Chapter

# Foreign Direct Investment and Productivity Spillover: A Firm-Level Analysis of MENA Region

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## Abstract

In an increasingly globalized economy, foreign direct investment (FDI) has become a key factor influencing the productivity of companies. In this research, we analyzed the effects of foreign direct investment on company productivity within the context of the Middle East and North Africa (MENA) region. We built our analysis on a panel of MENA manufacturing enterprises from a World Bank enterprise survey (WBES) conducted between 2013 and 2020. It was observed that vertical spillover exert a beneficial influence on MENA business output, whereas horizontal spillover negatively impact productivity. We evaluated certain academic ideas that ascribed this detrimental impact to local enterprises' low technology absorption ability and skilled labor shortages. According to our estimates, the spillover effect gets more significant as the business approaches the efficiency curve and becomes positive when its adaptability exceeds a particular threshold.

**Keywords:** foreign direct investment, horizontal spillover, vertical spillover, technology absorption, MENA region

## 1. Introduction

The role of trade and foreign direct investment (FDI) in improving the performance and technology transfer of domestic firms has prompted many countries, especially the developing ones, to enhance their attractiveness and adopt numerous fiscal and financial incentives [1–3].

One of the fundamental aspects of the presence of foreign firms (FF) in developing countries is the transfer of technology. Indeed, technology[1] would diffuse to local firms through positive externalities (or 'spillover') according to the terminology of Blomström [5]. In concrete terms, this spillover would operate through commercial relations with local producers, the rotation of qualified personnel, or the reduction of

[1] It encompasses all forms of 'tacit knowledge' related to production, including management and organizational practices [4].

productive inefficiencies through competition. In fact, the presence of technology spillover is confirmed by the positive correlation between FDI and productivity indicators, established by cross-sectional studies [6–9], which suggest that the presence of FFs generates an improvement in productive efficiency.

In addition, and apart from the interactions between FDI and productivity indicators, it seems useful to also analyze the factors (human capital, learning, role of institutions, and openness) that condition the impact of FDI on national technological performance and that illustrate the prerequisites for technology transfer. In general, spillover occur when the FF cannot extract the full rent or internalize the beneficial effects of its presence in the host country [10]. Indeed, the technology and productivity of host firms improve when FFs enter the market and bring in new technologies, providing technical assistance to their local partners and training workers and managers who will later be get hired by local firms. Similarly, competitive pressure from foreign affiliates forces local firms to operate more efficiently and to introduce new technologies into their production processes. These positive externalities are often referred to as "productivity spillover" [10].

Blomström and Kokko [10] distinguish between two external effects generated by FDI on the productivity of local firms, horizontal externalities and vertical externalities, which is illustrated in **Figure 1A**.

Horizontal externalities concern the intra-sectoral effects of the presence of FFs on the efficiency of local firms. The latter have the incentive to adopt (or imitate) more efficient production or management methods [11, 12] and to hire qualified personnel to maintain their competitive advantage (knowledge transfer effect). However, the arrival of FFs also tends to increase industry concentration, which may impede competition and hence the advantages to local businesses' productivity [13].

Vertical externalities, on the other hand, concern the spillover effects on local suppliers and customers who are linked to the FF. The first type, concerning the supply of inputs, describes upstream linkage effects: these are actions whereby the increase in production of the FF translates into an increase in demand addressed to local suppliers, thus generating additional production [14]. In addition, FFs can provide technical assistance, training, and after-sales service to their local suppliers, which can improve the quality of their products [15]. The second, which considers the use of outputs, concerns downstream linkage effects: these are the actions that occur whenever the FF decreases the selling price of its outputs (or when its prices vary according to a trend lower than that of the general price level), or when it improves the quality of its products [16]. Consequently, through its technical progress, the FF is likely to increase the productivity of its local customers by enabling them to maintain their level of production with less costly inputs or with fewer production factors [17].

The empirical literature on the spillover effects of FFs is very extensive. However, the cases of application are often limited to so-called advanced or transition countries [14, 18–21], and only a very limited number of such works address the cases of developing countries [22–24], let alone the MENA (Middle East and North Africa) countries. This lack of interest in this subject in the latter countries could be explained by obstacles related to the availability of statistical information and its reliability. In the following, we will present some studies on MENA countries.

Bouoiyour and Toufik [25] analyzed the impact of FDI on the productivity of local firms in eighteen sectors of the Moroccan manufacturing industry over the period 1987–1996. The results show that trade openness and FDI can had a positive and

significant impact on the productivity of Moroccan firms when accompanied by the development of a skilled labor force. FDI has spillover effects in the low-tech sectors by improving productivity but has no effect in the high-tech sectors. In fact, as in many developing countries, when FDI takes place in the high-tech sectors, it appears rather like cathedrals in the desert that do not produce technological and managerial transfers and do not have a knock-on effect on the local productive fabric. Bouoiyour and Toufik [25] reiterate a result that has been put forward in other works, according to which technological externalities depend on general characteristics specific to the host country, namely, its history or culture, its human capital, its technological capacity, its institutions, and so on. Therefore, one should not expect miracles following the entry of many FDIs if the internal changes remain marginal. The authors insist, in fact, on the fact that a country like Morocco can benefit from the technological externalities that its policy of openness favors in terms of foreign capital if it develops human capital. But developing human capital requires profound institutional reforms at the various levels of training and education. However, caution should be exercised in interpreting these results due to the high level of aggregation of the data. Indeed, the empirical results of the study by [25] were established based on sector-level regressions, which give more weight to large firms and do not capture their heterogeneity within each sector.

Thus, the availability of firm-level data has revived the debate. The new regressions carried out at the microeconomic level in the study by [26] tend to show that the productive efficiency of Tunisian firms is negatively correlated with foreign presence (the horizontal effect). Some authors attribute this negative effect to the low technological absorption capacity of local firms. Baccouche et al. [26] sought to test this hypothesis. According to their estimates, the spillover effect becomes more and more important as the firm approaches the efficiency curve and becomes positive when its capacity to adapt exceeds a certain threshold. This result implies that foreign presence in a sector can be beneficial for firms with high absorptive capacities.

Considering the findings of this brief literature review, vertical spillover are still very marginal and not well demonstrated in the empirical literature. In this context contribution, this article attempts to shed additional light on the existing literature by investigating whether horizontal and vertical spillover of FDI are positively related to the productivity of local firms. The field of application is broadened compared to previous studies and includes several countries in the MENA region. The choice of these countries is explained not only by their geographical proximity and stage of development but also by the origin of the foreign partners that have invested in them.

In addition, the original idea of this study is to find out whether the countries of the MENA region are a special case or whether they behave like all the countries in the other samples. The stakes are high for MENA countries, which have considerable potential (natural and human resources) but are unable to attract sufficient foreign investment.

However, each country has its own structural specificities and has followed a particular development model. Our analysis will be carried out based on a panel of firms covering the period 2013–2020 derived from the World Bank's enterprise surveys (WBES). To the best of our knowledge, the problem of FDI and its spillover effects in the MENA region has never been addressed in the framework of microeconomic panel data with such detailed data.

The rest of the paper will be organized as follows: A brief presentation of the stylized facts on the evolution of FDI in MENA countries will be the subject of Section 2, followed by a descriptive analysis of the data and a presentation of the methodology

and the database (Section 3); then, Section 4 will be devoted to the analysis of the results obtained, and finally, Section 5 will conclude the findings.

## 2. Trends and determinants of FDI in north African and middle eastern countries

Concerning FDI inflows, the diagnosis is unfavorable for the MENA-9 countries[2]. Despite the implementation of reforms and regional integration initiatives, they remain overall unattractive to FDI inflows (**Table 1**). Their share of FDI inflows to developing countries has been declining since the period 2007–2011. The amounts, although increasing since 2002[3], particularly in Morocco, Algeria, the Palestinian

| | 2002–2006 | 2007–2011 | 2012–2016 | 2017–2021 | Geometric growth rate |
|---|---|---|---|---|---|
| World | 841,38 | 1526,18 | 1687,88 | 1421,40 | 14% |
| Developed countries | 572,84 | 949,11 | 1002,15 | 704,08 | 5% |
| Developing countries | 268,53 | 577,07 | 685,73 | 717,32 | 28% |
| European Union | 270,94 | 406,97 | 379,48 | 278,00 | 1% |
| South America | 35,08 | 103,20 | 121,36 | 91,46 | 27% |
| Sub-Saharan Africa | 13,13 | 34,61 | 39,97 | 38,35 | 31% |
| MENA-9* | 11,71 | 19,28 | 15,87 | 14,27 | 5% |
| Algeria | 1,12 | 2,40 | 1,15 | 1,22 | **2%** |
| Egypt | 3,69 | 6,74 | 5,99 | 7,11 | **18%** |
| Jordan | 1,45 | 2,21 | 1,77 | 1,02 | −8% |
| Lebanon | 2,63 | 3,72 | 2,67 | 1,62 | −11% |
| Morocco | 1,56 | 2,28 | 3,00 | 2,31 | **10%** |
| Palestinian Authority | 0,03 | 0,19 | 0,16 | 0,18 | **57%** |
| Tunisia | 1,23 | 1,74 | 1,13 | 0,81 | −10% |
| MENA-9/Developing countries (in%) | 4,36% | 3,34% | 2,31% | 1,99% | |
| Sub-Saharan Africa/Developing countries (in%) | 4,89% | 6,00% | 5,83% | 5,35% | |

**Libya and Syria have been removed from the sample due to data unavailability.*
*Source: Authors' calculations based on UNCTAD data.*

**Table 1.**
*Average annual direct investment flows (USD billion).*

[2] MENA-9 corresponds to the MENA countries (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestinian Authority, Syria and Tunisia) minus the Arab Gulf States. Indeed, the MENA region should not be considered as a homogeneous block as the Gulf countries, compared to non-oil producing countries, can attract a lot of investment in natural resources.

[3] Even though there has been a significant increase in FDI flows to these four countries. The question that arises concerns the quality of these investments (which we will see later).

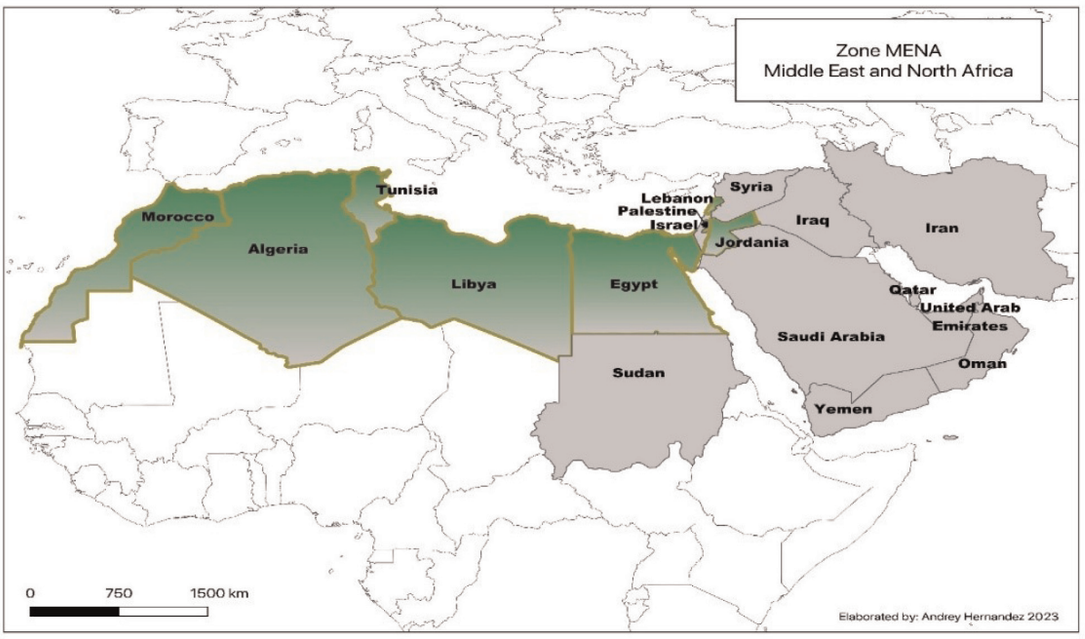


**Figure 1.**
*Map of the MENA-9 region with state borders. Areas colored green indicate MENA-9 countries whose data we analyze. Source: Elaborated by Andrey Hernandez.*

Authority, and Egypt, have remained relatively modest in all countries of the region (**Figure 1**).

This upward trend, from 2011 to 2017, observed in these four countries is due to the combination of several phenomena [27]. First, political instability since the 2011 uprisings has diverted investment from the Middle East and the United States to the Arab countries. Second, the drop in oil prices has generated unprecedented liquidity in oil-importing Arab countries. Finally, and to a lesser extent, the opening-up policies followed by these countries have begun to bear fruit. Overall, it can be said that this substantial increase in FDI is exogenous and depends essentially on the context and environment of the countries of origin.

However, this increase in FDI is likely to act in favor of the productivity of these countries, according to our hypothesis, in a rather indirect way through their spillover effects. This is what the following two sections propose to verify.

## 3. Presentation of the data and the empirical strategy

### 3.1 Firms survey and firms' characteristics

The statistical support for the empirical analysis covers six countries[4]: Egypt, Jordan, Lebanon, Morocco, the Palestinian Authority, and Tunisia, over the period 2013–2020[5]. It consists of several World Bank Enterprise Surveys (WBES) involving face-to-face interviews with owners or senior managers of the firms. The objective of the interviews is to analyze productive performance and measure the impact of a wide range of intraorganizational and external factors on it. Only manufacturing activities

[4] We have retained only these six countries due to the unavailability of data for Algeria, Libya and Syria.

[5] Table 1A in the Appendix shows the year in which data are collected for each country.

are considered in this article. There are two reasons for this restriction: Firstly, the amount of available data is mainly limited to this sector, and secondly, we have focused on the latter because of its competitive potential and its contribution to the financing of the external deficit [28].

Note that for the rest of this paper, the terms FDI and foreign ownership are used interchangeably. Firms are classified as foreign if their foreign ownership exceeds the 10% threshold; otherwise they would be classified as local or domestic[6]. The 10% threshold is, according to the IMF, the threshold at which a certain degree of control by the FF is established.

To analyze the impact of FDI on productivity[7], it is first necessary to evaluate the latter. Several approaches exist in the literature: accounting, nonparametric, and parametric. The latter, which is also ours in this work, is based on the specification and estimation of a Translog function. The latter has the advantage of not imposing a priori constraints on the partial elasticities of substitution, unlike the Cobb Douglas and CES (Constant Elasticity of Substitution) specifications. In addition to its flexibility properties, the Translog form is relatively easy to implement [29].

Thus, using a second-order Taylor development, the productivity equation for manufacturing firms is presented as follows:

$$VA_{ict} = \beta_k K_{ict} + \beta_l L_{ict} + \beta_{ki} K_{ict}\omega_c + \beta_{li} L_{ict}\omega_c + \beta_{kk} K2_{ict} + \beta_{ll} L2_{ict} + \beta_{kl} K_{it} L_{ict} + C + \omega_i + \omega_c + \omega_t + e_{ict} \quad (1)$$

i represents one of the enterprises, c the country, and t the time. VA is the output estimated by value added[8], K the capital stock, and L the number of permanent employees in firm i. The firm, country and year fixed effects are controlled for by including the dichotomous variables ω. e: the error term assumed to be normally distributed, β: a vector of parameters to be estimated, and C is a constant.

After estimating the parameters of Eq. (1) using ordinary least squares, total factor productivity (TFP) is calculated as follows:

$$\widehat{TFP}_{ict} = C + \omega_i + \omega_c + \omega_t + e_{ict} \quad (2)$$

In addition, Table 2A provides descriptive statistics for the 7926 enterprises. The sample of the eight sectors includes a total of 697 FFs (9% of the total sample). As the firm identifier varies from survey to survey, the empirical sample is a pseudo-panel. We are not able to detect whether some firms are observed more than once. The

[6] According to the OECD definition, "FDI is an activity whereby an investor resident in one country obtains a lasting interest and significant influence in the management of an entity resident in another country. This may involve the creation of an entirely new enterprise (greenfield investment) or, more generally, a change in the ownership status of existing enterprises (through mergers and acquisitions). Other types of financial transactions between related enterprises, such as reinvestment of profits of the FDI enterprise, or other capital transfers, are also defined as FDI. Noting also that FDI involves an acquisition of control by the FF. The threshold for such control is set by the IMF at 10%.

[7] This will be referred to as total factor productivity in the rest of the paper.

[8] We estimate this productivity using value added [30] which measures the difference between the value of production and intermediate consumption. While some authors estimate productivity by turnover, output, and income [31, 32], value added seems to be more relevant as it measures the gross wealth creation of the firm [33, 34].

number of observations differs across the 8 sectors according to their respective weight in the total manufacturing population. The two most important sectors, as expected, are textiles and agri-food. Together, they represent almost 45% of the observations.

The following **Table 2** provides comparisons of some positioning indicators of companies with and without foreign participation from which one can deduce generally positive sectoral performances in case of FDI, notably in terms of TFP, research and development (R&D) expenditure, employability, and, especially, export potential:

Most of the variables are closely related to the type of ownership. FFs are systematically larger—four times larger for agri-food—than domestic firms. In addition, labor costs are positively and strongly correlated with the foreign status of the firm, although for wood and paper and other manufacturing, the difference is only weakly significant. FFs are more likely to use their financial resources in R&D and to have a higher capital-labor ratio. As shown by [35], these technical characteristics are potentially related to the fact that FFs are less financially constrained, which is reflected in their higher access to an overdraft facility. These statistical characteristics probably help to explain why FFs outperform local firms in terms of productivity.

### 3.2 Empirical strategy

To assess the impact of FDI on the productivity of MENA-9 firms, we considered the following basic equation:

| Variables/Sectors | Food and Tobacco | Other products | Wood and Paper | Machines |
|---|---|---|---|---|
| Foreign firms | | | | |
| TFP | 1.634*** | 2.445*** | −0.473 | 2.367 |
| Permanent employees | 280.051*** | 232.58 | 105.236 | 313.107*** |
| Capital-labor ratio in $. | 31.421.562 | 11.676.134*** | 22464.467 | 29321.581 |
| Salary cost in $. | 1595284.6*** | 1173915.3 | 483096.47 | 1625759*** |
| R&D (binary variable) | 0.28*** | 0.231* | 0.039 | 0.334** |
| Export intensity (% sales) | 0.236*** | 0.266*** | 0.137*** | 0.382*** |
| Local firms | | | | |
| TFP | 1.234 | 2.357 | 0.383 | 1.770 |
| Permanent employees | 63.154 | 52.047 | 74.630 | 124.033 |
| Capital-labor ratio in $. | 38737.786 | 38540.562 | 18758.208 | 53653.175 |
| Salary cost in $. | 298872.564 | 147321.341 | 270405.888 | 342283.759 |
| R&D (binary variable) | 0.144 | 0.086 | 0.084 | 0.180 |
| Export intensity (% sales) | 0.087 | 0.055 | 0.052 | 0.081 |

**90%.*
***95%.*
****99%.*
*Source: Authors' calculations based on WBES data. Note: t-test is the difference-in-means statistic between foreign and local firms.*

**Table 2.**
*Comparison between FF and local firms: Main characteristics.*

$$TFP_{ict} = \gamma_1 FDI_{ict} + \gamma_2 Horizontal_{jct} + \gamma_3 Backward_{jct} + \gamma_4 Forward_{jct} + \sum_{p=1}^{5} \delta_p X_{ict} + D_j + D_c + D_t + \theta_0 + \varepsilon_{it} \quad (3)$$

$\varepsilon$ is an error term, D representing, sector j, country c and period t fixed effects and the other Greek letters the parameters to be estimated.

Thus, the natural logarithm of the TFP of firm i is regressed on the following list of variables:

$FDI_{ict}$: It is an indicator variable that is worth 1 if firm i has a foreign equity stake of 10% or more at date t and 0 otherwise. If foreign ownership increases the firm's productivity, then the coefficient $\gamma_1$ is expected to be positive. The coefficient $\gamma_1$ represents an approximation of the average growth rate of TFP induced by foreign ownership, all other things being equal, that is, once the effect of the other variables has been neutralized. The true growth rate is given by the quantity $e^{\gamma_1} - 1$.

$Horizontal_{jt}$ : It is a sectoral variable measuring horizontal spillover effects. In our study, this variable corresponds to the share of FFs in the total sales of each sector of activity.

$$Horizontal_{jct} = \sum_{i=1}^{n_j} \frac{IDE_{ict} \times Ventes_{ict}}{\sum_{i=1}^{N_j} Ventes_{ict}} \quad (4)$$

Where ni is the number of FFs in sector j and Ni is the total number of firms in that sector.

The variable measuring upstream vertical externalities, which relate to the relationships that FFs have with their suppliers, is calculated as follows:

$$Backward_{jct} = \sum_{j \neq k} a_{jkct} * Horizontal_{kct} \quad (5)$$

Where $a_{jk}$ is the share of output of sector j used as intermediate consumption in sector k. The $a_{jk}$ weights or technical coefficients are obtained from the EORA input-output tables for all countries. They are calculated excluding intra-consumption (which is already included in the Horizontal variable) and imports of intermediate goods.

The variable considering the role of FDI as suppliers of intermediate goods and thus measuring downstream externalities is defined as follows:

$$Forward_{jct} = \sum_{j \neq k} c_{jkct} * \theta_{jct} \quad (6)$$

Where $\theta_j$ is the share of FF sales net of exports in total sales of industry j and $c_{jk}$ is the share of inputs of sector j supplied by sector k (or the allocation coefficients). The weights are calculated based on the same input-output tables, considering only the production of intermediate goods sold on the domestic market.

We would like to stress that these indicators currently only measure the potential for externalities. The latter is not a guarantee that local firms will be able to benefit from the stock of technology held by the FFs. This potential is transformed into externalities only when it contributes significantly to the increase in productivity of local firms.

The EORA input-output tables used in this study are expressed in dollars, at base prices, and are for the years 2013, 2016, 2019, and 2020. This allowed us to calculate

variable weights, which is a significant improvement over some previous studies using constant weights (such as [14]). The list of sectors grouped according to the EORA classification is provided in Table 3A (classified according to NACE Rev. 1 codes).

Regarding the control variables:

$Export_{ict}$: It is a binary variable that takes the value 1 if the firm's share of exports in its total sales exceeds a threshold of 10% and 0 otherwise. The choice of this threshold is also arbitrary, and several thresholds could be tried[9]. It is also expected that the coefficient $\delta_1$ is positive; that is, exporting firms are on average more efficient than domestically oriented firms.

$(Export \times FDI)_{ict}$: It is a binary interaction variable between the FDI and Export variables. This variable takes 1 when the firm in question is both an exporter and a foreigner and 0 otherwise. The presence of this variable makes it possible to distinguish the four types of firms. In particular, the reference firm can be identified by assigning the value 0 simultaneously to these two variables: it is a local firm operating on the domestic market. A positive coefficient associated with this variable means that a firm that is both foreign and foreign-oriented is on average more efficient in terms of TFP than a local non-exporting firm. Thus, $\delta_2$ measures the productivity gain induced by FDI for a non-exporting firm, whereas this effect will be equal to the sum $\gamma_1 + \delta_1 + \delta_2$ (more precisely, $e^{\gamma_1+\delta_1+\delta_2} - 1$), when the firm in question is exporting.

The other control variables selected relate to the characteristics of firms that are likely to affect their performance. These are the age of the firm ($Age_{ict}$), its size ($Size_{ict}$) in terms of employees, and the degree of its financial obstacles ($Fin.Obs._{ict}$). The latter measures the manager's perception of constraints to accessing finance. It takes values ranging from 0 to 4 according to the degree of severity of financial constraints perceived by the manager. The descriptive statistics of the data are presented in Table 4A.

One problem that deserves special attention when estimating the equation of the basic model concerns selectivity bias. Indeed, it is quite possible that foreign investors are, from the outset, oriented toward companies operating in sectors and countries where productivity is growing at a relatively faster pace than others. In this case, a positive correlation between FDI and productivity does not necessarily reflect a causal relationship. Just as the orientation of FDI toward sectors of activity or countries in difficulty will result in a false negative correlation between FDI and productivity, this problem of self-selection of FFs in favor of the most productive local firms implies a causality problem between the dependent variable and the explanatory variables, notably "FDI" and the variables capturing the spillover effect, and therefore a bias in the estimation of the effects of FDI. We have not explicitly addressed this selectivity problem in this work. But we have tried to mitigate its effects as much as possible, first by introducing sectoral indicator variables $D_j$ and country $D_c$ to neutralize the intersectoral and spatial variability of productivity and then by estimating the model on a sub-sample made up solely of local firms.

## 4. Empirical analysis of the effects of FDI on productivity

Columns (1) and (3) give the estimation results of the basic model equation via heteroskedasticity-corrected ordinary least squares, respectively, without and with

[9] Several thresholds were tested without affecting our estimates.

the control variables. Finally, columns (2) and (4) estimate strictly the same equations as (1) and (3) but excluding the FFs from the sample:

The first lesson that can be drawn from **Table 3** is that whatever the specification used, the direct effect of FDI is negligible (t = 0.63), contrary to the results of [26] who found that FDI has a positive effect on TFP. This effect, however, varies

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Variables | All sample | Local firms | All sample | Local firms |
| FDI | 0.00911 | | −0.0199 | |
| | (0.63) | | (−0.92) | |
| Horizontal | −0.191*** | −0.199*** | −0.178*** | −0.175*** |
| | (−3.53) | (−3.34) | (−3.22) | (−2.94) |
| Backward | 0.262 | 0.259 | 0.279* | 0.270 |
| | (1.60) | (1.44) | (1.67) | (1.47) |
| Forward | 1.001*** | 1.104*** | 0.930*** | 1.007*** |
| | (4.71) | (4.75) | (4.37) | (4.32) |
| Export | | | −0.00260 | 0.000677 |
| | | | (−0.24) | (0.06) |
| (Export × FDI) | | | 0.0608** | |
| | | | (2.07) | |
| Size | | | −0.0000347*** | −0.0000562*** |
| | | | (−2.64) | (3.28) |
| Age | | | −0.00000557 | −0.0000137 |
| | | | (−0.02) | (−0.05) |
| Fin. Obst. | | | −0.0162*** | −.0172671*** |
| | | | (−5.23) | (−5.34) |
| Constant | 2.152*** | 1.878*** | 1.961*** | 1.856*** |
| | (77.90) | (53.68) | (54.58) | (48.96) |
| Number of observations | 5248 | 4838 | 5134 | 4783 |
| $R^2$ | 0.166 | 0.160 | 0.171 | 0.166 |
| F | 64.24 | 63.74 | 51.90 | 53.42 |
| P Value | 0.00 | 0.00 | 0.00 | 0.00 |
| Fixed effects - Sectors | Yes | Yes | Yes | Yes |
| Fixed effects - Countries | Yes | Yes | Yes | Yes |
| Effects fixes – Years | Yes | Yes | Yes | Yes |

**Significant at 10%.*
***Significant at 5%.*
****: Significant at 1%.*
*Note: Absolute values of Student's t corrected for heteroskedasticity are shown in brackets. Source: Authors' calculations based on WBES data.*

**Table 3.**
*Estimation results of the basic model.*

depending on whether the FF is exporting or focusing on the local market. For a non-exporting firm, this effect is measured directly through the coefficient associated with the FDI variable and is equal to −1.97% but is not significant (t = −0.92). This means that, compared to a local firm, foreign participation in the capital of a non-exporting firm generates on average no productivity gain. The latter increases significantly to 4.66%, that is, (e(−0.0199–0.0026 + 0.068)-1), when the FF in question is also an exporter. This result is expected since it implies that an exporting FF is more efficient than an FF operating on the local market.

The estimates also show that the linkages between local firms and the FFs have significant positive effects on their productivity. It seems that local firms have benefited more from better-quality inputs and that this business relationship has allowed them to be in contact with new technologies and innovations put forward by FFs. However, the backward effect seems to have a fragile (column 3) or insignificant effect here. The lack of impact of this variable on the productivity of local firms shows that FFs prefer to opt for imported intermediate goods that are cheaper, of better quality, and meet their required standards than locally produced inputs. A simple regression of the share of imported inputs on the share of foreign capital concludes that there is a positive and significant correlation at the 1% level (see **Figure 2A**).

Regarding the horizontal spillover effect, it has a negative and statistically significant effect on local firms in the MENA region. An increase of one point in the share of FF sales in a sector translates on average into a productivity loss of about 0.20% for a local firm belonging to the same sector. This loss increases to 0.18% when the regression includes control variables. Bouoiyour and Toufik [25] reach the same result in a sectoral study for Morocco. We can also refer to the micro-econometric study of [26] concerning the Tunisian manufacturing sector.

And finally, the perception of financial constraints has a negative and significant effect on the productivity of firms. In columns 3 and 4, it appears that an increase of one point in the perception of these constraints (on a scale of 0 to 4) reduces the average productivity gain by 0.0162% in the case of the total sample and by 0.0173% when only domestic firms are considered. The same is true for size, where the average gain drops to around 4.10–6%. Finally, the age of the firm, taken as another control variable, seems to have little impact on TFP. The coefficients are not statistically significant.

We then asked ourselves whether the presence of large companies in our sample might cause a bias in our results. Indeed, these firms necessarily experience sustained productivity growth, a very large inflow of FDI, and better quality [36]. Excluding large firms, the new sample was split into two categories: small firms (1–19 employees) and medium firms (20–99 employees). The results in Table 5A suggest that our previous findings hold in all cases, except for the backward variable, which becomes positive and significant for medium-sized firms. This suggests that the latter benefit more from upstream vertical externalities compared to their smaller counterparts.

Furthermore, some authors [24, 37, 38] attribute the negative or insignificant impact of horizontal spillovers to a low technological absorption capacity of local firms. We sought to test this hypothesis by including the interaction term $(\text{Horizontal} \times \text{Abs.})_{ict}$, where $\text{Abs.}_{ict}$ (see **Box 1**) is a variable that measures the capacity of firm i to adapt to the new norms imposed by FFs. Thus, the spillover effect becomes a function of the absorptive capacity and is equal to $\gamma_2 + \gamma_5$ Abs. According to our estimates, the coefficient $\gamma_2$, associated with the Horizontal variable,

$(\text{Horizontal} \times \text{Abs.})_{ict}$: It is an interaction variable between the "Horizontal" variable and the "Abs." variable that measures the degree of technological absorption of firms calculated, at each date t, as a deviation from a sectoral efficiency frontier. Formally:

$$\text{Abs.}_{ict} = \frac{\text{TFP}^{-}_{jct}}{\text{TFP}^{+}_{jct}} \tag{7}$$

Where $\text{TFP}^{+}_{jt}$ and $\text{TFP}^{-}_{jt}$ measure, respectively, the maximum and minimum productivity levels at date t in sector j to which firm i belongs. Note that this variable takes its values in the interval $[-\infty,1]$. A value close to 1 means that the firm in question is close to the frontier of its sector $\text{TFP}^{+}_{jt}$ and therefore has a good technological absorption capacity. On the other hand, a value close to $-\infty$ indicates the relative inefficiency of the firm and therefore its low capacity to absorb the technologies conveyed by the FFs. Thus, the spillover effect on productivity is given by:

$$\frac{\partial \text{TFP}_{ict}}{\partial \text{Horizontal}_{jct}} = \gamma_2 + \gamma_5 \text{Abs}_{ict} \tag{8}$$

A positive value of the coefficient $\gamma_5$means that the spillover effect of FDI increases with the technological absorption capacity of firms.

**Box 1.**

is always negative and statistically significant, while $\gamma_5$, which is associated with the interaction variable Horizontal × Abs., is positive and statistically significant. The fact that $\gamma_5$ is positive means that the intra-sector spillover effect becomes increasingly important as the firm approaches the efficiency curve and becomes positive when its adaptability exceeds the threshold $\text{Abs.}^{*} = -\frac{\gamma_2}{\gamma_5}$. This result implies that foreign presence in an industry can be beneficial for firms with high absorptive capacities.

Column 1 of **Table 4** shows that a 1 percentage point increase in the share of EFs in total sales leads at worst to a fall in the productivity of firms operating in the same sector of the order of 0.91%, for Abs. = 0, and at best to an increase of the order of 1.21%, that is, (2.113–0.906%), for Abs. = 1. The technological absorption threshold at which this effect becomes positive is about 0.43, that is, ((0.906)/(2.113)). As column 2 of **Table 4** shows, these conclusions remain valid when considering only local firms, but the magnitude of the spillover effects and the Abs. * threshold changes. Indeed, the elimination of FFs from the overall sample has had the effect of amplifying the losses, which for an increase of 1 point (Abs. = 0) in the share of FFs in sectoral sales, now rise to −0.97%. Consequently, the efficiency threshold Abs. * efficiency threshold for a positive effect falls to 0.40, that is, ((0.969)/(2.436)).

However, the hypothesis according to which human capital (HC) "is a means of fully absorbing the beneficial effects of FDI on productivity, via the imitation of techniques and the contribution to their evolution and adaptation to the local context" is not verified. More precisely, the variable HC, measured by the percentage share of skilled jobs in the total employment of firm i, does not allow to absorb, in all cases, the losses induced by the foreign presence in the same sector, given that the coefficient associated with the interaction variable (Horizontal × HC) is much lower than $\gamma_2$, that is, $0.0912 < 0.237$. In other words, the human capital considered here does not seem to be sufficiently adapted to benefit from the positive externalities linked to the presence of FF in each sector.

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Variables | All sample | Local firms | All sample | Local firms |
| FDI | −0.0219 | | −0.0241 | |
| | (−1.19) | | (−1.04) | |
| Horizontal | −0.906*** | −0.969*** | −0.237*** | −0.237*** |
| | (−10.40) | (−10.58) | (−3.73) | (−3.36) |
| Horizontal × Abs. | 2.113*** | 2.436*** | | |
| | (20.43) | (20.51) | | |
| Horizontal × HC | | | 0.0643 | 0.0912* |
| | | | (1.30) | (1.66) |
| Backward | 0.0735 | 0.168 | 0.340* | 0.322* |
| | (0.36) | (0.74) | (1.94) | (1.66) |
| Forward | 0.428* | 0.261 | 1.040*** | 1.113*** |
| | (1.72) | (0.92) | (4.53) | (4.42) |
| Export | −0.0117 | −0.0134 | −0.00224 | −0.00000445 |
| | (−1.24) | (−1.38) | (−0.20) | (−0.00) |
| (Export × FDI) | 0.00648 | | 0.0589* | |
| | (0.24) | | (1.85) | |
| Size | −0.0000345*** | −0.0000375*** | −0.0000370*** | −0.0000538*** |
| | (−2.93) | (−2.82) | (−2.61) | (−3.06) |
| Age | −0.0000447 | 0.0000426 | −0.00000702 | 0.0000183 |
| | (−0.22) | (0.21) | (−0.03) | (0.07) |
| Fin. Obst. | −0.00887*** | −0.008217*** | −0.0176*** | −0.0188*** |
| | (−3.28) | (−2.94) | (−5.45) | (−5.58) |
| Constant | 1.944*** | 1.850*** | 2.214*** | 1.931*** |
| | (44.04) | (37.77) | (63.49) | (52.49) |
| Number of observations | 5134 | 4738 | 4837 | 4484 |
| $R^2$ | 0.398 | 0.413 | 0.172 | 0.168 |
| F | 68.22 | 72.26 | 47.07 | 48.89 |
| P Value | 0.00 | 0.00 | 0.00 | 0.00 |
| Fixed effects - Sectors | Yes | Yes | Yes | Yes |
| Fixed effects - Countries | Yes | Yes | Yes | Yes |
| Effects fixes – Years | Yes | Yes | Yes | Yes |

**Significant at 10%.*
***Significant at 5%.*
****Significant at 1%.*
*Note: Absolute values of Student's t corrected for heteroskedasticity are shown in brackets. Source: Authors' calculations based on WBES data.*

**Table 4.**
*Externalities of FDI and the role of technology and skills gaps.*

## 5. Conclusion

In this paper, we have tried to assess the impact of foreign presence on MENA firms' productivity (total factor productivity). The results of the econometric analyses show that the direct effect of foreign investment on firms' total productivity is not statistically significant. On the other hand, the downstream vertical externalities, which are supposed to account for the relationship between FFs and their local customers, are positive. It also appears that the distinction between small and medium-sized firms shows the existence of positive upstream vertical spillovers in the latter case and their absence in the former. And finally, the horizontal spillover effect, measuring the intensity of foreign presence in each sector, is negative. We sought to test this hypothesis. Thus, the spillover effect becomes a function of the absorption capacity. According to our estimates, the spillover effect becomes increasingly important as the firm approaches the efficiency curve and becomes positive when its absorptive capacity exceeds the 0.40 threshold. This result implies that foreign presence in an industry can be beneficial for firms with high absorptive capacities. However, the complementarity between human capital and foreign presence does not produce the expected beneficial effects.

The main limitation of our study lies in the nature of the data. The analysis of spillover effects on firm productivity in the MENA region was based on data from a pseudo-panel. This limitation prevented us from:

measuring TFP by the method of [39], followed by [40], based on an instrumentation of the firm's productivity to circumvent the correlation problem between unobserved shocks affecting the firm's productivity and its input choices.

And delaying the externality variables to allow time for their impact.

To overcome the limitations mentioned above, it would therefore be desirable that future studies use comprehensive longitudinal data that is usually aggregated from repeated surveys over time on the same sample.

Being aware of the limitations of our work, we can argue that MENA countries should seize their opportunities by increasingly anchoring themselves with developed countries to benefit from technological externalities transmitted through trade and foreign direct investment. Taking advantage of these externalities would increase the countries' industrial productivity and promote their economic growth. However, it is more than necessary to intensify the efforts already undertaken in the field of education to improve the quality of human capital.

## Acknowledgements

We would like to express our sincere gratefulness to Jérémy Patrix (Doctor, OPAL Research) for his insightful comments during the research work and Andrey Hernandez Meza (Doctor, HighFi Research Lab, Sorbonne-Nouvelle University, France) for creating the map.

## Appendices

### Externalities of FF on firm productivity. Source: Authors, adapted from Blomström and Kokko [10]

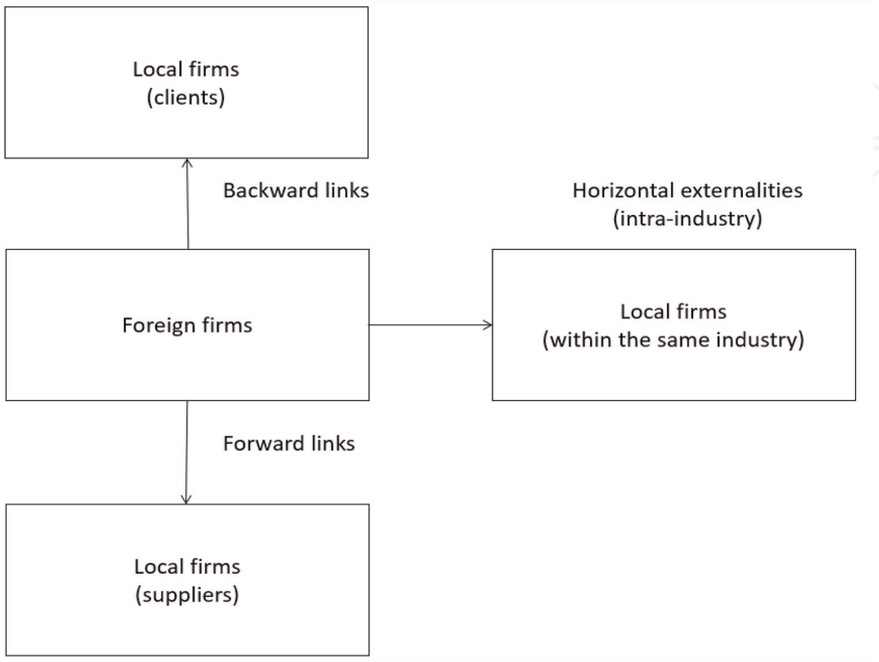


**Figure 1A.**
*Externalities of FF on firm productivity.*

### Correlation between the share of imported inputs (CIimp/CI) and the share of foreign capital (Part-Cap-Etr). Source: Authors' calculations based on WBES data.

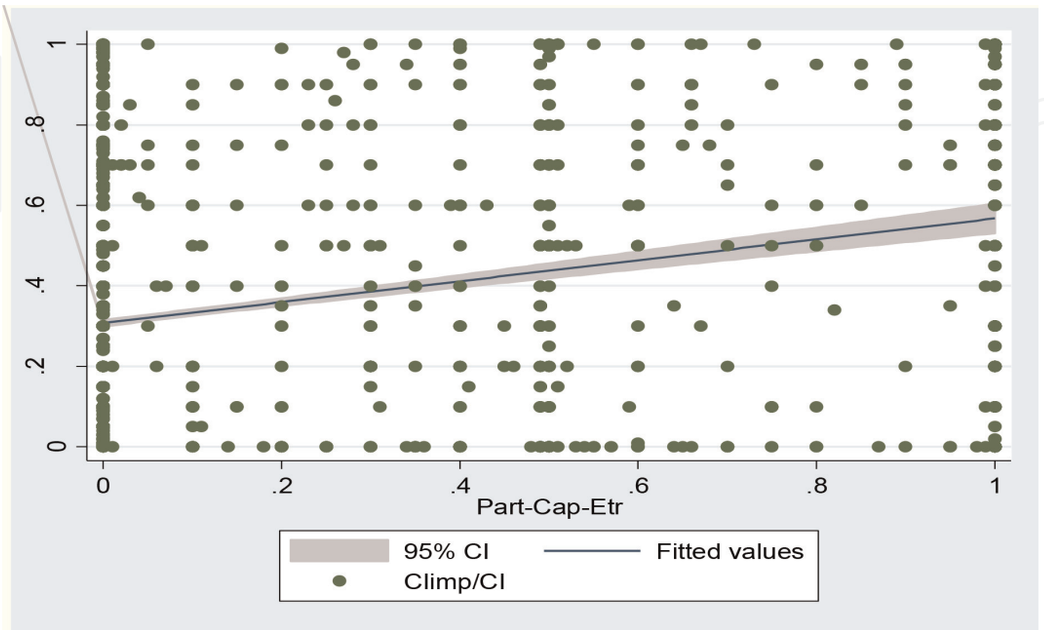


**Figure 2A.**
*Correlation between the share of imported inputs (CIimp/CI) and the share of foreign capital (Part-Cap-Etr).*

## Sample description.

| Country | Wave 1 | | Wave 2 | | Wave 3 | |
|---|---|---|---|---|---|---|
| | years | Obs# | years | Obs# | years | Obs# |
| Egypt | 2013 | 2008 | 2016 | 1173 | 2020 | 1990 |
| Jordan | 2013 | 335 | 2019 | 290 | | |
| Lebanon | 2013 | 238 | 2019 | 268 | | |
| Morocco | 2013 | 186 | 2019 | 462 | | |
| Palestinian Authority | 2013 | 158 | 2019 | 127 | | |
| Tunisia | 2013 | 327 | 2020 | 364 | | |

*Source: Authors' calculations based on WBES data.*

## Distribution of firms by sector of activity.

| Sectors/Firms | Local firms | Foreign firms | Total |
|---|---|---|---|
| Food and Tobacco | 1617 | 140 (7.97%) | 1757 (22.48%) |
| Other products | 323 | 17 (5.00%) | 340 (4.35%) |
| Wood and Paper | 640 | 34 (5.04%) | 674 (8.62%) |
| Machines | 490 | 60 (10.91%) | 550 (7.04%) |
| Transport equipment | 86 | 16 (15.69%) | 102 (1.31%) |
| Metal | 667 | 47 (6.58%) | 714 (9.14%) |
| Oil and chemicals | 1800 | 137 (7.07%) | 1937 (24.78%) |
| Textiles | 1496 | 246 (14.12%) | 1742 (22.29%) |
| Total | 7119 | 697 (8.92%) | 7816 (100.00%) |

*Source: Authors' calculations based on WBES data.*

## Classification of industrial sectors NACE Rev. 3.

| Sector Name | ISIC Rev.3 correspondence |
|---|---|
| Food and Tobacco | 15,16 |
| Textiles | 17, 18,19 |
| Wood and Paper | 20, 21,22 |
| Oil and chemicals | 23, 24, 25,26 |
| Metal | 27,28 |
| Machines | 29, 30, 31, 32,33 |
| Transport Equipment | 34,35 |
| Other products | 36 |

*C.1.1.1 Table 4A. Descriptive statistics.*

| Variables | Number of observations | Average/Frequency | Standard deviation | Min | Max |
|---|---|---|---|---|---|
| FDI | 7816 | 8.92% | | 0 | 1 |
| TFP | 5498 | 1.34 | 1.59 | −5.63 | 7.29 |
| Horizontal | 7926 | 0.20 | 0.19 | 0.00 | 1.00 |
| Backward | 7641 | 0.03 | 0.04 | 0.00 | 0.25 |
| Forward | 7641 | 0.02 | 0.03 | 0.00 | 0.25 |
| Export | 7552 | 23.50% | | 0 | 1 |
| Size | 7824 | 118.84 | 293.71 | 1 | 5500 |
| Age | 7805 | 23.22 | 15.72 | 1 | 95 |
| Fin. Obst. | 7881 | 1.54 | 1.33 | 1 | 4 |

*Source: Authors' calculations based on WBES data.*

*C.1.1.1.1 Table 5A. Estimation results by firm size.*

| | Small firms [1–20] | | Medium-sized firms [20–99] | |
|---|---|---|---|---|
| **Variables** | **All sample** | **Local firms** | **All sample** | **Local firms** |
| FDI | −0.0208 | | −0.0435 | |
| | (−0.43) | | (−1.08) | |
| Horizontal | −0.191*** | −0.182*** | −0.468*** | −0.441*** |
| | (−2.63) | (−2.47) | (−4.07) | (3.73) |
| Backward | 0.304 | 0.298 | 0.705** | 0.658** |
| | (1.14) | (1.09) | (2.34) | (2.04) |
| Forward | 0.609** | 0.586** | 1.916*** | 2.127*** |
| | (2.07) | (1.97) | (4.74) | (4.93) |
| Export | 0.0102 | 0.011 | 0.00277 | 0.00399 |
| | (0.48) | (0.54) | (0.16) | (0.22) |
| (Export × FDI) | 0.0780 | | 0.0224 | |
| | (0.89) | | (0.39) | |
| Age | −0.000386 | −0.000335 | −0.000105 | 0.0000350 |
| | (−1.05) | (−0.92) | (−0.22) | (0.07) |
| Fin. Obst. | −0.0192*** | −0.0184*** | −0.0173*** | −0.0220*** |
| | (−5.03) | (−4.78) | (−2.83) | (−3.39) |
| Constant | 2.289*** | 2.213*** | 2.223*** | 2.107*** |
| | (48.64) | (71.91) | (40.06) | (28.08) |
| Number of observations | 2071 | 2013 | 1864 | 1733 |
| $R^2$ | 0.165 | 0.167 | 0.178 | 0.168 |
| F | 30.83 | 33.36 | 17.64 | 18.45 |

| | Small firms [1–20] | | Medium-sized firms [20–99] | |
|---|---|---|---|---|
| **Variables** | **All sample** | **Local firms** | **All sample** | **Local firms** |
| P Value | 0.00 | 0.00 | 0.00 | 0.00 |
| Fixed effects - Sectors | Oui | Oui | Oui | Oui |
| Fixed effects - Countries | Oui | Oui | Oui | Oui |
| Effects fixes – Years | Oui | Oui | Oui | Oui |

**Significant at 10%.*
***Significant at 5%.*
****Significant at 1%.*
*Note: Absolute values of Student's t corrected for heteroskedasticity are shown in brackets; Source: Authors' calculations based on WBES data.*

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## References

[1] Cheng KL, Kwan KY. What are the determinants of the location of foreign direct investment? The Chinese experience. Journal of International Economics. 1998;**51**(2):379-400

[2] Fahinde C, Abodohoui A, Mohiuddin M, Su Z. External financial inflows and domestic investment in the economies of WAEMU: Crowding-out versus crowding-in effects. The Journal of Developing Areas. 2015;**49**(3): 230-248

[3] Karray Z, Toumi S. Investissement Direct Étranger et Attractivité Appréciation et enjeux pour la Tunisie. Revue d'Économie Régionale & Urbaine. 2007;**3**:479-501

[4] Farole T, Winkler DE. Foreign Firm Characteristics, Absorptive Capacity and the Institutional Framework: The Role of Mediating Factors for FDI Spillovers in Low- and Middle-Income Countries. World Bank Policy Research Working Paper; 2012

[5] Blomstrom M. Foreign Investment and Spillovers. London: Routledge; 1989

[6] Bouoiyour J, Hanchane H, Mouhoub E. Investissements directs étrangers et productivité: Quelles interactions dans le cas des pays du Moyen Orient et d'Afrique du Nord? Revue Économique. 2009;**60**:109-131

[7] Caves RE. Multinational firms, competition, and productivity in host-country markets. Economica. 1974;**41**: 176-193

[8] Desbordes R, Franssen L. Foreign direct investment and productivity: A cross-country, multisector analysis. Asian Development Review. 2019;**36**(1): 54-79

[9] Li C, Tanna S. The impact of foreign direct investment on productivity: New evidence for developing countries. Economic Modelling. 2019;**80**:453-466

[10] Blomström M, Kokko A. Multinational corporations and spillovers. Journal of Economic Surveys. 1998;**12**:247-277

[11] Das S. Externalities, and technology transfer through multinational corporations: A theoretical analysis. Journal of International Economics. 1987;**22**(1–2):171-182

[12] Wang JY, Blomström M. Foreign investment and technology transfer: A simple model. European Economic Review. 1992;**36**(1):137-155

[13] Nguyen HTT, Kechid M. FDI and its impacts on local industries. In: 8th International Conference of MEEA. Nice and Monaco; 2009

[14] Javorick BS. Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages. American Economic Review. 2004; **94**(3):605-627

[15] Lall S. Transnational, Domestic Enterprises and Industrial Structure in Host LDCs: A Survey. Vol. 30, No. 2. Oxford University Press; 1978. pp. 217-248

[16] Rugman A, Caves R. Multinational enterprises and economic analysis. Canadian Journal of Economics. 1983; **16**(4):742-744

[17] Newman C, Rand J, Talbot T, Tarp F. Technology transfers, foreign investment and productivity spillovers.

European Economic Review. 2015;**76**: 168-187

[18] Barrios S, Dimelis S, Louri H, Strobl E. Efficiency spillovers from foreign direct investment in the EU periphery: A comparative study of Greece, Ireland, and Spain. Review of World Economics. 2004;**140**(4):688-705

[19] Blanchard P, Mathieu C. Multinationals and domestic firms in France: Who gains from knowledge spillovers? Review of Agricultural, Food and Environmental Studies. 2016;**97**: 109-125

[20] Konings J. The effects of direct foreign investment on domestic firms: Evidence from firm level panel data in emerging economies. The Economics of Transition. 2001;**9**(3):619-633

[21] Xu X, Yu S. Productivity spillovers from foreign direct investment: Firm-level evidence from China. World Development. 2012;**40**(1):62-74

[22] Arif-Ur-Rahman M, Inaba K. Foreign direct investment and productivity spillovers: A firm-level analysis of Bangladesh in comparison with Vietnam. Economic Structures. 2021;**10**:17

[23] Sari DW, Khalifah NA, Suyanto S. The spillover effects of foreign direct investment on the firm's productivity performances. Journal of Open Innovation: Technology, Market, and Complexity. 2016;**46**:199-233

[24] Sugiharti L, Yasin MZ, Purwono R, Esquivias MA, Pane D. The FDI spillover effect on the efficiency and productivity of manufacturing firms: Its implication on open innovation. Journal of Open Innovation: Technology Market and Complexity. 2022;**8**(2):99

[25] Bouoiyour J, Toufik S. L'impact des investissements directs étrangers et du capital humain sur la productivité des industries manufacturières marocaines. Région et Développement. 2007;**25**: 177-191

[26] Baccouche R, Bouoiyour J, Mouley S. Interaction entre IDE, productivité et capital humain Cas des industries manufacturières tunisiennes. Série des Documents de travail du Centre d'Analyse Théorique et de Traitement des données économiques; 2011

[27] OCDE. Perspectives des politiques d'investissement au Moyen-Orient et en Afrique du Nord. Paris: Éditions OCDE; 2007

[28] Kirkpatrick C. L'industrialisation tournée vers les exportations et la répartition des revenus dans les pays nouvellement industrialisés d'Asie. Revue Tiers Monde. 1988;**115**:569-579

[29] Reynès F, Tamsamani YY. Substituabilité des facteurs et rendements d'échelle sectoriels en France: une estimation par une fonction de coût flexible. Série des Documents de travail de l'OFCE; 2009

[30] Gauzente C. Mesurer la performance des entreprises en l'absence d'indicateurs objectifs: quelle validité ? Analyse de la pertinence de certains indicateurs. Finance Contrôle Stratégie. 2000;**3**:145-165

[31] Adams RB, Mehran H. Bank board structure and performance: Evidence for large bank holding companies. Journal of Financial Intermediation. 2012;**21**(2): 243-267

[32] Charreaux G. L'entreprise publique est-elle nécessairement moins efficace ? Revue française de gestion. 1997;**115**: 38-56

[33] Mohnen P. R&D, Innovation and Productivity. Japan: United Nations University, Maastricht Economic and Social Research Institute; 2019

[34] Mohnen P, Hall BH. Innovation and productivity: An update. Eurasian Business Review. 2013;**3**:47-65

[35] Desai MA, Fritz Foley C, Forbes KJ. Financial constraints and growth: Multinational and local firm responses to currency depreciations. The Review of Financial Studies. 2008;**21**(6):2857-2888

[36] Kinoshita Y. Firm Size and Determinants of Foreign Direct Investment. CERGE-EI Working Paper; 1988

[37] Jordaan JA. Producer firms, technology diffusion and spillovers to local suppliers: Examining the effects of foreign direct investment and the technology gap. Environment and Planning A: Economy and Space. 2017; **49**(12):2718-2738

[38] Urata S, Baek Y. Technology Spillover and Absorptive Capacity of Firms and Countries. ADBI Working Paper; 2022

[39] Olley S, Pakes A. The dynamics of productivity in the telecommunications equipment industry. Econometrica. 1996;**64**(6):1263-1297

[40] Levinsohn J, Petrin A. Estimating production functions using inputs to control for unobservables. Review of Economic Studies. 2003;**70**(2):317-342