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Wages and wage growth in Poland

The role of foreign direct investment[1]

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Abstract

In recent years Poland has received substantial inflows of foreign direct investment. This paper combines detailed labour market data with industry data from the Polish manufacturing sector to examine the effects of foreign direct investment inflows on wages and wage growth. The empirical evidence we assemble suggests that workers in industries with greater foreign presence enjoy higher wages and higher wage growth. This effect appears to be robust to a variety of empirical approaches, estimation techniques and specification checks.

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1. Introduction

The sharp decline in gross domestic product (GDP) in the immediate years succeeding the 'big bang' reforms in Poland have been followed by several years of sustained economic growth.[2] The resumption of growth has been widely attributed to the success of the comprehensive reforms undertaken by the Polish government. An important element of these reforms dealt with the participation of private foreign capital in the economy.

Prior to 1990, foreign participation in the Polish economy was extremely restricted and was confined to a few small firms owned by Polish expatriates. However, since 1990, there has been a sharp revision of the role that may be played by foreign investors. Today foreign investment is viewed in a positive light and is seen as a source of scarce inputs. Befitting this new economic order, in 1991, new laws creating a more favourable environment for foreign participation were enacted. These new laws, the positive macroeconomic environment fostered by the reform process, and the changing social attitudes[3] have encouraged the flow of foreign direct investment (FDI).[4]

The desire to attract foreign direct investment is clearly linked to the benefits thought to be associated with its flow. A prominent benefit is that the flow of FDI allows developing and transition countries access to proprietary productive knowledge which multinational corporations (MNC) may possess.[5] As characterized by the World Bank (1999), MNC are leaders in innovation and knowledge creation, and the spread of their productive activities constitutes an important means of disseminating knowledge throughout the world. According to the Bank's development guidelines, if developing and transition countries are to acquire knowledge they need to attract more FDI.

The potential role of multinational corporations in spreading knowledge and consequently encouraging productivity and growth also finds support in a paper by Romer (1993). Romer argues that in addition to the lack of traditional inputs

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[2] After real GDP declines of 11.6 and 7.6 percent in 1990 and 1991, respectively, the Polish economy resumed positive GDP growth in 1992 (2.6 percent). Growth accelerated after 1992 and the economy has experienced annual growth rates of 3.8, 5.2, 7.0 and 6.1 percent between 1993 and 1996 (CSO, *Rocznik Statystyczny*, 1997c).

[3] Opinion polls conducted by the Polish Agency for Foreign Investment (PAIZ) suggest that social attitudes towards foreign direct investment are generally positive with a majority of surveyed Poles expressing the opinion that such investment is beneficial for the country and that more is required (PAIZ, 1996).

[4] In 1991, foreign direct investment flow in Poland amounted to $291 million. By 1996 this figure had reached $4498 million installing Poland as the second largest recipient of foreign direct investment in Central and Eastern Europe (IMF, 1998). Although the majority of direct investment flows take place between developed countries, foreign investors are increasingly attracted to transition countries like Poland. Between 1990 and 1998, Poland attracted almost $23 billion (Miyake and Thomsen, 1999).

[5] There are a variety of channels through which such knowledge may be transmitted to the host country. Learning may occur through direct channels, i.e., training of suppliers, sub-contracting to local firms, or through indirect channels such as labour mobility or imitation (see Rhee and Belot, 1989).

such as physical and human capital, developing countries may suffer from an 'ideas gap'[6] Romer believes that this ideas gap may be as important in influencing a country's economic growth as more traditional inputs. While there are several potential ways in which this ideas gap may be bridged, he argues that the quickest and most reliable way is to create a domestic economic environment conducive to the flow of foreign direct investment.

Despite the importance attributed to the knowledge flows, their intangible nature makes it difficult to measure whether foreign participation does indeed lead to their provision. One way of assessing the role of multinational firms in transmitting knowledge is to examine the impact of FDI on wages and wage growth. Similar to Aitken *et al.* (1996), one may use a labour market approach based on the argument that if multinationals transmit knowledge assets to the host country, this should increase the labour productivity and in turn should manifest itself in wage increases. Controlling for the effects of capital and other characteristics, evidence of higher wages in industries with greater foreign presence would suggest the provision of these productive indirect inputs.

This paper combines detailed labour market data with industry data from the Polish manufacturing sector to examine the impact of foreign presence on wages and wage growth. By examining these links we intend to gain an insight into the role that foreign direct investment has in promoting knowledge flows. The following section of the paper presents a review of the relevant literature and provides a context for our paper. Section 3 presents an analytical framework. Section 4 describes the data, Section 5 presents results and Section 6 concludes.

2. Foreign direct investment and knowledge diffusion – a brief review

Host country perceptions of the benefits of foreign participation, especially the provision of several indirect inputs, are consistent with the industrial organization approach to foreign direct investment. This approach argues that the ability of a multinational firm to compete in a foreign environment, where there are added costs of doing business, must arise due to the ownership of some firm-specific advantages. These productive advantages, usually intangible, may take the form of management and marketing skills, knowledge of a particular production process or the possession of trademarks and patents. Broadly these proprietary assets may be classified as the knowledge capital (see Markusen, 1995, 1998) of a

[6] The 'ideas gap' notion or the lack of knowledge capital is intended to suggest a broad range of knowledge handicaps that may afflict developing nations. Besides a technology gap, 'ideas include the innumerable insights about packaging, marketing, distribution, inventory control, payments systems, information systems, transactions processing, quality control, and worker motivation that are all used in the creation of economic value in a modern economy' (Romer, 1993).

multinational firm that enables it to compete in the domestic market. From the perspective of a host country, potential access to these scarce intangible inputs is a compelling reason to encourage foreign participation.

The intangible nature of these inputs makes it difficult to examine whether direct investment flows are accompanied by the provision of knowledge capital. In the Polish context, a study by Bąk and Kulawczuk (1996) suggests that the presence of foreign firms has had a substantial impact on domestic firms. Based on interviews with managers, the authors conclude that the presence of foreign firms has improved access to technology, improved marketing skills, altered the work environment and forced domestic firms to invest in better training and skills upgrading. While their findings mirror those reported in other descriptive case studies (see Helleiner, 1989), the picture emerging from more detailed and quantitative studies is less sanguine.

Broadly, two approaches have been used to study the role of foreign direct investment in spreading knowledge. The first set of studies examines the impact of foreign presence on industry or domestic firm productivity, while the second set concentrates on wage effects. Papers belonging to the first genre, initiated by the studies of Caves (1974, 1996), Globerman (1979), Blomström and Persson (1983), support the notion of knowledge diffusion by showing that domestic firms operating in sectors with greater foreign participation are more productive. In a similar vein, more recent studies by Blomström and Wolff (1994) and Sjöholm (1997) find that labour productivity in domestically-owned firms is positively related to foreign presence.

In the context of economic transition, Barrell and Holland (2000) use data from Hungary, the Czech Republic and Poland to examine the effect of foreign direct investment on industry-wide labour productivity. In general, their findings display a positive relationship between the stock of FDI and labour productivity. In addition, they demonstrate that the impact of foreign direct investment on labour productivity is larger than that of domestic investment. This finding supports the idea that the flow of foreign direct investment is accompanied by the flow of intangible productive assets to host economies.

Contrary to the above studies, a detailed OECD report (Germidis, 1977) of multinationals operating in twelve developing countries finds no discernible effects of foreign presence on domestic firms. More recent work based on data from Czech Republic (Djankov and Hoekman, 1998) and Venezuela (Aitken and Harrison, 1999) confirms this finding. The authors report that the presence of foreign firms raises industry productivity; however, these effects are confined to foreign firms while the productivity of domestic firms actually declines. In a similar vein, Prasnikar, Svejnar and Klinedinst (1992) analyze firm-level data from Yugoslavia and report that there is no effect of joint ventures on productive efficiency.

In an alternative attempt at gauging the flow of productive knowledge, Aitken *et al.* (1996) examines the impact of foreign presence on industry wages. Using

data from Mexico, Venezuela and the United States they find that industries with a greater foreign presence pay higher wages. Their evidence supports the idea that foreign firms transfer knowledge to the host country, but consistent with their earlier work, these effects (at least for Mexico and Venezuela) are restricted to foreign firms.

The variation in results across these papers makes it difficult to draw generalizations about the role of foreign firms as knowledge conduits. The differential impact across countries suggests the need for a country-specific analysis. Accordingly, in this paper we use data from Poland's manufacturing sector to examine the impact of foreign presence on wages. By examining this link we hope to draw implications for the role of foreign direct investment in spreading knowledge in a transition economy.

Although our empirical approach and the aim of our analysis seem similar to some of the papers cited above, a number of important differences can be identified. First, the papers discussed here are largely concerned with spillovers from foreign to domestically-owned firms. In contrast, we adopt a broader perspective and deal with the net impact of FDI on the host economy, rather than limiting ourselves to studying the existence of spillovers.[7] Second, the previous studies based on firm-level data distinguish between foreign and domestic firms but they are unable to control for the role of individual characteristics in determining productivity and wages. Instead, we use detailed labour market information that does not distinguish between domestic and foreign firms but allows us to control for the characteristics of individual workers in determining wages and permits us to analyse wages and wage growth in greater detail.

The approach that we use to examine the role of foreign direct investment draws on a well-established framework in labour economics. Accordingly, our paper may be placed in the line of research that focuses more on wage determinants than knowledge spillovers, although it combines some features of both approaches.

3. An analytical framework

Foreign investment by multinationals may be viewed as a flow of capital and other firm-specific proprietary advantages to a host country. Based on standard industry-demand/industry-supply labour curves, the flow of these inputs to various industries in the host country may be expected to increase the productivity of host economy workers, lead to shifts in the industry demand for labour and should manifest itself in an increase in equilibrium wages.

[7] To some extent our focus on the overall impact of FDI is driven by data constraints. In order to preserve privacy, the Polish Central Statistical Office does not permit access to firm-level data.

The following framework formalizes the scenario described above and aims to serve as a guide for our empirical work. We begin with a concave industry production function represented by,

$$Y_i = F\left(K_i, H_i, FDI_i\right), \tag{1}$$

where Y_i is the total output produced in industry i, K_i is industry-fixed capital, H_i is human capital supplied by workers. FDI_i is the share of employment in foreign-owned firms in industry i and is our proxy for the extent of foreign presence in an industry. This variable may also be interpreted in terms of the knowledge capital available in each industry. Following Aitken *et al*. (1996) the production function (1) may be rewritten as,

$$Y_i = T\left(FDI_i\right)F\left(K_i, H_i\right). \tag{2}$$

Assume, for the time being, that workers in industry i are homogeneous and supply one unit of labour (i.e., they all supply the same amount of human capital). Then the marginal product of workers in industry i is given by,

$$MP_{Hi} = T\left(FDI_i\right)F_H\left(K_i, H_i\right), \tag{3}$$

where the subscript denotes the partial derivative with respect to the indicated argument. At equilibrium

$$W_i = P_i MP_{Hi} = P_i\left[T\left(FDI_i\right)F_H\left(K_i, H_i\left(W\right)\right)\right], \tag{4}$$

where W_i and P_i represent wages and prices in industry i, and $H_i(W)$ represents the supply of labour. Given (4), the log wage (w) of workers in industry i is

$$w_i = \ln P_i + \ln T\left(FDI_i\right) + \ln F_H\left(K_i, H\left(W_i\right)\right)). \tag{5}$$

This equation constitutes the basis for our empirical analysis.

To obtain an empirical specification of (5) we assume that the level of knowledge capital in an industry is an exponential function of the industry foreign presence and expand $\ln F_H\left(K_i, H\left(W_i\right)\right)$ to first order in logs to obtain,

$$w_i = \gamma_0 + \ln P_i + \gamma_1 FDI_i + \gamma_2 \ln K_i + \gamma_3 w_i. \tag{6}$$

Rewriting this equation in a reduced form yields the regression specification,

$$w_i = \beta_0 + \beta_1 \ln P_i + \beta_2 FDI_i + \beta_3 \ln K_i + \varepsilon_i , \quad (7)$$

where the β's are coefficients to be estimated and ε is an error term. The first set of results that we present are based on estimates of this equation.

Since equation (7) controls for the effects of capital (both domestic and foreign) induced increases in wages, a positive coefficient on *FDI* in equation (7) would indicate that, independent of the effects of capital, greater foreign presence in an industry leads to higher industry wages.

It may be argued that the industry-level empirical specification obtained above has several shortcomings. Foremost, this specification does not control for several other variables that may influence wages. For instance, if foreign direct investment is concentrated in larger firms and firm size influences wages then a positive relation between *FDI* and wages may simply reflect the effect of firm size on wages. Similarly, if workers in foreign firms are more skilled (more education, more experience) then the positive relation between *FDI* and wages may simply be reflecting this feature. To allow for the effect of these individual characteristics we now drop the assumption that each worker supplies one unit of uniform quality labour (see LaLonde and Topel, 1992). We assume that the quality of labour or the human capital, *h*, supplied by worker *l* in industry *i* depends on his/her individual characteristics, *X*, so that $h_{il} = e^{X_{il}\delta + \varepsilon_{il}}$. Thus wages of individual *l* supplying *h* units of human capital is given by $W_{il} = W_i h_{il}$. This leads to the modified empirical specification,

$$w_{il} = \beta_0 + \beta_1 \ln P_i + \beta_2 FDI_i + \beta_3 \ln K_i + X_{il}\delta + \varepsilon_i + \varepsilon_{il} , \quad (8)$$

where w_{il} is the log wage of individual *l* in industry *i*.

This specification may be implemented by combining labour survey data on individual characteristics with data on industry characteristics (details about the data are provided in the following section). The second set of estimates that we present are based on this method. OLS estimation of (8) will yield consistent estimates. However, as the error structure indicates individuals in the same industry share a common error term i.e., within-industry error terms may be correlated leading to biased standard errors (see Moulton, 1986). Acknowledging this possibility our estimates of (8) correct for the effects of intra-industry error correlation on the standard errors.

As pointed out above, combining labour market data with industry data allows us to assess the impact of *FDI* on wages after controlling for the effects of individual characteristics on wages. However, these individual controls may not fully account for the special features of an industry that may be responsible for its high or low wage status. If the flow of *FDI* is influenced by the pattern of industry

wages (purged of the effect of individual characteristics on wages) then estimates of the effect of FDI on wages that do not control for such industry-fixed effects are likely to suffer from endogeneity bias. The availability of data over a three-year period allows us to tackle this issue. Equation (8) is estimated by pooling data over this period (the time subscript has been suppressed to avoid clutter). *FDI* varies over time while industry-fixed effects remain time-invariant. Pooling the data allows us to control for industry-fixed effects and mitigates the concern that *FDI* may be attracted to industries with certain wage patterns. Thus, estimates of equation (8) control for individual characteristics, as well as for industry-fixed effects and use variation in *FDI* over time to identify the relationship between FDI and wages.

An alternative approach to estimating equation (8) that has been used in papers that have combined both macro and microdata is a two-step wage premia approach (see Dickens and Katz, 1987; Gaston and Trefler, 1994). This approach corrects for biased standard errors that may arise when micro and macrodata are combined. The first step involves the regression of individual log wages on individual characteristics and industry-fixed effects (or industry wage premia). In the second step these industry-fixed effects are regressed on industry characteristics, including FDI, i.e.,

$$w_{il} = X_{il}\delta + D_{il}w_i^* + \varepsilon_{il}\left(step\ 1\right), \tag{9a}$$

$$w_i^* = \beta_1 \ln P_i + \beta_2 FDI_i + \beta_3 \ln K_i + \varepsilon_i\left(step\ 2\right) \tag{9b}$$

where D is a set of industry indicator variables, and w_i^* is the industry-fixed effect.

While this approach corrects for the effect of individual characteristics on wages and estimates of (9a) and (9b) may be readily compared with estimates based only on industry data (i.e., estimates of equation (7)) its disadvantage is that it does not allow us to use the time-variation in FDI to identify wage effects. Despite this drawback, for the sake of completeness as well as to enable comparisons we present a third set of results based on this approach.

4. Data description

The data for our paper are drawn from a variety of sources. This section describes the sources and the manner in which we combine these data, and provides a discussion of major descriptive statistics.

Our attention is restricted to the manufacturing sector and the unit of analysis in equation (7) is a two-digit manufacturing industry. There are 23 two-digit industries spanning a three-year period (1994–96) yielding a total of 69

observations. The dependent variable in these equations is the log of average net monthly wages for each industry. Our measure of capital is defined as the industry's inflation adjusted net fixed capital. This measure includes domestic and foreign capital. To lessen the potential endogeneity issues we lag net fixed capital by one period. To control for price variation across industries we include a price index that controls for yearly price changes but not for differences in the absolute price level across industries. These data on wages, capital and prices are culled from various issues of the statistical yearbook (*Rocznik Statystyczny*) published by the Polish Central Statistical Office (CSO).

Our measure of the extent of foreign participation in each sector (*FDI*) is defined as the share of industry employment in foreign-owned firms.[8] This variable may be split into two components – the share of industry employment in fully-owned foreign subsidiaries and the share of industry employment in joint venture undertakings – to provide (*FDI_FO*) and (*FDI_JV*). This information allows us to estimate a less restrictive version of (7). These data are obtained from CSO (1997a, 1997b).

Table 1. Means of selected variables – industry data
(Standard deviation)

Variable	Combined data	1994	1995	1996
Real monthly wages	477.29	452.34	473.03	506.51
	(120.34)	(108.92)	(117.23)	(132.65)
FDI	15.81	12.56	16.08	18.78
	(10.27)	(8.55)	(10.03)	(11.50)
FDI_FO	5.25	3.80	5.28	6.69
	(4.40)	(3.79)	(4.30)	(4.75)
FDI_JV	10.55	8.76	10.80	12.09
	(8.60)	(7.26)	(8.85)	(9.59)
N	69	23	23	23

Notes: Wages include bonus payments and special job performance related payments. FDI is defined as the share of industry employment in foreign-owned firms. FDI_FO is the share of employment in fully-owned foreign subsidiaries while FDI_JV is the share of employment in joint ventures. These industry data cover workers in firms employing more than 20 individuals.

[8] A firm is defined as foreign owned if ownership of any equity in the enterprise is in foreign hands. In most joint venture firms the share of foreign equity is more than 25 percent. For instance, in 1996 only 5.1 percent of all foreign firms had a foreign equity participation of less than 25 percent.

Descriptive statistics of selected industry level variables are provided in Table 1. The average real (base 1994) wage during this period is around 477 zlotys per month, with mean real wages recording an increase of 12 percent between 1994 and 1996 (from 452 to 506 zlotys per month). Approximately 15–16 percent of all manufacturing workers are employed in foreign firms with the share of foreign employment increasing from 12.5 percent in 1994 to 18.7 percent in 1996. Approximately a third of this foreign employment is in fully-owned foreign firms. Despite the overall dominance of joint ventures there are several sectors in which fully-owned foreign firms claim a larger share of employment (9 out of 23 sectors in 1996).

The detailed distribution of foreign employment across sectors for all three years of our sample is provided in Table A1. The highest share of foreign employment is in the automobile industry followed by the electronics industry. The lowest participation rate is in the coal and refined petroleum industry. While both types of FDI feature in almost all industries, it is interesting to note that fully-owned foreign firms tend to dominate industries that may be characterized as low-tech labour-intensive industries (i.e., apparel, leather and the furniture and other manufacturing industries, see Table A1).[9]

To control for individual characteristics that influence wages we combine detailed microdata on individual workers with data on the industry level variables described above. While combining these data allows us to present a more complete analysis of the impact of foreign participation it comes at a cost. The labour survey data collect information on an individual's industry of occupation only at a higher degree of aggregation. This results in fourteen manufacturing sub-sections as opposed to 23 two-digit industries.

Microdata on individual characteristics are taken from quarterly labour force surveys conducted by the Polish CSO. We restrict our attention to full-time (working 35 hours or more) hired workers, aged 15–64 (men) and 15–59 (women), working in 14 manufacturing sub-sections. Combining data on these workers from the surveys conducted in each of the years 1994–96 yields samples of 12,772 for 1994, 17,328 for 1995 and 16,926 for 1996. These combined data are used to estimate the pooled and unpooled versions of equation (8) and are also the basis for our two-step approach, i.e., estimation of equations (9a) and (9b).

Means of selected individual level variables are presented in Table 2. On the basis of this labour survey data the average net monthly wage increases from 334 to 358 zlotys, an increase of around 7 percent. The sharp differences in the wage level and wage growth between the two sets of data are explained by their

[9] This pattern may seem surprising. A stylized fact about FDI is that it tends to be more important in industries with a large share of professional and technical workers engaged in manufacturing new or technically complex products (Markusen, 1995; Lankes and Venables, 1996). However, these patterns are for FDI as a whole. The manner in which investment patterns differ by *type* of FDI is less well known. In Section 5 we provide some idea about the factors that determine the pattern of FDI in Poland; however, in order to focus on the main topic of interest we do not explore this issue in depth.

different coverage. The industry wage data include a regular wage, bonuses, and performance-based special payments while the labour survey data only include the regular wage. Further, the industry data are based on workers employed in firms with more than 50 workers while the labour survey data do not impose such restrictions (see CSO, 1996).

Table 2. Means of selected variables – individual data
(*Standard deviation*)

Variable	1994	1995	1996
Real monthly wages	334.30	334.69	358.12
	(159.95)	(159.14)	(181.19)
Male	0.605	0.609	0.615
	(0.488)	(0.487)	(0.486)
University	0.048	0.051	0.049
	(0.215)	(0.221)	(0.216)
Post secondary	0.012	0.013	0.012
	(0.110)	(0.116)	(0.112)
Secondary Vocational	0.245	0.237	0.230
	(0.430)	(0.425)	(0.420)
Secondary General	0.045	0.045	0.044
	(0.209)	(0.208)	(0.206)
Vocational	0.482	0.484	0.503
	(0.499)	(0.499)	(0.500)
Experience	17.44	17.62	17.61
	(9.76)	(10.06)	(10.20)
Urban	0.664	0.664	0.654
	(0.472)	(0.472)	(0.475)
City size-pop. > 100,000	0.280	0.272	0.259
	(0.449)	(0.445)	(0.438)
City size-pop. 50–100,000	0.100	0.106	0.104
	(0.300)	(0.308)	(0.305)
City size-pop. 10–50,000	0.208	0.207	0.214
	(0.406)	(0.405)	(0.410)
Firm size- >100 employees	0.637	0.617	0.605
	(0.480)	(0.486)	(0.488)
Firm size- 51–100 employees	0.092	0.100	0.102
	(0.289)	(0.300)	(0.302)
Firm size-21–50 employees	0.097	0.105	0.113
	(0.296)	(0.306)	(0.317)
Firm size-6–20 employees	0.125	0.128	0.131
	(0.330)	(0.335)	(0.338)
N	12,772	17,328	16,926

As may be expected, the other individual characteristics do not exhibit much variation over this time period. Individuals with vocational education dominate the educational structure (71–73 percent of the various samples) while the proportion of those with post-secondary and university education is around six percent. Average experience is around 17–18 years. The sample is largely urban (66 percent), and concentrated in smaller cities with populations of less than 10,000 inhabitants (42 percent). The majority of individuals in our sample work in establishments employing more than 100 workers.

Before we present the results it should be noted that, although the data used in our paper have some advantages they also have several drawbacks. For instance, combining detailed microdata with industry data allows us to control for individual characteristics that influence wages (rather than relying only on average industry wages) and permits an analysis of wage growth. However, unlike some of the other empirical work in this area, our industry data are particularly sparse.[10] The available industry data (at the most 23 two-digit industries) are highly aggregated and group together many heterogeneous industries. The use of this aggregate data does not allow us to distinguish between domestic and foreign firms. Thus, while we can evaluate the effect of the type of FDI on productivity/wages we cannot explore whether the wage effects of FDI are restricted to foreign firms or whether there are spillovers to domestic firms. Although this may be viewed as a shortcoming, it does not detract from the main aim of our paper which is to provide empirical evidence on the overall effects of FDI on wages and wage growth.

5. Results

5.1 Overall results

Table 3 displays a correlation matrix between the key variables in our analysis. Correlations in Column 1 are based on all industries for the three-year period 1994–96. Based on these, one may conclude that there is a negative correlation between FDI and wages (–0.21). Correlations between the two components of FDI (FDI_JV and FDI_FO) also support this idea and show that the bulk of the negative effect emanates from the correlation between FDI_FO and wages (–0.39). However, a closer examination of the data suggests that such a conclusion could be premature.

In all three years, the highest paying industry is coal and refining which at the same time receives none or negligible foreign investment (see Table A1). In the

[10] Aitken *et al.* (1996) have very detailed data at the firm level and at the four-digit industry level covering the period 1984–90 for Mexico and the period 1977–89 for Venezuela. Blomström and Persson (1983) use four-digit industry-level data from Mexico collected in 1970.

past this sector was considered socially important and accorded a special status (Jackman and Rutkowski, 1994). Although diminished, the higher wages and low foreign participation probably reflect this special status. To combat any potential contamination due to this industry, column 2 presents correlations excluding the coal and petroleum refining sector.

Table 3. Correlations between wages and FDI

	Monthly wages (1)	Monthly wages (2)
FDI	–0.2133	–0.0040
FDI_FO	–0.3995	–0.3244
FDI_JV	–0.0525	0.1622
N	69	66

Notes: Correlations in column 1 are across 23 two-digit manufacturing industries for the years 1994–96. Correlations in column 2 exclude the coal and petroleum refining industry.

The differences are striking. The correlation between FDI_JV and wages is now positive (0.16) while the correlation between FDI and wages is now negligible. Although smaller, the negative correlation between FDI_FO and wages is still pronounced (–0.32). One of the main reasons for foreign direct investment in Poland is the low cost of labour.[11] As noted earlier, FDI_FO has a dominant share in several low-wage, low-tech labour-intensive industries (see Table A1) and the negative correlation probably reflects this feature. An explanation for the sharp differences in the correlations between the two components of FDI may lie in the underlying reasons for the type of direct investment. Firms opting for joint venture operations may be interested in exploiting the domestic market and may be driven by size-of-market considerations and not wages while making their investment decisions, while fully-owned foreign subsidiaries may be driven by export considerations, explaining their location in low-wage industries. This conjecture is supported by the strong positive correlation, 0.56, between exports as a share of total output and FDI_FO. The similar correlation between exports and FDI_JV is –0.05. The dominance of FDI_FO in low-wage industries also suggests the importance of controlling for the endogeneity of wages and investment flows. In the following section we pay considerable attention to this issue.

[11] According to the survey of foreign investors conducted by PAIZ (1996), two factors – low labour costs and market size – were cited as important determinants of their location decisions. 60.8 percent of investors identified low labour costs while 49.1 percent listed market size.

Table 4. The influence of foreign presence on wages and wage premiums
(*Standard errors*)

Variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant	5.502	6.553	8.271	7.878	7.418	7.974	–0.368
	(1.407)	(1.276)	(0.586)	(0.424)	(0.241)	(0.396)	(0.520)
Net fixed capital	–0.026	–0.036	–0.007	–0.006	0.004	0.002	0.010
	(0.022)	(0.019)	(0.023)	(0.178)	(0.416)	(0.025)	(0.962)
Prices	0.164	–0.029	–0.520	–0.447	–0.354	–0.466	0.053
	(0.292)	(0.263)	(0.103)	(0.067)	(0.053)	(0.061)	(0.102)
FDI	0.0005	.	.	.	.	.	.
	(0.002)						
FDI_FO	.	–0.0202	–0.0153	–0.0045	–0.0017	–0.0046	–0.0004
		(0.0055)	(0.0045)	(0.0050)	(0.0024)	(0.0035)	(0.0023)
FDI_JV	.	0.0057	0.0121	0.0057	0.0049	0.0055	0.0037
		(0.0027)	(0.0045)	(0.0028)	(0.0019)	(0.0026)	(0.0015)
Individual characteristics	.	.	No	No	Yes	Yes	Yes
Industry-fixed effects	.	.	No	Yes	No	Yes	No
N	66	66	46,464	46,464	46,464	46,464	39
R^2	0.028	0.242	0.048	0.078	0.336	0.343	0.228

Note: Dependent variable – log of real net monthly wages (1994 prices). The individual characteristics include controls for education, experience, marriage, an urban indicator, three variables capturing city size, indicator variables for state of residence, nine occupational indicators and four variables capturing firm size.

5.2 Influence of foreign presence on wages and wage premia

Before proceeding to a discussion of our results it must be pointed out that the analysis in this section is based on datasets that exclude observations on the coal and refining industry. As discussed above, the special status of the coal and refining sector industry and the lack of foreign investment in this sector suggests that its inclusion in our analysis may obscure the relationship between FDI and wages. Accordingly, our estimates are based on data that exclude this sector.[12]

The first two columns of Table 4 present estimates based on industry data (equation 7). Estimates in column 1 show that the link between FDI and wages is positive but not very precise. The other variables, net fixed capital and prices display unexpected effects. A less restrictive version of (7) that allows us to discern the effects of FDI by investment type is presented in column 2. The increase in the explanatory power as well as a formal t-test (*p*-value 0.0001) clearly reject the imposition of a common coefficient on the constituents of FDI. The two components of FDI have sharply different effects on wages. The presence of fully-owned foreign subsidiaries seems to have a negative effect on industry wages while the effect of joint ventures is the opposite. A one percent increase in the share of fully-owned foreign employment is associated with a two percent wage reduction while a one percent increase in joint venture presence appears to increase wages by 0.6 percent. Later on in the text we provide potential explanations for this differential pattern.

As argued earlier, there may be several drawbacks associated with this industry data approach. To tackle some of these criticisms and present a more credible set of results we turn to estimates of equation (8). These estimates are based on combining labour force survey data with industry data and pooling them over a three-year period. The independent variables included in the regressions form a set of conventionally selected regressors and consist of gender, education levels (university, post-secondary, secondary vocational, secondary general and vocational), experience and its square, an urban indicator, three variables capturing city size, an indicator variable for each of Poland's 49 *voivodships* (i.e., states), nine occupational indicators and four variables that control for firm size.

Combining the two datasets leads to a drop in the number of industrial sectors from twenty-two to thirteen. To examine the impact of this aggregation, the third column in Table 4 presents estimates based on a specification that does not control for individual characteristics or industry-fixed effects and closely matches the specification reported in Table 4, column 2. A comparison of the two sets of

[12] While the validity of this exclusion may be questioned, the sharp change in the correlations and knowledge of the institutional arrangements in Poland (i.e., the importance and protection still accorded to this sector) suggests that excluding it from the analysis is appropriate. In any case, we included the coal sector in regressions that controlled for industry-fixed effects. These estimates revealed the same pattern on the FDI coefficients as displayed in Table 4.

results shows that estimates based on the merged data are higher in magnitude than those based only on the industry data. In terms of their sign configurations there are no differences between the two sets of estimates. The overall impression appears to be that aggregating the number of industries does not substantially alter the results.

We now turn to other issues. It is possible that the relationship between the two components of FDI and wages is subject to endogeneity bias. For instance, foreign direct investment may systematically be attracted to sectors with a low wage (high wage) and so explain the negative (positive) relationship between FDI_FO (FDI_JV) and wages. One way to tackle this possibility is to include a set of industry dummy variables that control for the particular nature of an industry (industry-fixed effects). Accordingly, estimates presented in column 4 include dummy variables for each of the industries in our sample. The inclusion of these variables leads to a noticeable change in the results. The magnitude of the negative coefficient on FDI_FO drops considerably and the coefficient loses its statistical significance. This change shows the importance of controlling for industry-fixed effects. Without these controls we would conclude that there is a negative relationship between FDI_FO and wages. However, the estimates in column 4 inform us that the negative correlation between FDI_FO and wages may be attributed to the tendency of fully-owned foreign firms to invest in low-wage industries. Turning to FDI_JV we see that while there is a considerable fall in the magnitude of the coefficient it remains statistically significant. This pattern suggests that after controlling for the tendency of joint ventures to set up operations in high wage industries, there remains a distinct and positive effect of FDI_JV on wages.

As discussed before it is also important to control for the effects of individual characteristics on wages. Estimates presented in column 5 include a vector of variables that control for various individual characteristics that may have a bearing on the relationship between foreign direct investment and wages (industry dummy variables are not included in this specification). A comparison of the estimates in column 3 and column 5 shows that the inclusion of these controls leads to a dissipation of the negative FDI_FO effect and a diminution of the FDI_JV effect, although the coefficient remains statistically significant. The pattern of results suggests a substantial portion of the negative effect between FDI_FO and wages may be attributed to the characteristics of workers who work in industries that have a high presence of fully-owned foreign firms. Similarly, the diminution in the FDI_JV effect suggests that a portion of the positive relationship between FDI_JV and wages may be attributed to the characteristics of workers who work in industries where there a large number of joint venture operations.

So far we have controlled for industry-fixed effects or individual characteristics. Our next specification includes both sets of controls. These estimates, presented in column 6, are not very different from those presented in columns 4 and 5. The stability of the results across these specifications suggests

that the inclusion of industry-fixed effects *or* the inclusion of individual controls appears to be sufficient to control for the potential endogeneity of FDI and wages.

In the last column of Table 4 we present results based on the wage premia approach (equations 9a, 9b). In the first step, monthly log wages for manufacturing workers is regressed on a vector of individual controls that includes a set of indicator variables for the industry in which an individual works. These industry-fixed effects, purged of the influence of individual characteristics that influence wages, are in turn regressed on industry characteristics. Results based on this approach are consistent with those already established. A comparison of these estimates and those in column 2 once again highlights the importance of controlling for individual heterogeneity. Without these controls the negative effect of FDI_FO on wages would be exaggerated.

Although restricted to FDI_JV, regardless of the empirical strategy, it appears that there is a positive relationship between foreign direct investment and wages. In terms of magnitude the positive impact of FDI_JV there is a 0.4–0.6 percent increase in wages for a one percent increase in FDI_JV.

So far we have commented mainly on the effects of the FDI variables. Of particular concern is the negative and statistically insignificant effect of capital stock on wages. *A priori* one may expect a positive relationship between capital stock and wages (see Aitken *et al.*, 1996). It is possible that the imprecise result that we report is driven by measurement error. Alternatively, the lack of a link may be attributed to the vestiges of the previous regime where investment decisions may not have been well co-ordinated and (state) enterprises may continue to possess a large amount of unproductive capital stock. If this were true, then over time with increasing privatization and better utilization of capital, one would expect the negative link between capital stock and wages to decline. There does seem to be some evidence to support this idea. During the three-year period covered by our data the negative correlation between capital stock and wages declines from –0.2 in 1994 to –0.13 in 1996. At the same time the unweighted share of the private sector in manufacturing output increases from 36.7 in 1993 to 65.2 in 1996 (Barrell and Holland, 2000).

5.3 Sensitivity analysis

5.3.1 Instrumental variable estimates

Although our estimates appear to have accounted for the possible endogeneity of foreign direct investment, they may still be subject to specification biases due to incomplete correction and/or due to measurement error. In order to probe the effects of these possibilities we decided to instrument FDI_FO and FDI_JV. Furthermore, since net fixed capital is a combination of domestic and foreign capital it would seem appropriate to instrument it as well. The instruments that we use are similar to those used by Aitken *et al.* (1996). We use three instruments

based on the idea that labour costs in the United States,[13] one of Poland's most important sources of foreign direct investment, are likely to be an important determinant of the industrial composition of foreign investment but are not likely to play a role in determining wages in Poland. The instruments we use are wages in US manufacturing industries, wages as a proportion of output and wages as a share of value added.

Instrumental variable estimates are presented in Table 5, column 1. To permit comparisons, OLS estimates are presented in column 2. The key difference between the two sets of results is the substantially larger IV estimate of the effect of FDI_JV on wages. The IV estimate indicates that a one percent increase in FDI_JV leads to a 2.6 percent increase in wages. In contrast the OLS estimate indicates a 0.6 percent wage effect. The larger IV estimate is consistent with the possibility that FDI_JV is measured with error. On a more formal note, a Hausman specification test rejects the null hypothesis that the OLS estimates are not subject to specification error with a p-value of 0.0152.[14] Despite the differences in magnitude and the implications of the Hausman test, the important point to note is that regardless of the estimation method there seems to be a positive and statistically significant relationship between FDI_JV and wages.

5.3.2 Time-fixed effects, trade tariffs, barriers to entry and competition

The relationship between foreign direct investment and wages has been identified using industry-specific changes in FDI over time. However, our estimates do not control for any exogenous time varying measures that may affect both wages and foreign direct investment across all industries. To account for the potential role of such an effect we now include time-fixed effects in our regressions. Since Hausman specification tests supported the IV specification, for the most part we discuss and present IV estimates. Results including time-fixed effects are presented in Table 5 column 3. The coefficient on FDI_JV is now larger and retains its statistical significance while the coefficient on FDI_FO is positive although still imprecise. The time dummy for 1995 is negative and statistically significant suggesting that the previously recorded negative effect of FDI_FO may have been due to a time effect. Despite these changes the inclusion of the time dummies does not overturn our earlier conclusions.

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[13] Despite Germany being the largest source of foreign investment in Poland, we use data on US manufacturing as we were unable to obtain similar data for German manufacturing industries. The US data are obtained from the International Statistical Year Book, 1997, DSI, Data Services and Information.

[14] These IV estimates and this particular test are valid provided the instruments are highly correlated with the pattern of foreign direct investment in Poland. This requirement seems to be satisfied. First-stage regressions of net fixed capital, FDI_JV and FDI_FO on these instruments yield R^2s of – 0.3851, 0.4432 and 0.4114, respectively. Additionally, as suggested by Bound *et al.* (1995) the quality of instruments may be gauged by examining whether F-tests reject the exclusion of the instruments from the first stage regressions. F-tests for excluding the instruments from the net fixed capital, FDI_JV and FDI_FO equations record p-values of 0.0008, 0.0012 and 0.0005, respectively, indicating their high statistical significance.

Table 5. The influence of foreign presence on wages: IV estimates and additional sensitivity checks

Variable	(1) IV	(2) OLS	(3) IV	(4) IV	(5) IV	(6) OLS	(7) IV
Constant	8.563	7.974	4.638	3.664	0.321	6.534	3.801
	(2.540)	(0.396)	(1.795)	(3.13)	(2.37)	(0.617)	(2.18)
Net fixed capital	–0.116	0.002	–0.071	–0.082	–0.053	0.015	–0.062
	(0.086)	(0.025)	(0.054)	(0.059)	(0.034)	(0.019)	(0.058)
Prices	–0.408	–0.466	0.271	0.432	1.052	–0.151	0.438
	(0.413)	(0.061)	(0.840)	(0.567)	(0.440)	(0.124)	(0.397)
FDI_FO	–0.0026	–0.0046	0.0235	0.0287	0.0555	–0.0102	0.0271
	(0.0194)	(0.0035)	(0.0132)	(0.0222)	(0.0189)	(0.0036)	(0.0161)
FDI_JV	0.0256	0.0055	0.0522	0.057	0.0757	0.004	0.0386
	(0.0134)	(0.0026)	(0.0111)	(0.0146)	(0.0139)	(0.0019)	(0.0181)
Time dummy, 1995 = 1	.	.	–0.034	–0.023	–0.023	0.009	–0.036
			(0.008)	(0.016)	(0.010)	(0.016)	(0.037)
Time dummy, 1996 = 1	.	.	–0.016	0.010	0.039	0.084	–0.004
			(0.017)	(0.408)	(0.017)	(0.037)	(0.037)

Table 5 (cont). The influence of foreign presence on wages and wages: IV estimates and additional sensitivity checks

Variable	(1) IV	(2) OLS	(3) IV	(4) IV	(5) IV	(6) OLS	(7) IV
Tariffs*10	.	.	.	0.003	0.006	0.004	.
				(0.003)	(0.002)	(0.005)	
Foreign firms*100	.	.	.	.	0.020	0.040	.
					(0.012)	(0.022)	
Domestic firms*100	.	.	.	.	–0.023	–0.028	.
					(0.006)	(0.050)	
Time dummy,1995*FDI_FO	.	.	.	.	.	.	0.001
							(0.003)
Time dummy,1996*FDI_FO	.	.	.	.	.	.	–0.001
							(0.003)
Time dummy, 1995*FDI_JV	.	.	.	.	.	.	0.002
							(0.001)
Time dummy, 1996*FDI_JV	.	.	.	.	.	.	0.004
							(0.002)
N	46,464	46,464	46,464	37,725	37,725	37,725	46,464
R^2	0.344	0.343	0.345	0.351	0.351	0.351	0.345

Notes: Dependent variable – log of real net monthly wages (1994 prices). All specifications include individual characteristics and industry-fixed effects. The individual characteristics include controls for education, experience, marriage, an urban indicator, three variables capturing city size, indicator variables for state of residence, nine occupational indicators, and four variables capturing firm size.

A time trend, such as the one we have included, exerts a universal influence on all industries. It is possible that our estimates may be driven by other industry-specific time-varying measures such as trade tariffs or the level of competition. We first examine the impact of trade tariffs on our results. Higher tariffs in a particular industry will increase the price of imports and restrict their entry into the domestic market. In turn, this restriction may increase the demand for labour and increase wages for workers in that particular industry. Thus, the estimated link between foreign direct investment and wages may be driven by the presence of higher tariffs in industries with higher levels of foreign direct investment. To examine the effect of tariffs we computed the industry-specific tariff rate imposed by Poland on imports from the European Union (Poland's main trading partner) and included this measure in our regressions.[15] As displayed in Table 5, column 4 the estimates are robust to the inclusion of the tariff measure.

We now consider the potential role of barriers to entry. Barriers to entry and correspondingly the level of competition across industries may differ. High barriers to entry in a particular industry may limit the number of producers and limit competition in the product market. In turn, this limited competition may have an impact on the pattern of wage increases. If FDI_JV is concentrated in sectors with high barriers to entry then the association between foreign direct investment and wages may be driven by this aspect rather than by foreign direct investment. Although, far from perfect, we include two variables – the number of foreign firms and the number of domestic firms in a particular industry – to account for the level of competition in an industry.[16] IV estimates including these variables in addition to the time trend and the tariff variable are presented in Table 5, column 5. There is an increase in the magnitude of the FDI variables but the sign pattern is the same as that established in the estimates presented in columns 2 and 3.

To enable further comparisons between IV and OLS results, in column 6, we provide OLS estimates that include time-fixed effects, the tariff measure and our measures of competition. The estimates of the coefficients on the foreign direct investment variables continue to display the same sign configuration and the size of the effects is also in the same range as reported in the set of OLS estimates presented in Table 4.

In the preceding section we pooled data over a three-year period and used changes in FDI over time to establish that wages (wage premia) are higher in industries with a greater foreign presence. The pooled data provide an estimate of

[15] We were unable to obtain data on the tariffs imposed by Poland on food and beverage products from the EU. Thus, we are forced to estimate the tariff-inclusive regression on a smaller set of observations.

[16] The expected link between competition and wages is difficult to determine. Since our aim is to examine the sensitivity of our results we do not hazard a guess. In addition, given the variables that we use as proxies for competition it is not clear whether these variables capture competition in the product market or the labour market. Given the considerable unemployment (between 14–16 percent) over the period we examine, it is likely that these variables capture competition in the product market.

the average FDI effect on wages during the three-year period. Pooling the data does not reveal the dynamics of the relationship between FDI and wages. To enhance our analysis we now propose to examine the temporal relationship between foreign presence and wages. *A priori* one may expect that if foreign investment leads to the provision of indirect productive inputs then the coefficient on FDI should become increasingly positive over time. On the other hand if FDI is not associated with the provision of these inputs then its effect on wages should not change over time.

To examine this relationship one may estimate separate regressions for each of the years and examine the pattern of coefficients on the FDI variables. A drawback of this approach is that it does not allow controls for industry-fixed effects.[17] A slightly more restrictive approach, although one which allows control for industry-fixed effects, is to interact the FDI variables with time-fixed effects. This allows the effect of the FDI variables to vary over time. Estimates with these interacted variables are presented in the last column of Table 5. The coefficients on both the FDI variables are positive, although only the coefficient on FDI_JV is significant at conventional levels. The coefficients on the interacted variables reveal that over time the effect of FDI_JV on wages becomes stronger. This suggests that over time this variable plays an increasingly important role in determining wages and promoting wage growth. In contrast the effect of FDI_FO does not follow any clearly discernible pattern.

5.3.3 Other potential explanations

In this section we consider other explanations that may be responsible for the observed positive effect of FDI_JV on wages. The positive wage effect of FDI_JV may reflect a 'sloughing effect' (Gaston, 2002). The entry of foreign firms into an industry may be accompanied by the shedding of less skilled workers leading to an increase in average wages (wage premia) and a decline in total employment. The available data (see Table 2) do not appear to support this story. During the three-year period covered by our data the observed skill (educational structure and experience) endowments of manufacturing workers remains virtually unchanged. Overall manufacturing employment displays negligible change from 20.5 percent in 1994 to 20.4 percent of the working population in 1996 (see CSO, 1997c), and the absolute number of workers employed as well as the share of foreign employment increases in almost all industries (see CSO, 1997a).

Another potential explanation for the positive link between foreign direct investment and wages may lie in the 'brain-drain' effect. If there is a flow of highly skilled workers from domestic firms to foreign firms then the positive link between FDI_JV and wages may be due to labour reallocation. This effect does

[17] Despite the inability to control for industry-fixed effects, in earlier versions of the paper we ran separate regressions for each year and carried out a Blinder-Oaxaca decomposition of wage growth at the mean. This decomposition revealed that the foreign presence in an industry played a substantial role in determining wage growth. Detailed results are available.

not appear to drive our results. If foreign presence simply results in a re-allocation of the most productive workers from domestic to foreign firms and does not increase the productivity of workers in an industry then FDI_JV should have no effect on average industry wages or on wage premia.[18] However, as our results consistently show, there is a clearly discernible impact of FDI_JV on average industry wages and on wage premia.

Regardless of the empirical approach and the specification, the results presented in Tables 4 and 5 show that greater foreign presence in an industry is associated with higher wages. A noticeable feature of these results is the sharp difference in wage effects by type of FDI. It may be tempting to hypothesize that the differential effect reflects that setting up fully-owned subsidiaries allows foreign firms to completely internalize the gains from their proprietary assets while setting up joint venture undertakings is not as effective. While this may be the case, in our view, the most likely explanation for this pattern is simpler and lies in the sectoral breakdown of FDI. As Table A1 shows, fully-owned foreign firms and joint ventures are located in very different types of industries. Fully-owned foreign subsidiaries are dominant largely in low-wage, low-tech industries (apparel, leather, furniture and other manufacturing) while joint ventures are located in more high-tech industries. We believe that the lack of wage effects in the case of FDI_FO is due to the fact that that these ventures are located in low-tech industries where knowledge capital may not be as important and room for spillovers is probably limited. A somewhat similar finding is reported in Burrell and Holland (2000). The authors find that labour productivity in the leather, transport equipment and other manufacturing sectors, that is sectors with a higher presence of fully-owned foreign ventures, is not related to the stock of FDI.

Our sectoral breakdown explanation of the differential effects of FDI immediately raises the question – why are joint ventures located in high-tech industries and fully-owned ventures in low-tech industries? The observed outcome could be a result of government policy. Although there appear to be almost no restrictions on patterns of foreign direct investment in Poland (see www.paiz.gov.pl), it is possible that the sectoral distribution of FDI may be a result of deliberate government policy which encourages (restricts) joint ventures (fully-owned foreign subsidiaries) in certain relatively high-tech sectors.

The sectoral breakdown may also be explained from a risk-sharing perspective. Despite the higher possibility of asset dissipation, given the relatively higher level of investment required to begin operating in a high-tech sector and a foreign firm's limited knowledge of the Polish economic and legal environment, a joint-venture may have been the optimal arrangement. A joint-venture would

[18] It may be argued that the flow of skilled workers to foreign firms may force domestic firms to pay higher wages and hence a positive link between foreign direct investment and industry wages may arise due to increased competition for workers and may have nothing to do with productivity. As discussed in the text, we have estimated regressions that include controls for the level of competition across industries and over time. Our results are robust to the inclusion of such controls.

allow a foreign investor to draw on the knowledge and expertise of a domestic partner and to share the risks associated with investing in Poland. Thus, in the early years of the transition process the risks associated with investing in Poland may have rendered a joint-venture the optimal arrangement for investing in a high-tech sector.[19] Regardless of the factors that are responsible for the underlying pattern of FDI, the results presented in Tables 4 and 5 consistently show that greater foreign presence in an industry is positively associated with higher wages. The results are, for the most part, robust to the endogeneity of the FDI variables, changes in the empirical approach and changes in the specification. Based on the relatively smaller OLS estimates we find that a one percent increase in foreign presence translates into a 0.4–0.6 percent increases in wages.

6. Conclusion

Our primary aim in this paper was to examine the effect of foreign direct investment on wages in Poland. The results presented suggest a positive link between wages and foreign presence in an industry. In particular, we found that workers in industries with a higher presence of joint venture foreign direct investments enjoy higher wages. This result appeared to be robust to a variety of different specifications and approaches. Furthermore, our analysis showed that the magnitude of the foreign presence effect increases over time suggesting that workers in industries with greater foreign participation experience faster wage growth. The results reported in this paper appear to be consistent with those reported in Barrell and Holland (2000). Their result of a positive link between foreign direct investment and labour productivity is similar to our result of a positive link between foreign presence and wages. Our findings, coupled with their results, supports the notion that in Poland foreign direct investment appears to serve as a channel for diffusing knowledge.

[19] If this hypothesis is true then one may expect that as the risk of investing in Poland declines or as foreign firms acquire more knowledge about Poland the share of joint ventures should decline (overall and in relatively high-tech sectors). While it is very limited there does appear to be some support for this idea. As displayed in Table 1, between 1994 and 1996 the share of FDI_FO in total FDI increased from 30 percent to almost 37 percent.

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Appendix Table A1. Wages and share of foreign employment

Industry	1994			1995			1996		
	Wages	FDI_FO	FDI_JV	Wages	FDI_FO	FDI_JV	Wages	FDI_FO	FDI_JV
Food, Beverages	382.66	4.11	8.72	399.74	5.36	10.5	425.88	6.65	11.7
Tobacco	582.36	2.23	0	622.37	2.63	0	799.96	3.60	0
Textiles	348.05	1.98	1.26	353.61	2.62	2.51	366.75	3.59	1.97
Apparel	301.5	17.0	7.70	297.24	17.9	8.24	298.77	17.6	8.13
Leather, Leather Products	305.86	5.00	0.87	318.33	7.44	2.24	337.38	7.71	3.33
Wood, Wood Products	357.65	3.28	5.71	366.93	5.14	5.75	380.60	6.49	5.89
Pulp, Paper Products	458.21	2.83	24.0	522.19	4.34	26.9	551.57	6.09	27.3
Publishing, Printing	508.17	6.68	8.67	533.46	8.54	9.41	582.38	11.9	6.97
Coal, Refined Petroleum	806.84	0	0	854.55	0.25	0	863.13	0.66	0
Chemical Products	514.22	2.83	4.49	562.37	3.24	7.80	610.50	4.65	10.4
Rubber, Plastic Products	445.78	3.01	4.29	472.08	9.93	14.6	479.15	11.8	20.9
Non-metal Mineral Products	404.79	1.41	15.7	430.15	3.19	16.3	457.19	3.87	17.5
Basic Metals	535.35	0.07	6.54	557.03	0.13	7.81	598.33	0.12	8.99
Fabricated Metal Products	395.84	2.10	10.9	416.72	3.07	8.44	440.62	4.16	10.3
Machinery & Equipment	410.03	0.88	6.32	433.74	1.36	8.24	466.60	1.90	9.58
Office Machinery	488.10	8.01	19.4	483.40	4.55	24.3	534.31	4.67	22.4
Electrical Machinery	450.6	4.62	12.5	467.94	9.69	12.7	502.27	12.3	17.5
Telecom, TV's and Radios	435.73	4.04	20.6	467.50	5.06	25.3	506.76	12.4	25.1
Precision Instruments	454.07	2.35	2.50	475.13	5.58	2.90	498.94	6.09	7.79
Motor Vehicles	441.57	1.36	19.1	460.40	2.38	30.6	511.82	4.90	37.2
Other transportation equipment	456.84	0.51	0.29	472.79	0.78	0.40	496.93	0.96	0.86
Furniture, other manufacturing	344.54	10.1	6.16	355.50	13.4	8.61	368.99	15.5	8.19
Recycling and Utilization	575.13	2.93	15.5	556.55	4.85	14.7	570.93	6.12	16.0