Ukrainian Statistical Committee reports that the total amount of FDI invested into Ukraine in 1991-2009 reached the level of about US$ 38.5 bln. It has been directed to various sectors, including food processing, machinery, construction, metal processing, chemical and petrochemical industries as well as insurance and banking. Therefore, the attraction of the foreign direct investments into Ukrainian economy has been one of the burning issues for a long time. Even though there is an obvious need in FDI for transition and developing countries like Ukraine, it is not clear enough, whether FDI has only a positive effect on all sectors of the economy. Since FDI attraction might be costly for the economy or for a particular sector, it is necessary to evaluate the gains of FDI. Hence, the purpose of this research is to investigate various channels of the FDI impact on productivity in different sectors of the Ukrainian economy and to analyze the disparity of the effect across sectors. We investigate the question at the micro level which was not done so far for all sectors.

The remaining of the paper is organized as follows. In Section 2 the previous works are discussed, Section 3 describes the methodology, Section 4 presents the data; Section 5 discusses empirical results. Finally, Section 6 concludes.

2. LITERATURE

The sectoral impact of FDI became the question of interest in the middle of the 20th century. Hirschman (1958) first studied the influence of FDI across sectors of the economy and concluded that not all of the industries can deal in the same way with the foreign investment inflows and technologies

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[2] http://www.ukrainetradeinvest.com/en/business/economy/?pid=210

[3] http://www.ukrindustrial.com/news/index.php?newsid=170609

and create linkages and spillovers with other sectors. The latter is particularly acute for the primary sector (agriculture and mining). Since then, the empirical studies looking at difference in FDI impact across sectors are relatively scarce due to the data limitations.

Research on the FDI sectoral differences is mostly done either at the country or industry level. Cross-country studies reveal negative relation between growth and FDI in the primary sector and positive in the manufacturing sector. The effect on services is found ambiguous (Alfaro, 2003; Vu and Noy, 2006) or negative (Aykut and Sayek, 2007).

Industry-level studies, though quite fragmented, tend to confirm arguments about possible negative effect of FDI in the primary and positive – in the primary sectors. Mathiyazhogan (2005) associates growth decline in the food-proceeding and industrial machinery in India with FDI inflow, while impact on transportation and metallurgy are positive. Similarly, Khaliq and Noy (2006) found FDI to negatively influence quarrying and mining industries in Indonesia, while overall effect on 12 different industries is positive. Unfortunately, the data didn't contained information about the inflow of FDI into manufacturing sector, so authors were unable to test for the impact of FDI on the secondary (manufacturing) sector.

Hence, cross-country and industry level studies show that the influence of FDI varies across sectors. But neither cross-country nor industry level studies are able to explain the source of the negative effect. We contribute to the literature by investigating deeper this disparity at the firm level. We suggest that the difference in FDI impacts is largely determined by intrasectoral and intersectoral linkages. The extent and the strength of these interactions affect prospects for vertical spillovers caused by FDI inflow into the sector. The importance of FDI vertical spillovers was brought up in earlier studies (for example, Javorcik, 2004; Kugler, 2006; Lutz et. al, 2006; Wang et al., 2008) but it was not linked to the difference in FDI outcomes. Besides, firm-level panel data allows us controlling for unobservable regional and sectoral shocks, which may bias results when using more aggregated data.

Even after we control for intrasectoral and intersectoral linkages the impact of FDI still differ by sectors. We believe that a potential reason explaining this is a sectoral difference in a productivity gap between foreign and domestic companies. In particular, foreign agricultural companies can be significantly more productive than domestic while in manufacturing this difference is much smaller. Of course, with time cross-sectoral differences should converge. But if such sectoral differentials are combined with unequal entry opportunities for foreigners in some sectors, variation in the FDI impact

across sectors will persist. Ukraine is a useful playing field here given its limitations for foreign companies in the primary sector and only recently liberalized rules in services.

There are numerous firm-level studies analyzing the FDI spillovers. However, most researchers restrain their analysis of FDI impact to one sector (Aitken and Harrison, 1999; Konings, 2001; Lutz et al., 2006) and mainly to horizontal spillovers (Haddad and Harrison, 1993; Djankov and Hoekman, 2000; Barrios and Strobl, 2002). Aitken and Harrison (1999) showed that the direct and indirect FDI effects on firms' productivity of Venezuelan manufacturing firms are opposite. So, the overall impact appeared to be quite small, almost negligible. They found no evidence of technology spillover from foreign enterprises on domestic firms. Konings (2001) analyze the FDI influence in Poland, Bulgaria and Romania and found foreign enterprises to be more productive than domestic ones. The author observed no horizontal spillover effect for Bulgaria and Romania and a negative – for Poland. It is not clear what causes the later effect. Lutz and co-authors (2006) explore the industry and region spillover effects of FDI for the Ukrainian enterprises and founds positive influence of investment inflow into the economy. However, due to the lack of data, the authors weren't able to check for direct and indirect effects of FDI effect as well as to capture vertical spillover effects, assuming that the vertical spillovers are of a high importance in the economy, which might lead to bias in the obtained results.

Papers looking at vertical spillover effects (Schoors and Van Der Tol, 2002; Harris, 2002; Ayyagari, 2006; Sasidharan, 2007, Wang, 2008) provide quite limited evidence on cross-industry links which does not allow fully exploring the spillovers across sectors. There is no clear answer concerning the direction of the spillovers as the studies dedicated to that issue have conflicting estimated results. Schoors and Van Der Tol (2002) analyzed the FDI impact on the labor productivity of Hungarian firms. These authors found both the evidence of horizontal and vertical spillover effects on the labor productivity. In addition, while dividing vertical spillovers on forward and backward the effects appeared to be of the opposite sign. Harris and Robinson (2002) while capturing the impact of FDI on the UK manufacturing enterprises came to similar results. So, that there were both negative and positive vertical spillover effects on the firms from other industries. Sasidharan and Ramanathan (2007) concentrate on the Indian manufacturing sector. They show negative vertical spillover effects and no evidence of horizontal spillover. In opposite, Ayyagari and Kosova (2006) while answering the same question obtained that the FDI stimulate the domestic firms enter the economy. Both horizontal and vertical spillover effects had positive influence on the industry's entry. They also found that the vertical effect turned out to be prevalent over the horizontal. Wang and Zhao (2008) also got the positive

horizontal and vertical effects of the foreign capital inflow and pointed out the superiority of vertical spillovers over horizontal. Unfortunately, the data precluded them from distinguishing between forward and backward spillovers.

So, we see that the results obtained in the previous studies are rather diverse and don't provide clear answer concerning the FDI influence on the performance by sectors. Besides, so far there was no micro firm-level study investigating the FDI spillover effects and comparing those sectoral differences. Our data allows us to do that. Regarding the case of Ukraine, there has not been done a relevant research examining the impact of FDI on different sectors of the Ukrainian economy. Hence, we contribute to the literature by looking at the micro data of Ukrainian enterprises in order to analyze difference in the FDI impact on firms' productivity in the primary, manufacturing and service sectors.

3. METHODOLOGY

To evaluate the impact of FDI on the performance of different sectors of the economy we consider the framework similar to the one used by Javorcik (2004), Sasidharan and Ramanathan (2007). First, we estimate the total impact of FDI on the firms' performance separately for each sector and after that analyze intrasectoral and intersectoral linkages between firms.

We assume the usual Cobb-Douglas production function in the log form, which will be estimated separately for each sector k::

$$\log Y_{ijkt} = \alpha_k + \beta_{1k} \log L_{ijkt} + \beta_{2k} \log K_{ijkt} + \beta_{2k} \log M_{ijkt} + A_{ijkt} + \varepsilon_{ijkt}, \tag{3}$$

where

Y_{ijkt} – output of firm i in the industry j of sector k at time t;

K_{ijkt}, L_{ijkt}, M_{ijkt} – capital, labor, material inputs of firm i in the industry j of sector k at time t;

A_{ijkt} – production efficiency of the firm i in the industry j of sector k at time t.

Production efficiency is approximated as follows

$$A_{ijkt} = \gamma FDI50_{ijkt} + \phi FSH_{jkt} + \theta FWD_{jkt} + \nu HI_{jkt} + \pi BWD_{jkt} + \eta S_{jkt} + \lambda T_{kt} + \delta R_{ik} \tag{4}$$

where

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FSH_{jkt} – a measure of the horizontal (intrasectoral) spillover, estimated as a share of foreign firms' output in the sector j;

FWD_{jkt} and BWD_{jkt} – measures of backward and forward vertical (intersectoral) spillovers;

HI_{jkt} – Herfindahl concentration index for industry j;

$FDI50_{ijkt}$ – firm's ownership indicator, 1 if majority foreign-owned;

S_{jkt}, T_{kt}, R_{ik} – industry, time and territory indicators.

In this paper output (Y) is represented as total sales deflated by the industry specific producer price index. The capital (K) is the value of fixed assets the enterprise possesses deflated by the producer price index; labor (L) is taken as the number of full- and part-time employees, materials (M) is presented by the cost of raw materials used by the enterprise during the production process. Share of the foreign capital in the firm's total fixed assets (FDI) is taken as a ratio between the foreign fixed assets and the total fixed assets of the company. And firm is defined as foreign ($FDI50$) if the share (FDI) is more or equal to 50%. The horizontal (FSH_{jkt}) and vertical (FWD_{jkt} and BWD_{jkt}) spillovers are capturing the intrasectoral and intersectoral linkages. Following Sasidharan and Ramanathan (2007) the horizontal spillover effect FSH_{jkt} is measured as a share of the output produced by the foreign firms in the industry j to the total output in the industry j. Vertical spillovers are divided into forward FWD_{jkt} and backward BWD_{jkt}, where for each sector k:

$$BWD_{jkt} = \sum_{b, b \neq j} \rho_{jkb} FSH_{bkt}$$, where ρ_{jkb} is share of industry's j input purchased from industry b;

$$FWD_{jkt} = \sum_{f, f \neq j} \rho_{jkf} FSH_{fkt}$$, where ρ_{jkf} is the share of industry's j output supplied to industry f (5)

ρ_{jkb} and ρ_{jkf} were calculated using the input-output tables for 2001-2007. Positive effect of vertical spillovers suggests that operation in the industry which actively interacts with foreign-dominant industries improves firm's productivity while negative effect implies lower productivity for such firms. The latter may be due to high cost of finding and establishing relationship with partners requiring high-quality inputs (forward effect) or partners supplying high-quality and thus more expensive inputs into firm's production (backward interactions).

Herfindahl index (HI_{jkt}) is calculated using shares of each individual firm's i output in the industry's j output. In order to control for other factors that may influence firm's performance we

include industry, territory and time indicators. To avoid omitted variable bias we rely on the fixed effect panel estimator. This method allows us to control for unobserved factors of each firm, in particular such as administration methods, managerial skills, which might both influence firm's productivity and correlate with FDI which leads to the omitted variable bias if not treated properly.

Additionally, we might face a problem of endogeneity here as FDI flows may affect the firm's performance, while the raising productivity, on the other hand, may stimulate FDI inflows. The most appropriate instruments, used in the literature in order to get rid of that problem and influence just the amount of FDI are lagged values of FDI inflows and profit margin of the firm. Unfortunately, according to the available data set the only possible instrument, used in this study, is the lagged value of the FDI. However, while testing for endogeneity with this instrument after running the Davidson and MacKinnon test lagged value of FDI appeared to be a weak instrument. Hence, we cannot strongly rely on it. Therefore, we should retain that there's a possibility of potential endogeneity while analyzing the results.

4. DATA

This study is using the unbalanced panel data from the mandatory annual firm's reports (forms 10-zez [report about the foreign investments inflow into Ukraine], firm's balance sheets and financial results), collected by the Ukrainian Statistics Committee. The data covers the period over 2001-2007 and includes the information about the industries and firm's performance. It contains the information about the employment, fixed capital, sales, and FDI inflows. Every firm is allocated to some specific 2-digit industry. All the industries are aggregated into 3 main sectors, primary, secondary and services. The data consists of 16 industries, since we excluded industries with small number of firms. Besides, firms with the number of employees less than 10 and with the missing information were removed from the dataset. All the nominal data was deflated using the industries price indices.

Table 1 shows that firms mainly operate in the services sector. Their share in the total number of enterprises slightly increased in the time period from 2001 to 2007 and is about 53% of the entire population of Ukrainian firms. Concerning the firms from the secondary sector, their share is about 35% and hasn't changed much. Regarding the primary sector, we observe a decrease of the sector's

share from 18% to 12%. While looking at foreign firms in particular, the picture doesn't change a lot through years. There are relatively more foreigners in services (60%) and relatively less in primary sector (5%). We also observe that in the primary sector the share of foreign firms has slightly grown throughout 2001-2007, while in the secondary sector it decreased contrary to the general tendency for these sectors. This implies that overall in 2001-2007 firms reallocated from primary sector to services, while foreign enterprises – from secondary sector to services.

[Table 1]

Even though firms from the service sector are dominant in term of number, on average they are smaller in size than the enterprises from the primary and secondary sector (see Table 2). Nevertheless, the service sector still contributes more to the total output, FDI attraction, and employment compared to the manufacturing and primary sectors. Table 2 also demonstrates that the foreigh firms are larger, employ more workers and use more (or more expensive) capital and materials in all sectors. That means that the foreign investors are more likely to invest money into large firms. However, we can see that the difference in average employment between foreign and domestic firms is not as much as the difference in gross income, fixed assets and material costs. Hence, labor productivity in foreign enterprises seems to be higher than in domestic.

[Table 2]

5. RESULTS

5.1 Direct effect of FDI

First, we estimated the direct impact of FDI on the firm's performance using pooled OLS, random and fixed effect models using all observations (unbalanced sample) and only firms operating during the entire period (balanced sample). There are quite high entrance-entry rates. The balanced panel makes about 40% of the whole dataset which raises concerns about potential impact of entrants and exiters on the estimates. Fortunately, as Table A.3 reveals the results for balanced and unbalanced panel are similar. Therefore, later on all the estimations are made using the unbalanced panel dataset, as it describes the behavior of the entire population.

As we can see from the Table 3 below, the log of total income was regressed on the vector of main inputs, namely capital, labor inputs as well as material costs. The basic specification also includes

the ownership variable (FDI50) and Herfindahl index as a proxy for the industry concentration. Time, industry and territory dummies were also included into the regression. We can see that all the coefficients near the main inputs have the expected positive sign and are significant and in concordance with previous works. The Herfindahl index, it's negative and significant. Hence, the latter results imply that as more competitive Ukrainian economy is so more productive it is. Thus, we can state that the foreign enterprises on average perform better than domestic ones. It is interesting to note that OLS estimates are almost 7 times larger than those by fixed effect. This fact suggests that firm's unobservables are strongly positively correlated with ownership.

[Table 3]

The returns to different inputs are likely to vary across sectors due to the differences in technologies and ways of production. Hence, Table 4 below presents results for each sector separately. We can see that the results are pretty much consistent with the results obtained for the entire economy. The variable FDI50, which indicates that the enterprise is foreign-owned, is positive and significant. That coincides with the previous works (Schoors and Van Der Tol, 2002; Konings, 2001) according to which enterprises with the foreign capital perform better in cases of Hungary, Poland, Romania and Bulgaria. However, as for the services sector in contrast to the literature[4] foreign ownership has a significant positive effect on the firms' performance. Moreover, positive direct FDI effect in the primary sector is three times larger than in the manufacturing, while latter is quite comparable to the estimate for in the service sector. The possible explanation for this might be connected with the importance of competitiveness. As it can be seen the Herfindahl Index is negative and significant in the secondary and services sectors assuming that these enterprises are more likely to follow the latest methods of administration and production to stay competitive than those from the primary sector. As stated above, particularities of production process in the primary sector stimulate FDI inflow in a form of a large volume of capital. Consequently, financially restrained local producers are unable to compete with foreigners. This situation allows foreign companies in the primary sector earn a large premium due to a difference in productivity.

[Table 4]

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[4] It is interesting that in the balanced sample the effect is not significant which is similar to results in the literature. Thus, limiting the sample to only incumbant firms reduces the positive impact of foreign ownership in this sector.

5.2 Horizontal and vertical spillovers

We proceed with the analysis of spillover effects and include horizontal and vertical spillovers into the regression. The results presented in the Table 5 below provide evidence of a strong positive horizontal spillover effect (FSH) of foreign investments inflow for the entire economy and for the local enterprises in particular, which is similar to findings of some previous studies (Javorcik and Spatareanu, 2006; Schoors and Van Der Tol, 2002). The probable explanation for such results is the potential demonstration effect of the foreign presence in the sector. First, it is possible that due to the foreign firm's appearance in the market stimulate domestic firms to restructure in order to be compatible, thus such industries become more productive. Second, the local enterprises may try to copy the methods of administration and obtain new technologies in order to reach the level of production similar to foreign players in the market. Concerning the backward and forward linkages, we can observe that there is no evidence of backward spillover effect for the economy. At the same time, forward spillover is positive and significant for foreign firms and the economy in general. The positive sign of the coefficient near the forward spillover may suggest that foreign firms tend to provide training and technical support to their business partners in the downstream industries. This way such partners becomes more productive compared to their fellow firms trading with industries that are less influenced by foreign companies. Assuming that firms with the international capital are able to adapt faster than the domestic ones because they have access to a better technology, thus they benefit more than domestic firms from the backward spillovers and improve the performance of the entire economy. Hence such actions increase the internal demand for the products of foreign producers and, since, their gap in productivity and performance of foreign and local enterprises decreases. Regarding the size of the effects, we observe that the coefficients for the forward spillover effects are larger in comparison to the horizontal spillover. Hence, the intersectoral effect of FDI on the performance of the enterprises is higher than the intrasectoral one.

[Table 5]

In order to see the role spillover effects play in each sector, we analyse them separately. Table 6 shows the results for the sectors and in Table 7 the influence is distinguished between foreign and domestic firms within each sector.

[Table 6]

In the Table 6 we observe that for each sector results are partly coinciding with those for the entire economy, but influence of FDI across sectors differs significantly. First of all, the horizontal spillover effect is positive only in the secondary sector, which might be the evidence of importance of competition as a productivity driver in that sector. As, in order not to be crowded out from the market the local producers have to improve the efficiency of their work through the new technologies, methods of managements personnel trainings etc. Horizontal spillovers in the primary and services sectors appear to be insignificant.

Second, in terms of vertical spillovers, no backward effect is found in primary and secondary sectors similarly to the entire economy. However, while looking at the services sector, the backward effect appears to be negative. Thus, the presence of the foreign investors in the downstream industry negatively affects the performance of the services sector. This may imply that foreign producers prefer services of other foreign companies, which decreases the productivity of the domestic service sector.

Finally, a positive forward spillovers effect, found for the entire economy, is mainly driven by the results in the services sector. This is the only sector able to benefit from foreign capital presence in the upstream industry in order to meet the required standards and improve performance.

It is notable, that after controlling for the spillover effects we observe that the direct effect of FDI stays almost the same in all three sectors. That supports the previous findings (Barrios and Strobl, 2002; Schoors and Van Der Tol, 2002) suggesting that the foreign enterprises perform better than domestic ones due to special knowledge or technologies they have.

[Table 7]

While comparing the results for domestic and foreign firms in Table 7, we see again that the horizontal effect is positive only in the secondary sector, both for domestic and foreign companies. Thus, competition seems to play a very important role in that sector, which is proven by a strong negative sign of the coefficient near the Herfindahl Index.

The vertical spillover effects vary by sectors. In the secondary sector we found positive backward effect for domestic companies only. This implies that local firms in that sector are able to benefit from the presence of foreign companies in the input market.

In the services sectors vertical spillover effects are also found only for domestic companies. But here backward spillovers are negative while forward spillovers have a positive effect. This implies that presence of foreign companies in the input market has negative impact on the productivity of

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local producers. Local producers are unable to benefit from foreign input suppliers; they bear higher expenses, which decrease their productivity. On the other hand the appearance of foreign-owned upstream partners positively affects the firms' performance in the services sector, for example through training.

In the primary sector the impact of the vertical spillovers is found to be strong as well. The direction is similar to the one found in the service sector, but here only foreign firms are affected. Specifically, the backward spillovers are negative while forward effects are opposite.

So, why even after we include vertical spillover variables, the return to foreign ownership is still so different in the primary sector? We suggest that this outcome may relate to the significant restrictions for foreigners exist in Ukraine in that sector. In particular, according to the land trade moratorium, foreigners aren't allowed to buy land from the local land owners and the only available option for them is a lease or a sublease. This legal limitation decreases foreigners' interest to invest into the land quality, since in a case of a sudden moratorium cancellation all capital expenditures by leases will be lost. The situation reduces both the FDI inflow into the sector and the capital expenditures of the enterprises with the foreign capital which are already operating in this market. Lack of the pressure from more productive foreign companies preserves the productivity gap in the sector and guarantee higher productivity premium to those foreigners that managed to enter the market.

While we are unable to test this hypothesis directly, some supporting evidences can be provided. In the last decade EBRD documented substantial liberalization in the service sector. Under the pressure of WTO accession, Ukraine has considerably improved the market access and noticeably reduced the barriers to entry in banking, insurance, telecommunications, and public infrastructure sub-sectors[5]. For example, the laws on insurance and on telecommunication (both in 2003) declared principles of equal access and fair competition, specified detailed procedures for frequency auctions and rules for licensing (including foreigners). In 2006 the amendments to the law on banking simplified the entrance procedure for domestic banks and subsidiaries, clearly specified the procedure for foreign banks willing to buy unrestricted number of shares of Ukrainian domestic bank. Even more it allowed opening branches of foreign banks after the WTO accession (took place in 2008).

Table 8 contracts the returns to foreign ownership during more restricted period of 2001-2004 to the effect in more liberalized 2005-2007 years. Our particular focus is on services, where market has been substantially liberalized in term of foreign owners' participation, as described above. We observe

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[5] EBRD Transition reports 2005-2009.

that in the first period foreign firms in services are 8% more productive than domestic while in the second period the return is 4%. The former number is above the 4.5% return in manufacturing where restrictions for foreigners have been removed long ago but still lower than 18% in the most restricted primary sector. The estimated direct effect of FDI in services in the second period converges to the number for manufacturing. No cross-period variation in the return to foreign ownership is found in other two sectors. The latter result is consistent with no liberalization in the primary sector during the entire period and high level of liberalization in manufacturing achieved earlier.
[Table 8]

6. CONCLUSION

This paper investigates the influence of FDI on enterprises' performance across three large sectors (primary, secondary and services). The main question of interest was whether the foreign direct investments positively affect all three sectors of the Ukrainian economy. Large Ukrainian firm-level dataset for 2001-2007 was used to investigate that question. All the enterprises were divided into three abovementioned main sectors. In order to estimate the role FDI play in the sectors, direct effects as well as inter- and intra-sectoral spillovers using input-output matrix are examined.

Regarding the direct effect of FDI, the findings are in line with the previous studies and show that firms with the foreign capital perform better than the domestic in all three sectors of the economy. These results also hold after we add spillovers controls. Interestingly, that direct effect in the primary sector is three times larger. This result is consistent with our first hypothesis. We assumed that productivity gap between domestic and foreign firms in the primary sector is much larger than in manufacturing. When such gap differentials are combined with unequal entry opportunities for foreigners in different sectors, differences in the FDI impact across sectors persist. Ukraine is a useful playing field here given its limitations for foreign companies in the primary sector and only recently liberalized rules in services. We provide some evidence supporting this hypothesis. In particular, the direct FDI effect in services is the largest in the most restricted primary sector and falls with time in services where substantial liberalization has been undertaken.

Concerning the effects of spillovers themselves, the results vary by sectors. In the secondary sector, the horizontal spillover effects play positive role while forward and backward spillover effects appear to be insignificant. The results obtained for the manufacturing sector are partly consistent with

the literature (Javorcik and Spatareanu, 2006; Schoors and Van Der Tol, 2002). It is important that both domestic and foreign companies are able to benefit from horizontal spillovers, though foreigners do much more.

Primary sector shows insignificant horizontal spillovers which implies that domestic firms are not able to absorb the superior technology of foreign companies. Moreover, vertical spillover effects are not found either, which reveals weak linkages between this sector and the rest of the economy. At the same time, foreign firms operating in this sector experience negative backward and positive forward effect. We connect this interesting phenomenon to the internal institutional particularities. While the gap between foreign and domestic firms in the primary sector is large, the foreign entries are more restricted, especially in agriculture.

Similar to the primary sector we found no evidence of horizontal spillover effect in services. At the same time, forward spillovers positively influence firms' productivity while backward spillovers have a negative impact.

Thus, the main upshots of the paper are:

1. Foreign enterprises do perform better than the domestic ones in the Ukrainian economy, especially in the primary sector.
2. The overall positive horizontal spillover effect on the economy's performance was found, which is mostly driven by impact in the manufacturing due to the level of competitiveness of that sector.
3. Vertical spillovers are working in the opposite direction and their influence is pronounced for domestic companies in the service sector and for foreign enterprises in the primary sector.

As for the possible policy implications, the obtained results suggest two probable ways of FDI attraction. The first one is to stimulate inflow into the upstream industries, since the attraction of foreign capital in the upstream industries positively affects the downstream industries. Second, we saw that the horizontal spillover is always positive in case of the secondary sector, since the purposeful attraction of FDI into that sector will improve the overall sectoral performance.

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Table 1. Number of firms by sectors and years

		2001	2002	2003	2004	2005	2006	2007
Primary	Foreign	71	96	112	130	153	167	196
	All	15724	15262	14265	13371	12383	11284	10046
	% to all foreign	4.08	5.01	5.17	5.25	5.61	5.53	5.3
	% to all	18.66	17.65	16.32	15.30	14.41	13.33	11.93
Secondary	Foreign	735	832	932	1034	1117	1166	1289
	All	29563	30034	30603	30698	30294	29722	29544
	% to all foreign	42.24	43.42	42.99	41.76	40.93	38.61	34.86
	% to all	35.08	34.73	35	35.13	35.25	35.11	35.08
Services	Foreign	934	988	1124	1312	1459	1687	2213
	All	38996	41191	42558	43304	43256	43661	44633
	% to all foreign	53.68	51.57	51.85	52.99	53.46	55.86	59.84
	% to all	46.27	47.63	48.68	49.56	50.34	51.57	52.99

Table 2. Descriptive statistics by sectors and ownership

	Primary		Secondary		Services	
	Foreign	Domestic	Foreign	Domestic	Foreign	Domestic
Gross Income	22.857	4.264	46.424	9.665	59.073	10.872
	[1095.33]	[1115.00]	[2589.55]	[1489.00]	[4789.44]	[2237.04]
Employment	24.598	14.572	28.214	11.662	10.313	7.139
	[868.25]	[6653.96]	[1460.07]	[702.20]	[414.94]	[1154.50]
Fixed assets	10.367	3.76	12.793	3.587	9.966	4.333
	[434.27]	[435.75]	[528.29]	[679.31]	[912.01]	[715.97]
Material costs	10.748	1.818	22.923	4.523	4.988	0.912
	[629.22]	[291.86]	[1459.89]	[628.37]	[591.17]	[318.97]

Note: gross income, fixed assets and material costs are presented in millions of UAH, employment is described by the number of employees. Standard deviations are in brackets.

Table 3. Direct impact of FDI on the firms' performance

	OLS unbalanced	OLS balanced	FE unbalanced	FE balanced	RE unbalanced	RE balanced
	1	2	3	4	5	6
lnK	0.0216***	0.0137***	0.0723***	0.0613***	0.0559***	0.0558***
	(0.000884)	(0.00141)	(0.00149)	(0.00209)	(0.00178)	(0.00111)
lnM	0.406***	0.465***	0.291***	0.321***	0.341***	0.310***
	(0.00125)	(0.00203)	(0.00177)	(0.00277)	(0.00240)	(0.00138)
lnL	0.595***	0.542***	0.597***	0.543***	0.556***	0.598***
	(0.00208)	(0.00313)	(0.00375)	(0.00517)	(0.00409)	(0.00269)
HI	-0.136***	-0.0268	-0.0926***	-0.0467*	-0.0238	-0.0869***
	(0.0311)	(0.0495)	(0.0179)	(0.0241)	(0.0248)	(0.0170)
FDI50	0.426***	0.483***	0.0696***	0.0533***	0.204***	0.216***
	(0.00959)	(0.0123)	(0.0165)	(0.0191)	(0.0162)	(0.0125)
year 2002	0.0825***	0.0455***	0.00463*	0.0429***	0.0445***	0.0248***
	(0.00485)	(0.00671)	(0.00277)	(0.00360)	(0.00370)	(0.00267)
year 2003	0.173***	0.0906***	0.0370***	0.0929***	0.0950***	0.0682***
	(0.00487)	(0.00664)	(0.00288)	(0.00345)	(0.00360)	(0.00275)
year 2004	0.315***	0.155***	0.116***	0.163***	0.166***	0.160***
	(0.00488)	(0.00658)	(0.00294)	(0.00340)	(0.00352)	(0.00277)
year 2005	0.394***	0.189***	0.148***	0.195***	0.199***	0.201***
	(0.00487)	(0.00653)	(0.00301)	(0.00346)	(0.00354)	(0.00280)
year 2006	0.473***	0.226***	0.195***	0.238***	0.242***	0.255***
	(0.00503)	(0.00674)	(0.00317)	(0.00373)	(0.00375)	(0.00294)
year 2007	0.567***	0.284***	0.253***	0.269***	0.279***	0.325***
	(0.00503)	(0.00663)	(0.00341)	(0.00410)	(0.00403)	(0.00311)
Industry indicator	Yes	Yes	Yes	Yes	Yes	Yes
Territory indicator	Yes	Yes	Yes	Yes	Yes	Yes
Constant	1.282***	1.343***	2.794***	2.739***	1.987***	1.922***
	(0.00938)	(0.0129)	(0.211)	(0.358)	(0.0284)	(0.0184)
Obs	600392	238819	600392	238819	238819	600392
R-sq	0.708	0.777	0.436	0.463		

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 4. Direct impact of FDI on firms' performance by sector

COEFFICIENT	Primary 1	Secondary 2	Services 3
lnK	0.0851***	0.0601***	0.0700***
	(0.00355)	(0.00228)	(0.00215)
lnM	0.472***	0.447***	0.168***
	(0.00614)	(0.00337)	(0.00210)
lnL	0.376***	0.504***	0.711***
	(0.00791)	(0.00636)	(0.00624)
HI	-0.0645	-3.231***	-0.162***
	(0.262)	(0.569)	(0.0186)
FDI50	0.190***	0.0606***	0.0549**
	(0.0677)	(0.0211)	(0.0250)
year 2002	0.0134***	0.0122***	-0.00513
	(0.00465)	(0.00416)	(0.00448)
year 2003	-0.0417***	0.0611***	0.0616***
	(0.00540)	(0.00428)	(0.00460)
year 2004	0.121***	0.0907***	0.133***
	(0.00584)	(0.00434)	(0.00468)
year 2005	0.159***	0.0966***	0.178***
	(0.00639)	(0.00440)	(0.00475)
year 2006	0.224***	0.145***	0.219***
	(0.0167)	(0.00476)	(0.00497)
year 2007	0.250***	0.170***	0.310***
	(0.00820)	(0.00489)	(0.00535)
Industry indicator	Yes	Yes	Yes
Territory indicator	Yes	Yes	Yes
Constant	1.159***	3.562***	3.193***
	(0.384)	(0.717)	(0.370)
Observations	92335	210458	297599
R-squared	0.588	0.588	0.336

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table 5. The spillover effect of FDI by ownership for the entire economy

COEFFICIENT	Entire economy	Home all	Foreign all
	1	2	3
lnK	0.0722***	0.0706***	0.131***
	(0.00149)	(0.00149)	(0.0145)
lnM	0.291***	0.292***	0.248***
	(0.00177)	(0.00179)	(0.0112)
lnL	0.597***	0.594***	0.683***
	(0.00375)	(0.00379)	(0.0259)
HI	-0.0660***	-0.0743***	0.171
	(0.0185)	(0.0187)	(0.152)
FDI50	0.0692***		
	(0.0165)		
FSH	0.135***	0.127***	0.158
	(0.0212)	(0.0212)	(0.219)
BWD	-0.164	-0.0665	-1.839
	(0.393)	(0.398)	(3.329)
FWD	0.948*	0.811	5.563*
	(0.532)	(0.544)	(2.876)
Time indicator	Yes	Yes	Yes
Industry indicator	Yes	Yes	Yes
Territory indicator	Yes	Yes	Yes
Constant	2.728***	2.701***	2.263***
	(0.215)	(0.233)	(0.580)
Observations	600392	582645	17747
R-squared	0.436	0.436	0.440

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 6. The spillover effect of FDI by sector

COEFFICIENT	Primary all	Secondary all	Services all
	1	2	3
lnK	0.0851***	0.0571***	0.0700***
	(0.00355)	(0.00228)	(0.00215)
lnM	0.472***	0.446***	0.168***
	(0.00614)	(0.00337)	(0.00210)
lnL	0.376***	0.508***	0.711***
	(0.00791)	(0.00635)	(0.00624)
HI	-0.106	-5.723***	-0.167***
	(0.266)	(0.581)	(0.0194)
FDI50	0.190***	0.0553***	0.0548**
	(0.0677)	(0.0211)	(0.0250)
FSH	0.0741	1.727***	-0.0320
	(0.129)	(0.0774)	(0.0259)
BWD	0.793	1.459	-1.233**
	(0.720)	(0.961)	(0.506)
FWD	1.117	0.122	1.374**
	(1.076)	(1.361)	(0.628)
Time indicator	Yes	Yes	Yes
Industry indicator	Yes	Yes	Yes
Territory indicator	Yes	Yes	Yes
Constant	1.010***	3.226***	3.176***
	(0.384)	(0.730)	(0.372)
Observations	92335	210458	297599
R-squared	0.588	0.589	0.336

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 7. The spillover effect of FDI by sector and ownership

COEFFICIENT	Primary home	Primary foreign	Secondary home	Secondary foreign	Services home	Services foreign
	1	2	3	4	5	6
lnK	0.0832***	0.222***	0.0575***	0.0468**	0.0682***	0.132***
	(0.00351)	(0.0549)	(0.00229)	(0.0186)	(0.00215)	(0.0203)
lnM	0.470***	0.508***	0.447***	0.390***	0.169***	0.154***
	(0.00612)	(0.0755)	(0.00341)	(0.0214)	(0.00212)	(0.0138)
lnL	0.376***	0.419***	0.505***	0.653***	0.709***	0.705***
	(0.00793)	(0.0898)	(0.00639)	(0.0421)	(0.00634)	(0.0377)
HI	-0.347	4.932*	-5.680***	-3.774	-0.172***	-0.0127
	(0.247)	(2.886)	(0.588)	(4.979)	(0.0195)	(0.158)
FSH	0.0173	0.921	1.681***	3.495**	-0.0354	-0.0935
	(0.129)	(1.006)	(0.0779)	(1.387)	(0.0258)	(0.248)
BWD	0.957	-24.62**	1.784*	-3.853	-1.162**	-1.810
	(0.733)	(12.43)	(0.969)	(3.129)	(0.512)	(4.582)
FWD	0.771	11.74**	0.0789	-3.783	1.234**	8.249
	(1.157)	(5.531)	(1.387)	(5.109)	(0.621)	(6.645)
Time indicator	Yes	Yes	Yes	Yes	Yes	Yes
Industry indicator	Yes	Yes	Yes	Yes	Yes	Yes
Territory indicator	Yes	Yes	Yes	Yes	Yes	Yes
Constant	0.944**	1.111	2.933***	1.508***	3.186***	2.295***
	(0.380)	(0.787)	(0.670)	(0.490)	(0.386)	(0.757)
Observations	91410	925	203353	7105	287882	9717
R-squared	0.589	0.509	0.588	0.606	0.335	0.338

Robust standard errors in parentheses, *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8. The spillover effect of FDI by sector before and after 2004

COEFFICIENT	Primary all	Secondary all	Services all
	1	2	3
lnK	0.0851***	0.0571***	0.0699***
	(0.00355)	(0.00228)	(0.00215)
lnM	0.472***	0.446***	0.168***
	(0.00615)	(0.00337)	(0.00210)
lnL	0.376***	0.508***	0.711***
	(0.00792)	(0.00635)	(0.00626)
HI	-0.105	-5.688***	-0.168***
	(0.266)	(0.581)	(0.0194)
FDI50	0.182**	0.0450**	0.0811***
	(0.0755)	(0.0224)	(0.0275)
FDI50_after2004	0.0127	0.0186	-0.0406**
	(0.0632)	(0.0147)	(0.0186)
FSH	0.0736	1.716***	-0.0323
	(0.129)	(0.0777)	(0.0259)
BWD	0.791	1.457	-1.227**
	(0.720)	(0.961)	(0.506)
FWD	1.124	0.128	1.371**
	(1.078)	(1.361)	(0.627)
Time indicator	1.010***	3.231***	3.172***
Industry indicator	(0.383)	(0.730)	(0.372)
Territory indicator	92335	210458	297599
Constant	0.588	0.589	0.336
	23282	58727	87780
Observations	0.0851***	0.0571***	0.0699***
R-squared	(0.00355)	(0.00228)	(0.00215)

Robust standard errors in parentheses, *** p<0.01, ** p<0.05, * p<0.1