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Foreign direct investment and wages in Central and Eastern Europe

Giulia Faggio

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Hamburgisches Welt-Wirtschafts-Archiv (HWWA)
Hamburg Institute of International Economics
Neuer Jungfernstieg 21 - 20347 Hamburg, Germany
Telefon: 040/428 34 355
Telefax: 040/428 34 451
e-mail: hwwa@hwwa.de
Internet: http://www.hwwa.de

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FLOWENLA Discussion Paper

Foreign direct investment and wages in Central and Eastern Europe

Giulia Faggio *

FLOWENLA Discussion Paper 10
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* CEP, London School of Economics and Political Science

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ABSTRACT

This paper explores the link between foreign direct investment (FDI) and wages in three countries of Central and Eastern Europe: Poland, Bulgaria and Romania. The objective of the study is twofold. It tries to detect (1) whether higher levels of foreign investment in a local market are associated with higher wages for the market as a whole and (2) whether a higher foreign presence is also associated with higher domestic firms` wages. Results indicate that higher levels of foreign activity are associated with higher local wages in all countries. Moreover, evidence supports the existence of positive FDI spill-overs from foreign to domestic producers in Poland, but not in Bulgaria and Romania. Evidence also suggests that there is a link between the FDI impact on wages and the sector of activity in which foreign and domestic firms operate. FDI effects seem to vary substantially across sectors of the economy.

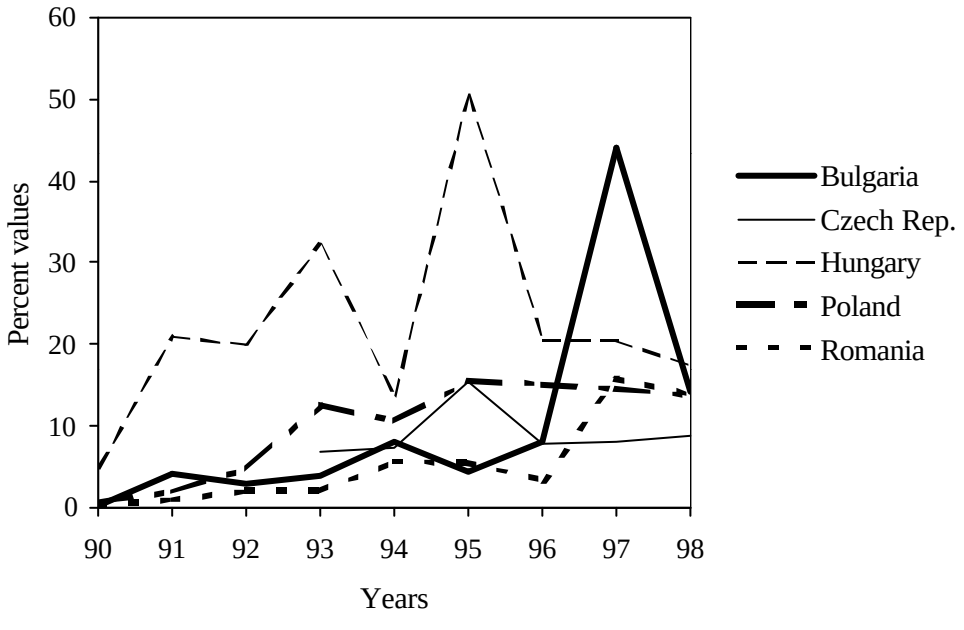
Keywords: foreign direct investment, spillovers, wage, manufacturing, emerging countries
JEL-Classification: F2, J3, L6, P2

Giulia Faggio
CEP, London School of Economics and Political Science
Houghton Street WC2A 2AE, London, UK
E-mail: G.Faggio@lse.ac.uk

Introduction

Central and Eastern European countries (CEECs) have recently undertaken drastic reforms for moving from a centrally planned system to a market economy. In the aftermath of price liberalization, privatization and opening-up to the world economy, foreign investors have been either encouraged as in the cases of Hungary, Czech Republic and Poland or gradually admitted as in the cases of Bulgaria and Romania. Evidence confirms that Hungary, Czech Republic and Poland have been favorite targets for foreign direct investment (FDI) since the early 90s. Bulgaria and Romania have registered substantial FDI inflows only after 1996 (World Bank, 1999). However, considering the share of FDI in gross fixed capital formation, the experiences of Bulgaria and Romania after 1993 are comparable to those of other CEECs (see Fig. 1).

Figure 1: Share of FDI in gross fixed capital formation



Source: Author's calculations based upon World Bank (1999) and IMF (2000).

A number of justifications have been advanced by the literature for favoring the entry of foreign investors in the region. They include employment creation; regional

development; enforced firm restructuring (Blanchard, 1997); efficient corporate governance in privatized enterprises when sold to foreign investors (Frydman et al., 1999). One particularly prominent argument refers to the productivity gap between foreign and domestic firms[1], and the resulting potential for spillovers, i.e. productivity and wage spillovers, from inward investment. Such spillovers may occur through various channels, such as direct transfer of technological know-how, imitation and worker mobility.

There is an extensive literature that looks at FDI spillovers for industrialized and developing countries[2]. Using industry data for Canada and Australia, Caves (1974) and Globerman (1979) find positive productivity spillovers between foreign and domestic firms. These results are confirmed by Liu et al. (1999) analyzing industry data for the UK. Using firm level data, Haddad & Harrison (1993), Aitken & Harrison (1999), and Djankov & Hoekman (1999) find no ownership effect in productivity equations looking at the experiences of Morocco, Venezuela and Czech Republic.

As far as wages are concerned, evidence for the UK (Driffield, 1996) and for the US (Aitken et al., 1996) indicates that higher levels of foreign investment at the industry level are associated with higher wages for the whole sector. Moreover, in both countries a higher foreign presence is associated with higher domestic firms' wages. Lipsey & Sjöholm (2001) look at the Indonesian manufacturing sector. Even controlling for different characteristics of the workforce, they find that foreign-owned firms pay higher wages than domestic producers. They also find that higher foreign ownership in an industry, in a province, or in an industry within a province, is associated with a higher level of wages in domestically-owned firms for workers of a given educational level. These results contrasts with those presented for Mexico and Venezuela (Aitken et al., 1996), where FDI is associated with higher wages only for foreign-owned firms.

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[1] According to the so-called "industrial organization" approach to FDI, foreign investors can compete successfully with domestic producers because they enjoy a productive knowledge not available to domestic firms. These productive advantages, intangible in nature, can be in terms of technological know-how, marketing, managing skills, export contacts, coordinating relationships with suppliers and customers, and reputation. See Caves (1971), Teece (1977) and, more recently, Helpman (1984), Dunning (1988) and Horstmann & Markusen (1989).

Several explanations have been suggested for the lack of FDI spillovers in Mexico, Venezuela, Morocco and Czech Republic. Domestic firms in developing countries might suffer a technological gap with respect to foreign investors (Kokko, 1994) or they might have an insufficient level of managerial and technical skills to absorb new technology (Leahy & Neary, 1999). It is also possible that foreign and domestic firms operate in different labor markets because of institutional factors or different skill composition of the workforce. Alternatively, as foreign firms invest more in worker training, they might offer higher wages and, thus, inhibit labor turnover which might provide a channel through which productivity increases reach domestic producers (see, for a modeling framework, Fosfuri et al., 2001).

This study looks at the relationship between FDI and wages in three countries of Central and Eastern Europe: Poland, Bulgaria and Romania[3]. Using firm level data on manufacturing over the period 1994-1997, we study whether the entry of foreign investors in a local labor market is associated with higher average wages as well as with higher wages offered by domestic firms.

We conduct the empirical analysis using data aggregated up at the industry and regional level, and at the firm level. Conducting the analysis at the industry and regional level, there seems to be a positive relationship between FDI and manufacturing wages in Poland, Bulgaria and Romania. The positive relationship is consistent with studies showing that the entry of foreign firms in a local market shifts upwards the labor demand curve for the whole sector. In addition, evidence suggests the existence of a positive relationship between foreign presence and domestic firms' wages in Poland, but not in Bulgaria and Romania, where the effect is limited to foreign firms.

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[2] See Caves (1996) and Blomström & Kokko (1997) for recent surveys.

[3] For the same countries, Konings (2000) explores the link between FDI and productivity performance of domestic firms. He finds evidence of negative technology spillovers for Bulgaria and Romania, and of no spillovers for Poland. However, in the case of Poland, the limited number of observations might have driven the results.

Conducting the analysis at the firm level, results confirm the picture given at the industry and regional level. Moreover, evidence suggests that there is a link between the FDI impact on wages and the sector of activity in which foreign and domestic firms operate. In particular, FDI effects seem to vary across sectors of the economy.

The study proceeds as follows. Section 2 presents a modeling framework. While section 3 describes the data, section 4 reports estimation results at the industry and regional level, and at the firm level. Some explanations for the absence of FDI spillovers in Bulgaria and Romania are reviewed in section 5. Section 6 concludes.

2. A modeling framework

In this study, we analyze the impact of foreign direct investment on local and domestic firms' wages applying a standard supply and demand framework for labor.

In a perfectly competitive framework, the entry of foreign firms in a local labor market will raise the average level of wages as well as the wages offered by domestic firms. This is a pure demand shift effect due to the entry of new firms in the market and is not necessarily related to any characteristics of the new entrants, i.e. wages, productivity level, or skill composition of the workforce.

If we assume that foreign investors have also a productive advantage relative to domestic producers, an increase in foreign ownership in the labor market will be associated with a higher level of productivity and, thereby, a further upward shift in the labor demand schedule for a given set of factors. In this case, there are two effects on local and domestic firms' wages. First, a pure demand shift effect as described above. Secondly, a productivity effect: foreign-owned firms can pay higher wages because they are more productive and their presence can raise the average labor productivity for the whole market. However, it is only through labor mobility, transfer of technological know-how and demonstration effects that domestic firms can become as productive as their foreign counterparts.

Both effects imply that a higher foreign presence in a market is associated with a higher average level of wages. However, a higher foreign presence might be associated with higher domestic firms' wages through the competition effect if the markets are close to be perfectly competitive, but not necessarily through the productivity effect.

In this section, we present the model suggested by Aitken et al. (1996), which assumes that foreign firms have a productivity advantage relative to domestic producers and focuses on the productivity effect. We proceed, being aware that a pure

demand shift effect, a productivity effect, or other pecuniary effects[4], might be difficult to disentangle.

Consider *n* firms, both domestically- and foreign-owned, operating in a local labor market. At any time *t* all firms face a given local supply of labor. Provided the local supply curve is upward sloping, the demand schedule will be represented by the value of the marginal product of labor derived from the aggregate production function[5].

More explicitly, consider the following aggregate production function for the local labor market:

$$Y=A(FDI)\, f[L,Z] \tag{1}$$

where *FDI* refers to the foreign presence in the market, *L* is the labor employed and *Z* includes all other factors of production.

In a competitive labor market, firms hire workers until the marginal cost of labor, which is the wage rate, is equal to the marginal revenue it creates or $P*MP_L$. Thus, the labor demand schedule is given by the value of the marginal product of labor:

$$W = P*MP_L = P*A(FDI)f_L[L,Z] \tag{2}$$

where *P* is the output price, MP_L stands for the marginal productivity of labor and $f_L[L,Z]$ indicates the partial derivative of output with respect to labor.

The local labor supply is simply a function of the average wage rate *W*:

$$L^S = W^{\nu} \tag{3}$$

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[4] For instance, foreign firms might invest more in worker training and, thus, prevent trained workers from moving by offering higher wages (see Fosfuri, Motta & Rønde, 2001). Alternatively, they can offer higher wages for preventing their workers from starting-up intermediation activities competing with their rivals abroad.

[5] Although this framework assumes perfect competition in the labor market, it is consistent with both a perfectly competitive and an imperfectly competitive product market.

where v is the labor supply elasticity. Note that v will be a positive number as long as the labor supply schedule has a positive slope, which is the standard case.

Equilibrium in this labor market is achieved at the point where $L^S = L^D$. Expressed algebraically, the equilibrium condition is:

$$W=P*MP_L= P*A(FDI)f_L[L(W),Z] \quad (4)$$

where $L(W)$ denotes the labor supply curve.

The hypotheses we want to test is (1) whether a higher foreign presence in the local market is associated with a higher overall marginal productivity of labor, generating an upward pressure on wages for the entire sector, and (2) whether a higher foreign presence is also associated with higher wages offered by domestic producers. To this end, we express equation (4) in log-form:

$$ln(W) = c + a_1 FDI + a_2 ln(P) + a_3 v\, ln(W) + a_4 ln(Z) \quad (5)$$

where $ln(W)$ is the log wage and $ln(Z)$ includes other factors of production. Assuming a Cobb-Douglas specification for production, we consider Z as capital so that a_3 and a_4 would be equal to the input shares of labor and capital.

In the analysis, we estimate the reduced form of equation (5), which becomes:

$$ln(W) = c/(1-a_3v) + a_1/(1-a_3v)\, FDI + a_2/(1-a_3v)ln(P) + a_4/(1-a_3v)ln(K) \quad (6)$$

In order to test our two hypotheses, we estimate equation (6) either including all firms operating in a local market or the sub-sample of domestic firms only. Thus, the dependent variable, i.e. log average wage, will be defined correspondingly.

If foreign investors bring new technology or ideas that raises average productivity, the $a_1/(1-a_3v)$ parameter would be positive. As long as labor supply is not perfectly elastic, i.e. v is not equal to infinity, a positive coefficient of FDI will imply a positive relationship between wages and foreign ownership.

We include industry and regional dummies that capture various industry and location specific factors such as labor force characteristics, differences in infrastructure and agglomeration. Macroeconomic shocks are controlled for by the inclusion of year dummies. The estimation equation consists of:

$$ln(W)_{j,s,t} = c' + \alpha_1 FDI_{j,s,t} + \alpha_2 ln(P)_{j,t} + \alpha_3 ln(K)_{j,s,t} + \Sigma \alpha_i X_i + \varepsilon_{j,s,t} \quad (7)$$

where $ln(W)_{j,s,t}$ is log average wage in industry j in region s at time t; $FDI_{j,s,t}$ refers to the share of industry j region s output that is produced in foreign-owned firms. This output share serves as a proxy for foreign presence in the local labor market, which is identified by industry j and region s. $ln(P)_{j,t}$ refers to log industry j producer price index and $ln(K)_{j,s,t}$ to log capital stock. X_i $(i = j, s, t)$ stands for industry, regional and year dummies. $\mathring{a}_{j,s,t}$ is a random shock.

If the coefficient on FDI, α_1, is positive, then a greater foreign presence is associated with higher local wages. However, the capital stock variable, as constructed, includes both domestic and foreign capital. Thus, the coefficient α_3 might reflect increases in wages that accompany new investment in physical capital. Since foreign investors are generally among new investors as well, the inclusion of the capital variable in equation (7) allows us to distinguish between two different channels through which FDI might affect wages. While the coefficient on FDI is likely to measure the impact of foreign presence on wages via technology, the coefficients on capital stock may capture the FDI impact on wages through physical stock and thus labor demand. However, as new equipment and machinery is likely to incorporate new technology, which leads to permanent increases in the productivity of the labor force, the two effects might be difficult to disentangle.

If foreign firms invest only in the most productive industries or regions, the coefficient of FDI will not be significant since equation (7) includes industry and regional dummies. If foreign firms are “poaching” the most productive workers from domestic producers, the entry of foreign firms generate only a reallocation of workers without any increases in average labor productivity, then the coefficient on FDI will not be significant.

3. Data issues

3.1 Sample description

Annual data on Polish, Bulgarian and Romanian manufacturing firms are retrieved from the Amadeus CD-ROM (Dec. 1999)[6]. They cover the period 1994-1997 and give information on a number of variables such as factor usage, sales, equity ownership position, 3-digit industry classification and the region in which the firm is located.

The Amadeus data set consists mainly of medium and large enterprises, whose average size is around 600 employees. However, they cover a substantial fraction of the country manufacturing activity: the sales coverage ratio between Amadeus firms and total country firms, computed over the sample period, is on average 75%, 62% and 61% for Bulgaria, Poland and Romania, respectively (see Table 1).

Table 1: Comparison between Amadeus data and country national statistics

	N. of firms in Amadeus	Avg. Sales in Amadeus	N. of firms in National St.	Avg. Sales in National St.	Sales coverage ratio
Poland					
1994	924	18.6	18686	17.5	0.35
1995	2308	29.0	24932	12.1	0.66
1996	2267	44.6	29293	10.9	0.75
1997	2157	41.9	32723	11.1	0.72
Bulgaria					
1994	999	28.9	4418	8.6	0.80
1995	1275	25.4	7454	9.7	0.78
1996	1167	18.7	8292	9.2	0.70
1997	1196	17.3	8954	7.7	0.72
Romania					
1994	1737	16.9	32257	9.8	0.59
1995	1850	19.7	34404	11.2	0.64
1996	1927	21.7	32065	12.0	0.63
1997	1984	24.2	35962	12.7	0.63

Note: Coverage ratio = Total sales in Amadeus over total sales in the national statistics by 2-digit NACE industry classification. Sales variables are expressed in millions of US$.

[6] Amadeus database is a Pan European financial database, provided by Bureau van Dijk Electronic Publishing SA, Belgium.

Summary statistics by country and ownership are reported in Table 2. In all countries, foreign firms have higher sales and higher productivity than their domestic counterparts. Average wages are fairly similar for the two categories of firms in Romania, but not in Bulgaria and in Poland where foreign firms' wages are higher. While in Bulgaria and in Poland foreign firms have also a larger size than domestic ones, the opposite holds for Romania.

Table 2: Summary statistics according to ownership, 1995-1997

	Domestic firms		Foreign firms	
	1995	1997	1995	1997
Poland				
Employment	570	563	873	1025
	(802)	(794)	(1082)	(1236)
Capital stock	12,846	8,478	20,594	19,263
	(43,220)	(34,170)	(26,820)	(26,675)
Sales	34,513	26,257	57,177	60,017
	(119,710)	(106,190)	(65,438)	(81,533)
Labor	60.9	54.2	91.0	91.8
productivity	(103.0)	(113.4)	(110.7)	(117.2)
Average wage	4.5	4.4	4.6	5.0
	(4.1)	(2.4)	(2.4)	(1.9)
Bulgaria				
Employment	419	373	713	671
	(712)	(661)	(715)	(650)
Capital stock	2,525	1,657	6,011	4,739
	(8,906)	(4,773)	(11,360)	(9,339)
Sales	5,642	3,134	15,096	9,647
	(37,001)	(8,690)	(24,918)	(16,627)
Labor	12.6	7.4	21.0	13.1
productivity	(66.6)	(14.6)	(26.1)	(13.5)
Average wage	1.7	1.3	2.3	1.8
	(1.3)	(1.4)	(1.7)	(1.2)
Romania				
Employment	876	763	513	482
	(1230)	(1073)	(823)	(734)
Capital stock	9,348	3,152	5,843	2,459
	(23.71)	(7,711)	(20,534)	(5,133)
Sales	8,181	6,452	8,630	8,201
	(22,022)	(15,900)	(19,284)	(18,242)
Labor	9.6	8.4	25.5	20.6
productivity	(13.0)	(10.9)	(11.1)	(4.4)
Average wage	2.0	1.6	1.9	1.8
	(1.2)	(0.6)	(1.0)	(1.0)

Note: All variables report mean values; standard deviations are in parenthesis.
All financial variables are expressed in thousands (0,000.0) US$.

Data on firm equity participation are provided by Amadeus only once during the reference period. The ownership information has been collected during the years 1997

and 1998. Moreover, there is no information on the ownership history of the firm. In this study, we identify foreign-owned firms as those in which a single foreign investor holds at least 10% of the shares of the enterprise, thus applying the standard definition of FDI used by the OECD and the IMF[7].

The structure of the sample according to foreign ownership is provided in Table 3. Even if ownership information for the Polish sample is less accurate than for the other countries, foreign-owned firms in Poland represent about 42% of the total number of firms that report some ownership information. In the Bulgarian and Romanian samples, firms with foreign participation are about 8% and 20%, respectively, of those reporting ownership information.

In all countries, foreign investors tend to detain majority equity participation. However, they prefer to invest in existing plants and not establish new ones. Firms with total foreign participation represent only the 11.8% of all foreign firms in Bulgaria. In Poland and Romania, the same percentage is about 25.4%.

Despite some differences across countries, foreign-owned firms in manufacturing are mostly concentrated in traditional sectors, such as food & beverages, wearing apparel, non-metallic products and furniture & miscellaneous. A higher presence of foreign firms are also in chemicals (see Table 4). In Poland, there is also a relatively high concentration of foreign firms in capital-intensive sectors, such as electrical machinery, fabricated metal products and machinery & equipment. In Romania, a high percentage of foreign firms (42.3%) are operating in labor-intensive sectors, such as textiles, wearing apparel and leather & footwear.

[7] The definition of a foreign investment as a direct one requires that a single foreign investor holds at least 10% of the shares of the enterprise, or that it is for other reasons clear that the foreign investor aims at having a lasting interest in the enterprise. The foreign investor is a resident entity and may be a person or an enterprise.

Table 3: Sample structure according to foreign ownership in 1997

	Bulgaria	Poland	Romania
Total number of firms	1395	2500	1984
Total number of firms which report ownership information	994	418	1400
Number of firms which report foreign ownership	76	177	284
Foreign ownership >50%	60	114	206
of which: 100%	9	45	72
Foreign ownership <=50%	16	63	78
of which: Joint ventures	1	13	15

Source: Author's calculations from Amadeus CD-ROM, Dec. 1999.

Table 4: Sample structure according to foreign ownership and industry classification in 1997

	Bulgaria	Poland	Romania
15 Food & beverages	23	47	68
16 Tobacco	2	1	0
17 Textiles	4	2	38
18 Wearing apparel	5	9	54
19 Leather & footwear	2	0	28
20 Wood products	3	2	12
21 Paper products	3	6	1
22 Publishing & printing	0	5	9
23 Coke & refined products	0	0	0
24 Chemicals	6	15	14
25 Rubber & plastic products	0	9	7
26 Non-metallic products	8	19	8
27 Basic metals	4	2	0
28 Fabricated metal products	2	11	7
29 Machinery & equipment	5	8	7
30 Office machinery	0	2	4
31 Electrical machinery	5	13	7
32 Communication equipment	0	5	4
33 Optical instruments	0	3	1
34 Motor vehicles	1	6	4
35 Other transport equipment	2	1	4
36 Furniture & miscellaneous	1	12	12

Source: Author's calculations from Amadeus CD-ROM, Dec. 1999.

3.2 Variable definition

Before proceeding with the empirical analysis, we briefly describe the variables used in the estimation at the industry and regional level. Conducting the analysis at the firm level, the variables are defined correspondingly.

Wages are defined as the log of average wages. Average wages are computed at the firm level as total labor costs over number of employees and then they are aggregated up to the industry and regional level. The capital stock variable is defined as reported tangible fixed assets in millions of national currency by each firm and aggregated up to the industry and regional level. In the estimation, we express the variable in logs. According to the sample of firms we consider, we specify average wages for the entire sector and for the sub-sample of domestic firms only.

In order to avoid endogeneity problems, the capital stock variable lagged one period will be used in the estimation. Endogeniety problems may arise when the hiring of high skilled workers, which is likely to be reflected in higher average wages, requires the firm also to invest in new machinery and equipment. The introduction of a lagged capital variable might reduce the probability of estimating this reverse causality helping to capture the effect of capital stock on average wages.

As price variable, we use the producer price industry at the 3-digit industry level. Industries are defined according to the 2-digit NACE industry classification and regions follow the 3-level NUTS nomenclature. Both classifications are provided by EUROSTAT (1992, 1998).

We measure the local and industry concentration of foreign activity ($FDI_{j,s,t}$) as the share of industry *j*-region *s* output in foreign firms over total industry *j* output. Output is proxied by sales. We also experiment with the employment share of foreign ownership. Results are robust to both measures of FDI activity[8]. However, in the analysis we focus on output instead of employment shares because the latter might raise endogeneity problems. In fact, the dependent variable is defined as total labor costs over employment.

[8] Results using employment shares of foreign activity are available from the author upon request.

To account for common aggregate shocks or unobserved time varying factors, we include time dummies in the estimation as well as we use industry and regional dummies to control for industry-specific and regional-specific effects. Foreign firms might be attracted only by regions that offer better communication and transport facilities or governments might provide incentives to foreign investors to locate in particular regions or sectors of the economy.

4. Estimation results

This section presents estimation results applying the modeling framework suggested in section 2. First, estimated coefficients of equation (7) are computed using data aggregated up to the industry and regional level. Results are reported by country for the complete sample of firms and for the sub-sample of domestic firms only. Then, firm level data are used in the analysis.

4.1 Industry-regional level estimations

Estimated coefficients of equation (7) for Poland, Bulgaria and Romania are reported in Table 5. In all countries, there exists a positive relationship between foreign activity and manufacturing wages when all firms, i.e. domestically- and foreign-owned, are included in the estimation (see columns 1, 5 and 9 in Table 5). The coefficient on $FDI_{j,s,t}$ is positive and statistically significant in the three countries and indicates that a 1% increase in the share of foreign investment in industry *j* in region *s* at time *t* is associated with a wage increase in that industry and region of 1.2%, 0.9% and 0.5% in Poland, Romania and Bulgaria, respectively[9]. However, when we include industry and regional dummies in the estimation, the FDI coefficient loses significance for the Polish sample. Foreign investors seem to be attracted by particular industries and regions in Poland, perhaps those that offer better infrastructure, higher proportions of skilled workers or government incentives. For Romania and Bulgaria, the FDI impact is somewhat reduced, but still positive and significant.

The coefficient on lagged capital stock is also positive and significant in all countries, implying that investment in new machinery and equipment has a positive impact on wages. Presumably, the FDI coefficient captures wage increases which are a reflection of increases in the productivity of workers and thus, through labor mobility, of the local labor force. The coefficient on $ln(K)_{j,s,t-1}$ is likely to reflect the impact on new investment in physical capital on the firm demand for labor.

[9] The mean values of the $FDI_{j,s,t}$ variable are .0056, .0069 and .0051 for the Polish, Romanian and Bulgarian samples, respectively.

Table 5: The relationship between foreign direct investment and manufacturing industry wages in Poland, Bulgaria and Romania (dependent variable: log industry-regional wage)

	Poland				Bulgaria				Romania			
	All firms		Domestic		All firms		Domestic		All firms		Domestic	
$FDI_{j,s,t}$	2.202*	.903	2.666*	.451	1.079**	.849**	-.181	.122	1.395*	1.175*	-.153	-.226
	(.620)	(.642)	(.803)	(.848)	(.450)	(.428)	(.511)	(.484)	(.243)	(.231)	(.263)	(.244)
$\ln(K)_{j,s,t-1}$	.041*	.030**	.037*	.024**	.152*	.103*	.152*	.097*	.082*	.051*	.081*	.052*
	(.011)	(.012)	(.011)	(.012)	(.009)	(.009)	(.009)	(.010)	(.005)	(.005)	(.005)	(.005)
$\ln(P)_{j,t}$	-.136	.340	-.107	.522	.606*	-.029	.610*	-.031	.177*	-.114*	.211*	-.115**
	(.231)	(.317)	(.237)	(.322)	(.140)	(.150)	(.145)	(.154)	(.038)	(.042)	(.040)	(.045)
Year dummies	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.
Industry dummies		Estim.		Estim.		Estim.		Estim.		Estim.		Estim.
Regional dummies		Estim.		Estim.		Estim.		Estim.		Estim.		Estim.
n. of obs.	814	814	771	771	1464	1464	1439	1439	1451	1451	1401	1401
Adj. R^2	.12	.24	.10	.24	.90	.92	.90	.92	.72	.83	.72	.82

Note: $FDI_{j,s,t}$ is measured as the share of industry j-region s output that is produced by foreign firms in total industry j output. (*): significant at 1% level; (**): significant at 5% level; and (***): significant at 10% level.

In Bulgaria and Romania, the positive FDI impact on wages disappears as soon as foreign firms are excluded from the estimation. Consistent with the results found for Mexico and Venezuela (Aitken, Harrison & Lipsey, 1996), foreign activity does not seem to affect domestic producers, at least in terms of wages, in Bulgaria and Romania. Poland shows a different picture. Not only is there a positive relationship between foreign activity and wages when all firms are considered, but foreign activity seems also to affect domestic firms in terms of positive wage increases. A 1% increase in local FDI is associated with a 1.3% increase in domestic firms' wages[10]. However, as soon as we include industry and regional dummies in the estimation, the positive effect disappears.

4.2 Firm level estimations

In order to investigate more precisely the impact of FDI on manufacturing wages and test the robustness of the results presented in Table 5, we conduct the analysis using firm level data. We proceed in two steps. First, we test whether foreign-owned firms pay higher wages than domestic producers. Secondly, we test whether a higher foreign presence in the local market is associated with higher manufacturing wage as well as with higher domestic firms' wages.

Conducting the analysis at the firm level allows us to take into account firm characteristics, such as ownership and firm size. Therefore, we construct a dummy variable equal to 1 if the firm is foreign-owned and 0 otherwise ($Foreign_i$). In addition, we introduce a measure of relative market size, which is defined as firm *i* sales at time *t* over average firm sales in the 3-digit industry the firm belongs to. The variables is expressed in logs, $ln(Y_{i,t}/Y_{j,t})$.

The introduction of a size measure controls for situations in which firms pay higher wages just because they have a larger market share. Thus, they can earn higher profits that might be partly distributed to their employees. We also experiment with a measure of absolute size, i.e. firm's number of employees. However, potential endogeneity problems rise when using log employment.

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[10] The mean value of the $FDI_{j,s,t}$ variable is .0049 for the Polish sub-sample of domestic firms.

Since our measure of FDI activity is defined as an industry-regional share of output (sales) that is produced in foreign firms, this might create collinearity problems with relative market size. Therefore, in the estimation, industry/regional variables are defined in net terms, i.e. excluding the firm which the information is taken from.

Table 6 shows the first set of results. In all countries, foreign-owned firms pay on average higher wages than domestic producers. The wage differential is around 9-12%. For Polish and Romanian firms, this result is robust to the introduction of industry and regional dummies as well as of a measure of firm R&D intensity, $ln(R\&D)_{i,t-1}$ (see specifications (2)- (4) in Table 6). We measure firm R&D as the firm's stock of intangible fixed assets reported at time *t-1*. We use a lagged R&D variable for the same reason why we use a lagged capital stock variable: excluding the possibility of testing a reverse causality between capital and wages.

Our measure of firm R&D might control for situations in which firms offer higher wages because they have a higher skill composition of their workforce. Alternatively, they might have access to a better technology and thus, being more productive, offer higher average wages. Of course, it might be that the effect of R&D on wages varies according to ownership. In order to test this possibility, we experiment interacting the foreign dummy with our measure of firm R&D. While for Poland and Bulgaria the interaction term is not statistically significant, the interaction is positive and significant at the 5% level for the Romanian sample with a coefficient of .025 in a estimation similar to specification (3) in Table 6. This result suggests that in Romania, among firms with the same level of R&D intensity, foreign firms offer higher wages than their domestic counterparts. The result can also indicate that foreign-owned firms pay higher wages when characterized by higher level of R&D activity.

For the Bulgarian sample, the ownership effect disappears as soon as we introduce industry and regional dummies (see column 2 in Table 6). This finding suggests that there are limited wage differentials between foreign and domestic firms operating in the same industry and region and with a similar market size.

Table 6: The relationship of average firm wage to ownership and firm characteristics (dependent variable: average firm wage per employee)

	Poland				Bulgaria				Romania			
	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)	(1)	(2)	(3)	(4)
$Foreign_i$	.120**	.105***	.106**	.096***	.120*	.049	.095***	.023	.087*	.116*	.070***	.102*
	(.052)	(.055)	(.053)	(.055)	(.046)	(.050)	(.055)	(.057)	(.026)	(.023)	(.040)	(.036)
$\ln(K)_{i,t-1}$	.025**	.001	.001	-.015	.089*	.026*	.075*	.001	.063*	.025*	.053*	.012
	(.013)	(.014)	(.014)	(.016)	(.009)	(.010)	(.012)	(.012)	(.005)	(.005)	(.008)	(.008)
$\ln(Y_{i,t}/Y_{j,t})$	.075*	.101*	.059*	.083*	.124*	.177*	.095*	.167*	.052*	.087*	.046*	.096*
	(.015)	(.020)	(.016)	(.022)	(.011)	(.010)	(.012)	(.012)	(.006)	(.006)	(.011)	(.011)
$\ln(P_{j,t})$	.182	.402	.247	.509***	.681*	-.052	.620*	-.166	.325*	.086	.251*	.074
	(.213)	(.295)	(.215)	(.313)	(.108)	(.082)	(.142)	(.119)	(.039)	(.045)	(.063)	(.091)
$\ln(R\&D)_{i,t-1}$			.048*	.038*			.075*	.011			.035*	.014*
			(.008)	(.008)			(.012)	(.007)			(.005)	(.005)
Industry dummies		Estim.		Estim.		Estim.		Estim.		Estim.		Estim.
Regional dummies		Estim.		Estim.		Estim.		Estim.		Estim.		Estim.
Year dummies	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.
n. of obs.	1093	1002	966	890	4076	4076	2577	2577	5248	4915	1470	1373
n. of groups	762	693	679	620	1329	1329	926	926	1875	1751	782	727
R^2	.12	.30	.16	.32	.88	.90	.88	.90	.62	.71	.62	.71

Note: $Foreign_i$ is equal to 1 if the firm is foreign-owned, and to 0 if the firm is domestically-owned. Heteroskedasticity consistent standard errors are reported in parentheses. (*): significant at 1% level; (**): significant at 5% level; and (***): significant at 10% level.

The relationship between foreign presence and wages in a local labor market using firm level data is analyzed in Table 7. For Poland, estimated coefficients on industry and regional concentration of foreign activity ($FDI_{j,s,t}$) are positive and significant in all specifications. These results are consistent with those reported in Table 5 for Poland, suggesting that there is a positive relationship between foreign presence and wages at the industry-regional level. Moreover, there is a positive relationship between foreign presence and domestic firms' wages, even controlling for industry fixed effects.

For the Bulgarian sample, results show a positive relationship between foreign activity and local wages when we include all firms in the estimation. As soon as industry effects are controlled for, or foreign firms are excluded from the estimation, the positive impact of FDI on wages disappears.

Using Romanian data, results seem to suggest that there is no positive relationship between foreign presence and market wages. However, when we consider the sub-sample of domestic firms and include industry dummies in the estimation, the FDI coefficient becomes positive and significant. In other words, considering firms operating throughout Romania across different industries, there is evidence of no relationship between foreign activity and manufacturing wages. However, considering firms operating within the same 2-digit industry, it appears a positive and significant relationship between FDI and wages for the sub-sample of domestic firms only (see last column in table 7). Looking at the sign and significance of the industry dummies (not shown), there is indication that the change of the FDI coefficient is driven by the relatively high concentration of foreign-owned firms in the Romanian textiles sectors (NACE 17-19), which are traditionally low-wage sectors (see also table 4).

For the whole sample of firms, estimated coefficients on $FDI_{j,s,t}$ are computed more precisely using firm level data than industry-regional data, given the inclusion of a dummy for foreign-owned firms, $Foreign_i$. This ownership dummy is likely to capture the extent to which foreign firms internalize the effects of ownership and management changes at the firm level. Not surprisingly, the coefficient of $Foreign_i$ is positive and significant for all countries.

Table 7: The relationship between foreign direct investment and manufacturing wages in Poland, Bulgaria and Romania (dependent variable: log firm average wage)

	Poland				Bulgaria				Romania			
	All	All	Dom.	Dom.	All	All	Dom.	Dom.	All	All	Dom.	Dom.
$FDI_{j,s,t}$	.157**	.144**	.177**	.132***	.132**	.010	.100	.008	-.042	.029	-.040	.050***
	(.071)	(.073)	(.075)	(.078)	(.061)	(.062)	(.064)	(.066)	(.032)	(.030)	(.033)	(.030)
$Foreign_i$	.152*	.177*			.145*	.102**			.089*	.109*		
	(.058)	(.055)			(.049)	(.051)			(.026)	(.024)		
$ln(K)_{i,t-1}$	.013	-.014	.010	-.017	.083*	.026*	.080*	.022**	.060*	.023*	.053*	.017*
	(.015)	(.016)	(.016)	(.017)	(.010)	(.010)	(.010)	(.010)	(.005)	(.005)	(.005)	(.006)
$ln(Y_{i,t}/Y_{j,t})$	.085*	.119*	.088*	.123*	.134*	.183*	.135*	.186*	.056*	.093*	.051*	.088*
	(.017)	(.020)	(.019)	(.022)	(.011)	(.011)	(.011)	(.012)	(.006)	(.006)	(.006)	(.006)
$ln(P_{j,t})$	.430***	.577***	.411	.597***	.579*	-.111	.618*	-.101	.387*	.162*	.393*	.165*
	(.257)	(.309)	(.267)	(.321)	(.117)	(.090)	(.120)	(.091)	(.043)	(.050)	(.044)	(.050)
Industry dummies		Estim.		Estim.		Estim.		Estim.		Estim.		Estim.
Year dummies	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.
n. of obs.	914	914	842	842	3525	3525	3335	3335	4744	4744	4139	4139
n. of groups	651	651	600	600	1173	1173	1107	1107	1707	1707	1461	1461
Adj. R^2	.11	.11	.10	.22	.88	.90	.88	.90	.62		.63	.69

Note: $Foreign_i$ is equal to 1 if the firm is foreign-owned, and to 0 if the firm is domestically-owned. Heteroskedasticity consistent standard errors are reported in parentheses. (*): significant at 1% level; (**): significant at 5% level; and (***): significant at 10% level.

Given the relevance of industry specific effects, we conclude this study exploring the link between foreign presence and the sectors of activity in which foreign- and domestic-owned firms operate. We conduct estimations similar to those reported in Table 7, including an interaction term between our measure of foreign presence and 2-digit industry dummies. We aim at studying whether FDI effects are different depending on the firms' sector of activity.

As suggested by Fosfuri et al. (2001), the impact of FDI on domestic firms' wages might be larger when the local firm can compete in markets for products that are unrelated or complementary to the ones produced by foreign firms. In fact, the local firm can use the foreign technology easier in activities that do not compete fiercely the foreign firm. Therefore, product market as well as labor market characteristics are relevant in studying the impact of FDI on local wages.

Preliminary results indicate that the FDI impact on local wages varies according to the sector of activity in which firms operate (see Table 8). In Poland, positive FDI effects are concentrated on non-metallic products (NACE 26) and on two high-tech industries, office machinery and communication equipment (NACE 30 and 32), where potential wage and technology spillovers from foreign- to domestic-owned firms are particularly important. In Bulgaria, a positive and significant FDI effect is reported in textiles (NACE 17), whereas in Romania positive FDI effects are concentrated on two sectors: furniture & miscellaneous, and communication equipment (NACE 36 and 32).

There are also negative FDI effects. In Bulgaria, metallurgy and motor vehicles (NACE 27, 28 and 34) report negative FDI effects; in Romania, they are concentrated in paper products and footwear (NACE 21 and 19); in Poland, optical instruments and furniture & miscellaneous (NACE 33 and 36) show negative effects.

Results seem also to suggest that evidence of no FDI spillovers at the aggregate level might hide the presence of spillovers at the industry level or the fact that the FDI impact is concentrated on a few sectors.

Table 8: The link between foreign presence and firms' sector of activity (dependent variable: log firm average wage)

	Poland		Bulgaria		Romania	
	All	Dom.	All	Dom.	All	Dom.
$Foreign_i$	.181*		.117**		.111*	
	(.055)		(.052)		(.024)	
$\ln(K)_{i,t-1}$	-.014	-.017	.025**	.022**	.023*	.017*
	(.016)	(.017)	(.010)	(.010)	(.005)	(.006)
$\ln(Y_{i,t}/Y_{j,t})$	.116*	.121*	.185*	.188*	.093*	.088*
	(.021)	(.023)	(.011)	(.012)	(.006)	(.006)
$\ln(P_{j,t})$	.657**	.682**	-.104	-.094	.163*	.166
	(.314)	(.327)	(.091)	(.092)	(.050)	(.049)
$FDI_{j,s,t}$* nace 15	.291***	.253	.028	.003	.040	.024
	(.182)	(.190)	(.128)	(.130)	(.066)	(.067)
$FDI_{j,s,t}$* nace 16			-.515*			
			(.188)			
$FDI_{j,s,t}$* nace 17			.570*	.599*	-.045	.002
			(.213)	(.216)	(.084)	(.092)
$FDI_{j,s,t}$* nace 18	.115	.056	.080	.109	.069	.098
	(.341)	(.642)	(.421)	(.420)	(.084)	(.088)
$FDI_{j,s,t}$* nace 19			-.176	-.216	-.183**	-.174
			(.307)	(.302)	(.090)	(.128)
$FDI_{j,s,t}$* nace 20			-.035	.034	.008	.026
			(.185)	(.186)	(.091)	(.095)
$FDI_{j,s,t}$* nace 21	-.107	-.187	.119	.106	-.407*	-.392*
	(.210)	(.208)	(.221)	(.226)	(.033)	(.037)
$FDI_{j,s,t}$* nace 22	-.327	-.315			.195	.351
	(.257)	(.280)			(.251)	(.257)
$FDI_{j,s,t}$* nace 23						
$FDI_{j,s,t}$* nace 24	.140	.108	.303*	.229	.092	.133
	(.177)	(.177)	(.177)	(.204)	(.105)	(.096)
$FDI_{j,s,t}$* nace 25	-.217	-.212			.053	.028
	(.225)	(.231)			(.083)	(.092)
$FDI_{j,s,t}$* nace 26	.325*	.398*	.039	.085	.037	.114

	(.105)	(.093)	(.109)	(.113)	(.114)	(.098)
$FDI_{j,s,t}$* nace 27	.047	.036	-.286	-.488*		
	(.140)	(.146)	(.202)	(.128)		
$FDI_{j,s,t}$* nace 28	-.168	-.125	-.622*	-.628*	-.113	-.103
	(.232)	(.234)	(.234)	(.231)	(.146)	(.145)
$FDI_{j,s,t}$* nace 29	.613	.589	.348	.311	-.077	-.086
	(.523)	(.520)	(.294)	(.286)	(.120)	(.118)
$FDI_{j,s,t}$* nace 30	1.255*	1.244*				
	(.180)	(.183)				
$FDI_{j,s,t}$* nace 31	-.045	-.083	-.014	-.101	.028	-.052
	(.242)	(.303)	(.206)	(.209)	(.123)	(.120)
$FDI_{j,s,t}$* nace 32	1.000*	.992*			.253	.281***
	(.321)	(.318)			(.346)	(.166)
$FDI_{j,s,t}$* nace 33	-.279*	-.274*			-.083	-.034
	(.091)	(.092)			(.213)	(.219)
$FDI_{j,s,t}$* nace 34	.127	.127	-.271*	-.307*	.081	.078
	(.112)	(.117)	(.086)	(.082)	(.055)	(.058)
$FDI_{j,s,t}$* nace 35	-.010	-.014				
	(1.015)	(1.000)				
$FDI_{j,s,t}$* nace 36	-.222***	-.200***	.069	.091	.270*	.283*
	(.120)	(.126)	(.579)	(.568)	(.092)	(.098)
Industry dummies	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.
Year dummies	Estim.	Estim.	Estim.	Estim.	Estim.	Estim.
n. of obs.	914	842	3525	3325	4744	4139
n. of groups	651	600	1173	1107	1707	1461
R^2	.25	.24	.90	.90	.69	.69

Note: $Foreign_i$ is equal to 1 if the firm is foreign-owned, and to 0 if the firm is domestically-owned. Heteroskedasticity consistent standard errors are reported in parentheses. (*): significant at 1% level; (**): significant at 5% level; and significant at 10% level.

5. Interpreting the results

Several explanations have been proposed by the literature for the lack of positive FDI spillovers over wages. Perhaps domestic and foreign firms are operating in different labor markets with scarce or no labor mobility between them. Thus, transfer of technology cannot occur through worker mobility, but only through direct transfer or imitation (Aitken et al., 1996). If foreign firms incur higher search costs than domestic producers, which know better labor market and country institutions, they might decide to offer higher wages for keeping their workers. As a consequence, labor mobility is reduced and also the extent of FDI spillovers on wages. Alternatively, as foreign firms invest more in worker training, they might offer higher wages for retaining trained workers (Fosfuri et al., 2001).

Another explanation focuses on the competitive effect of FDI, which is called also demand effect (Aitken & Harrison, 1999). The entering of foreign investors, instead of acting as a discipline devise (Blomström & Kokko, 1997), appears to be detrimental for the productivity of domestic producers, at least in the short run. This is more likely to occur in product markets that are imperfectly competitive and where sunk-costs of entry are high. Under these conditions, the productive advantage of foreign firms might draw demand from local producers and force them to cut production substantially (see, for a modeling framework, Aitken & Harrison, 1997).

However, recent theoretical and empirical work has suggested that technological FDI spillovers are more likely to occur in domestic firms which engage sufficiently in R&D activities (Leahy & Neary, 1999; Sanna-Randaccio, 1999) or if the technological gap between domestic and foreign firms is not too large (Kokko, 1994 and Borensztein et al., 1998). Using the Amadeus data set, Konings (1999) suggests that there is a threshold of R&D investment, above which domestic firms in Poland, Bulgaria and Romania can benefit from foreign firms' proximity.

In addition, the lack of FDI spillovers on wages in Bulgaria and Romania might simply reflect the fact that it takes time for FDI spillovers to materialize. Worker training and labor mobility are time-consuming processes. Moreover, domestic firms

in developing countries need time, expertise and capital to acquire a sufficient level of R&D that will allow them to absorb new technology. Statistical evidence shows that Bulgaria and Romania have become target countries for FDI only recently, in 1995 and 1996, while Poland, Hungary and Czech Republic have been open to FDI since the beginning of the 90s (see Table 1).

In addition, as Faggio (2001) provides some evidence, multinational enterprises seem to be mainly driven by cost considerations when investing in Bulgaria and in Romania. If cost considerations are relevant, the entry of foreign investors in the host country is unlikely to be accompanied by rapid wage increases. The labor productivity in foreign subsidiaries might rise substantially, but the productivity increases will not be translated in wage increases, at least in the short run. However, as time proceeds, productivity enhancement will start putting upward pressure on wages in foreign-owned firms and then through FDI spillovers (direct transfer of technology, imitation and labor mobility) on domestic firms also.

Finally, the impact of FDI might be different according to the sector of activity in which domestic- and foreign-owned firms operate. Evidence of no spillovers at the aggregate level might hide the presence of spillovers at the industry level or the fact that spillovers are concentrated on a few sectors. Table 8 provides preliminary evidence which seems to support this hypothesis.

6. Conclusions

This paper explores the relationship between wages and foreign investment in Poland, Bulgaria and Romania. Despite different economic conditions and levels of development, we find that across all three countries higher levels of FDI are associated with higher manufacturing wages. However, in Bulgaria and Romania, the effect is limited to foreign-owned enterprises. Higher foreign presence in a local labor market does not seem to be associated with higher domestic firms' wages. Poland offers a different picture. Evidence shows the existence of a positive relationship between foreign presence and domestic firms' wages.

Results appear to be sensitive to the introduction of industry specific effects. Thus, we perform a simple exercise in order to test whether FDI effects are different according to the sector of activity in which domestic- and foreign-owned firms operate. Evidence shows that the FDI impact varies across sectors suggesting that product market characteristics and, particularly, the degree of competition between foreign and domestic firms, are relevant in analyzing the impact of FDI on domestic wages.

As also indicated by Fosfuri et al. (2001), further research is needed in order to investigate the link between the impact of foreign investment on local producers and the sectors of activity in which foreign- and domestic-owned firms operate. Potential wage and productivity spillovers are expected to be higher in markets where domestic producers do not compete fiercely with foreign-owned firms.

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