WAGES AND WAGE GROWTH IN POLAND: THE ROLE OF FOREIGN DIRECT INVESTMENT

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ABSTRACT

In recent years Poland has received substantial flows of foreign direct investment. This paper combines detailed labour market data with industry data from the Polish manufacturing sector to examine the effects of these foreign direct investment flows on wages and wage growth. The empirical evidence that we assemble suggests that workers in industries with greater foreign presence enjoy higher wages and higher wage growth. In addition, the foreign presence effect appears to stimulate wage growth all along the wage distribution and does not appear to be responsible for any increases in wage inequality.

I. INTRODUCTION

The sharp decline in gross domestic output (GDP) in the immediate years succeeding the "big bang" reforms in Poland have been followed by several years of sustained economic growth.[1] The resumption of growth has been widely attributed to the success of the comprehensive reforms undertaken by the Polish government. One element of these wide ranging 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.[2] 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 though to be associated with its flow. A prominent benefit is that, the flow of FDI allows developing countries access to proprietary productive knowledge which multinational corporations (MNC) may possess.[5] As characterised 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 to devel-

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

[2] In 1987 the share of these *Polonia* firms in total employment was around 0.3 % (Balcerowicz, 1995).

[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 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 takes place between developed countries, foreign investors are increasingly attracted to transition countries like Poland. Between 1990 and 1998, Poland attracted almost $ 23 billion, roughly twice as much as Japan in the same period (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, subcontracting to local firms, or through indirect channels such as labour mobility or imitation.

oping and transition countries. According to the Bank's development guidelines, if these 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 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 compared to more traditional inputs. While there are several ways in which this ideas gap may be bridged, he argues that the quickest and most reliable way to bridge the growth hindering effects of the ideas handicap is to create a domestic economic environment conducive to the flow of foreign direct investment.

Despite the importance attributed to these 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 productivity of workers which in turn should manifest itself in an increase in wages. 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 hope to draw some insights on the role of foreign direct investment 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 III presents an analytical framework. Section IV describes the data, section V presents results and section VI concludes.

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[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).

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) of a multinational firm which enables it to compete in the domestic market. From the perspective of a host country, potential access to these scarce intangible inputs, through training and the local diffusion of knowledge and technology, 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. Business-oriented case studies identify a number of potential channels through which foreign firms can and do influence the performance of the host country.[7] Despite these studies the quantitative impact of foreign firms in spreading knowledge is hard to ascertain.

In the Polish context a recent survey (Bak and Kulawczuk, 1996) suggests that the presence of foreign firms has had a substantial impact on domestic firms. Based on a survey of managers in foreign corporations 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, 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 examines wage effects. Papers belonging to the first genre, such as, Caves (1974), Globerman

[7] For references and a survey of the technology and export marketing benefits conferred by foreign corporations see Helleiner (1989).

(1979), Blomstrom 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, studies by Blomstrom and Wolff (1994) and Sjoholm (1997) find that labour productivity in domestically owned firms is positively related to foreign presence.

Contrary to these papers, a detailed OECD study (Gerimidis, 1977) of multinationals operating in twelve developing countries finds no discernible effects of foreign presence on domestic firms. Recent work using data from 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. Similarly, in a study using data from the Czech Republic, Djankov and Hoekman (1998), find that foreign presence has a negative impact on the performance of local firms.

In an alternative attempt at gauging the flow of productive knowledge, Aitken et al. (1996) examine 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 have 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 lack of positive effects for domestic firms may be attributed to a range of factors. These may include, limited labour turnover between foreign and domestic firms, limited hiring of domestic employees in key positions, and limited subcontracting to local firms (Aitken and Harrison, 1999).

The variation in results across these papers makes it difficult to draw generalisations 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 wage levels and their growth over time. By examining these links we hope to draw implications for the role of foreign direct investment in spreading knowledge.

Although our empirical approach and the aim of our analysis is similar to the papers cited above, there are important differences. First, the papers discussed here are largely concerned with spillovers from foreign to domestically owned firms. In contrast, our analysis does not make a distinction between foreign and domestic firms as we are

concerned with the overall impact of FDI on the host economy, rather than whether there are spillovers to domestically owned firms.[8] Second, these previous studies are based on firm-level data and are able to distinguish between foreign and domestic firms but are unable to control for the role of individual characteristics in determining productivity and wages. The data we use does not allow us to distinguish between domestic and foreign firms. While this may be a drawback the data we use also confers some advantages. Our detailed labour market information allows us to control for the characteristics of individual workers in determining wages, permits us to analyse wage growth in greater detail and to examine whether foreign presence plays a role in exacerbating wage gaps between workers. Thus, our paper may be placed in a line of research that focuses more on wage determinants rather than spillovers, although it combines some features of both approaches.

3. 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.

The following framework formalises 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

$$Y_i = F(K_i, H_i, FDI_i), \quad (1)$$

where Y_i is the total output produced in industry i, K_i is 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,

$$Y_i = T(FDI_i)F(K_i, H_i). \quad (2)$$

[8] 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.

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,

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

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

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

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

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

This equation is 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 $\ln F_H(K_i, H(W_i))$ 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 reduced form yields the regression specification,

$$w_i = \beta_0 + \beta_1 \ln P_i + \beta_2 FDI_i + \beta_3 \ln K_i + \varepsilon_i, \tag{7}$$

where the β's are coefficients to be estimated and ε is an error term. This equation forms the basis for the first set of results that we present.

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 labor. We assume that the quality of labor 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). 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 upward biased standard errors. A two-step wage premiums approach corrects for this bias (see Gaston and Trefler, 1994 and references therein).[9] In the first step we regress individual log wages on individual characteristics and industry fixed effects (or industry wage premiums)[10]. In the second step these industry fixed effects are regressed on industry characteristics, i.e.,

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

$$w_i^* = \beta_1 \ln P_i + \beta_2 FDI_i + \beta_3 \ln K_i + \varepsilon_i \ (step\ 2) \quad (9b)$$

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

The industry level specification (7) and the two-step approach (9a, 9b) outlined above, allow an assessment of the effect of foreign direct investment on wages. The availability of data over a three year period suggests that we can enhance our analysis by investigating the impact of foreign direct investment on wage growth. To do so we estimate equation (8) for each of three years. These estimates are corrected for biased standard errors due to intra-industry error correlations. Using these estimates we conduct (i) a standard Blinder-Oaxaca decomposition of the sources of wage growth at the mean

[9] Alternatively we may persist with the one step approach and correct the standard errors for intra-industry error correlations. However, to enable a comparison of results based on industry data and combined industry and individual data we follow the two-step approach.

and (ii) using methodology developed by Juhn et al. (1993), a more detailed decomposition of the sources of wage growth at different percentiles of the wage distribution.

A key advantage of estimating specification (8) for each of three years is that it allows us to tackle the potentially endogenous nature of *FDI* and wages. For instance, if foreign investment is attracted towards industries with lower wages then the coefficient on *FDI* obtained from the specifications above may be biased downwards. Even if this is true, over time, if foreign investment leads to the provision of indirect productive inputs and promotes knowledge diffusion then the coefficient on *FDI* should become increasingly positive (i.e. over time the negative influence should decline or the positive influence should increase), on the other hand if *FDI* is not associated with the provision of these inputs then the effect of *FDI* on wages should not change over time.

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 some descriptive statistics.

Our attention is restricted to the manufacturing sector and the unit of analysis in equation (7) is a two digit manufacturing industry.[11] There are 23 two digit industries spanning a three year period (1994-1996) 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 year book (*Rocznik Statystyczny*) published by the Polish Central Statistical Office (CSO).

[10] We do not delve deeper into the exact source of these industry wage differentials except to note that their existence is still a subject of inquiry (see Gibbons and Katz, 1992).

[11] These manufacturing industries are classified on the basis of two digit EKD codes i.e. *Europejska Klasyfikacja Dzialnosci* or the European system of classification.

Our measure of the extent of foreign participation in each sector (*FDI*) is defined as the share of industry employment in foreign-owned firms.[12] 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).

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. A third of this foreign employment is in fully owned foreign firms. The share of these fully owned foreign firms in total foreign employment displays a slight increase from 30 percent in 1994 to almost 36 percent in 1996. 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 sectoral distribution of foreign employment for all three years 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 coke and refined petroleum industry. While both types of FDI prevail 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 labor intensive industries (i.e., apparel, leather and the furniture industry, see Table A1).[13]

To control for individual characteristics that influence wages we combine detailed micro data on individual workers with data on the industry level variables described above. While combining these data allow us to present a more complete analy-

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[12] 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.

[13] This pattern may seem surprising. A stylized fact about FDI is that, among other industry traits, 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). However, these patterns are for FDI as a whole. The manner in which investment patterns differ by *type* of FDI is less well known. It is interesting to speculate about the factors that determine the different investment patterns by type. While we do provide some idea about these factors (in section V), in order to focus on the main topic of interest we do not discuss this issue in depth.

sis of the impact of foreign participation it comes at a cost. The labour survey data collects information on an individuals industry of occupation only at a higher degree of aggregation. This results in 14 manufacturing subsections as opposed to 23 two-digit industries.

Micro data 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 subsections. [14] Combining data on these workers from the surveys conducted in each of the years 1994-1996 yields samples of 12,772 for 1994, 17,328 for 1995 and 16,926 for 1996. These data form the basis of our first step estimates where individual log wages are regressed on several individual characteristics and yield industry wage premiums (14 for each of three years) which are in turn regressed on industry characteristics. The combined individual and industry data are also used to estimate equation (8) and are the basis for our analysis of wage growth.

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 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). 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 6 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, com-

[14] These age restrictions correspond to the different retirement ages for men and women.

bining detailed micro data 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.[15] 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 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

We first present estimates based on industry level data (equation 7). These are followed by estimates based on the wage premiums approach (9a, 9b). Finally, to detect the dynamic links between FDI and wages we present estimates of equation 8 for each of the years that our data covers.

Table 3a 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 this conclusion may be unwarranted.

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 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 refining sector.

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[15] Aitken et al. (1996) have very detailed data at the firm level and at the four-digit industry level covering the period 1984-1990 for Mexico and the period 1977-1989 for Venezuela. Blomström and Persson (1983) use four-digit industry level data from Mexico collected in 1970.

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.[16] As noted earlier, FDI_FO has a dominant share in several low-wage, low-tech labor 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 and hence 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.[17] The dominance of FDI_FO in low-wage industries also suggests the importance of controlling for the endogeneity of wages and investment flows. This is an issue that we pay considerable attention to in the next section.

5.1 The influence of foreign presence on wages and wage premiums

Table 4 presents estimates based on industry data. Estimates in column 1 show that the link between FDI and wages is negative and not very precisely measured. 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 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

[16] According to a recent survey (PAIZ, 1996) of foreign investors, two factors - low labor costs and market size - were cited as important determinants of their location decisions. 60.8 percent of investors identified low labor costs while 49.1 percent listed market size.

[17] 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 in addition to the strategic export objective the sectoral distribution of FDI by type may be a result of deliberate government policy aimed at encouraging (restricting) joint ventures (fully owned foreign subsidiaries) in certain sectors.

effect of joint ventures is the opposite. Later on in the text we provide potential explanations for this differential pattern.

As discussed above, the special status of the coal and refining industry and its effect on the correlations (Table 3a and 3b) suggests that it may obscure the relationship between FDI and wages. Accordingly, in columns 3 and 4 and in the succeeding sections we present estimates that exclude this sector.[18] Although similar to the pattern established earlier, exclusion of the coal and refining sector sharpens the results. 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 increases wages by 0.6 percent.

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 the wage premiums approach (equations 9a, 9b). Monthly log wages for manufacturing workers are regressed on a set of individual characteristics including a set of indicator variables for the industry in which an individual works.[19] 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 presented in Table 5.

In contrast to the earlier estimates (results based on the two approaches can be compared by examining estimates in columns 3 and 4 of Table 4 and columns 1 and 2 of Table 5), net fixed capital and prices exert a positive influence on wages. The effect of FDI on wages is positive and significant indicating that a one percent increase in foreign presence increases monthly wages by 0.2 percent. It is possible to discern the underlying reasons for this change by looking at the results in column 2.[20] The negative effect of FDI_FO is considerably smaller and is no longer significant, while the effect of FDI_JV is in the same range as the earlier set of estimates.

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[18] While the validity of such an 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.

[19] The independent variables form a conventionally selected set of regressors and includes, 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 thirteen industry indicators.

[20] A t-test (p-value 0.0554) rejects the null hypothesis of a common coefficient on FDI_FO and FDI_JV.

The drop in the magnitude of the FDI_FO coefficient highlights the importance of controlling for individual heterogeneity. Without these controls the negative effect of FDI_FO is pronounced and reflects the tendency of fully owned foreign subsidiaries to locate in low wage industries (i.e. industries with less skilled workers). The reduction in the size of the coefficient suggests the endogeneity of wages and FDI_FO, and that the use of individual data reduces some of these biases. In contrast to this sharp change, the stability of the FDI_JV coefficient supports the idea that labor costs are not a crucial consideration in the location of joint ventures and that FDI_JV and wages may be exogenous.

5.2 Sensitivity analysis

Having established that an increase in FDI exerts a positive influence on wages we turn to an exploration of the robustness of our results. Despite the individual controls it may be argued that the positive effect of FDI_JV on wages (a one percent increase in FDI_JV leads to a 0.4 percent increase in monthly wages) is driven by firm-size effects. If joint ventures are located in large firms then the effect of FDI_JV on wages may simply be reflecting this feature. In recent work, Lipsey (1994) finds that the inclusion of controls for firm size leads to a dissipation of the positive effect of foreign ownership on wages. To tackle this issue we re-estimate our two-step model with the inclusion of four firm-size controls in the first step regression.[21] Industry wage premiums based on this expanded regression are then regressed on industry characteristics. These results are reported in columns 3 and 4 of Table 5. While firm size does influence individual wages (as may be seen in Table 6) the impact on industry wage premiums is minimal. The results presented in columns 3 and 4 are similar to those in columns 1 and 2 and support the pattern of results already established.

Another potential explanation for the positive wage effect of FDI_JV is that it may reflect a "sloughing effect" (Gaston, 1998). The entry of foreign firms into an industry may be accompanied by the shedding of less skilled workers leading to an increase in wage premiums and a decline in total employment. The available data (see Table 2) do not support this story. During the three year period covered by our data the

[21] Here we re-run our first step regression (equation 9a) including four variables that capture firm size. The new set of industry wage premiums (now purged of firm size effects) are in turn regressed on industry characteristics (9b).

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), while the absolute number of workers employed as well as the share of foreign employment increases in almost all industries (see CSO, 1997a). Another reason often cited for higher wages in foreign firms is a "brain-drain" effect. This effect does not drive our re-sults. If foreign presence simply results in a re-allocation of the most productive workers from domestic to foreign firms then FDI_JV should have no effect on industry wage premiums.

A key issue still unaddressed in our estimates is the potential simultaneity of foreign direct investment and wages. The negative effect of FDI_FO on wages may simply be driven by the tendency for these investments to be attracted to low wage industries. Similarly, unobserved factors that influence wage premiums may also exert an influence on the decision to locate joint venture investments. To tackle these issues we resort to instrumental variable (IV) estimation. Our instruments are similar to those used by Aitken et al. (1996). We use three instruments based on the idea that labor costs in the United States[22], one of Poland's most important sources of foreign direct investment, are an important determinant of the industrial composition of foreign investment. These instruments are wages in U.S. manufacturing industries, wages as a proportion of output and wages as a share of value added.

The results discussed above suggest that FDI_FO is attracted by low wages, and accordingly IV estimates of this variable should be larger than OLS estimates, while IV estimates of FDI_JV should be similar to the OLS estimates. Instrumental variable estimates based on treating the two components of FDI as endogenous are presented in Table 5, column 5.[23] As expected the effect of FDI_JV on wages is positive and of a

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

[23] A Hausman test rejects the null hypothesis of no specification errors at the ten percent level, *p*-value - 0.0603. However, 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 FDI_JV and FDI_FO on these instruments yield R^2s - 0.4237 and 0.4761 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 FDI_JV and FDI_FO equations record *p*-values of 0.0013 and 0.0286 respectively, indicating their high statistical significance.

slightly larger magnitude than the OLS estimates. However, unexpectedly the negative effect of FDI_FO on wages increases and the coefficients on net fixed capital and prices also display negative effects. So far we have treated FDI_FO and FDI_JV as endogenous, but it may be argued that net fixed capital which includes foreign and domestic investment should also be treated as an endogenous variable. The presence of three instruments allows us to follow through on this approach. Estimates treating these three variables as endogenous are reported in column 6[24]. The effect of FDI_JV is in the same range as earlier. Consistent with our expectations, the coefficient on FDI_FO is larger than the OLS estimates and is now positive, and the effect of net fixed capital on wages is also larger than the corresponding OLS estimate.

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 internalise the gains from their proprietary assets while setting up joint venture undertakings are 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 located largely in low-wage, low-tech industries 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 is not important and room for spillovers is very limited.

5.3 The influence of foreign presence on wage growth

So far we have established that average wages (wage premiums) are higher in industries with greater foreign presence. Despite allowances for endogeneity, the causal relationship between FDI and wages may be questioned. The availability of data over a

[24] A Hausman test rejects the null hypothesis of no specification errors, *p*-value - 0.0060. The R^2s from the first stage regression of FDI_JV, FDI_FO and net fixed capital are 0.4114, 0.4432 and 0.3851 respectively. *F*-tests for excluding the instruments from the three first step regressions record *p*-values of 0.0005, 0.0012 and 0.0008 respectively.

three year period provides an alternative manner of examining the the link between foreign presence and wages. Even if FDI is endogenous, if foreign direct investment leads to the flow of intangible assets then over time this flow should manifest itself as a stronger link between foreign presence and wages. That is, an increasing coefficient on FDI (FDI_FO, FDI_JV) would support the view that foreign firms promote the flow of productive knowledge, and exert a causal influence on wage growth and wages. To examine this dynamic pattern we estimate (8) for each year.

Estimates of (8) are presented in Table 6. Two specifications are presented for each year.[25] While the main target of attention is the pattern of change in FDI and its components, we note several other features of the results.[26] Returns to education do not exhibit much variation over time indicating that there does not seem to be an increase in wage gaps between educational groups. Similarly, returns to experience range between 0.7-0.9 percent a year. A noteworthy feature is the distinct increase in the coefficients on firm size with the wage benefits of working in the largest firms (more than 100 workers) recording a substantial increase. This increase is pronounced over time as well as in comparison to other firm sizes and displays a marked exacerbation of wages gaps between workers in large and small firms. This sharp increase possibly reflects the concentration of foreign direct investment in larger firms.

The coefficients on FDI are positive and over time there is an increase in the magnitude of the coefficient. The source of this increase is apparent by examining the second set of estimates. Over the years the effect of FDI_JV on wages records a steady increase[27] In 1994 a one percent increase in this variable led to a 0.1 percent increase in wages, while in 1996 the effect jumps five-fold with a one percent increase leading to 0.5 percent increase in wages. In contrast the effect of FDI_FO remains negative and does not follow an increasing pattern. This pattern of results indicates that workers in industries with greater foreign presence enjoy higher wage growth, albeit with the caveat

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[25] These estimates are based on combining individual level data with industry data. In such instances it is important to correct for intra-industry error correlations. In the absence of this correction the standard errors would be biased (see Moulton, 1986). Accordingly, all estimates are presented with corrected standard errors.

[26] An *F*-test (*p*-value 0.0001) rejects the pooling of the 1994 and 1996 data.

[27] While the coefficient on FDI_JV does record an increase, a statistical test (a t-test) rejects the null of a common coefficient (in 1994 and 1996) on FDI_JV only at the 10 percent level, *p*-value - 0.1020.

that these increases appear to be driven largely by joint venture foreign direct investments.

To isolate the sources of wage growth, we use the estimates in Table 6 to carry out a Blinder-Oaxaca decomposition. Wage growth may be attributed to changes in the rewards to various endowments (say higher returns to education) or to changes in the endowment itself. In our case we decompose wage growth due to changes in rewards/endowments into three sources - changes in human capital (i.e., changes in all variables in *X*), changes in fixed capital and changes in foreign presence (FDI, FDI_FO, FDI_JV). Decomposition results based on both specifications reported in Table 6 are presented in Table 7. Concentrating on the results in columns 3 and 4 of Table 7, we see that almost all the wage growth (a 6.5 percent increase in mean log wages) during this period may be attributed to changes in rewards to endowments. Given the short span of time this is not surprising. At the same time the higher returns to the same characteristics suggest that over time workers in the host country are learning and becoming more productive. Higher returns to human capital (especially to firm size) and foreign presence (FDI_JV) appear to be the principal components driving wage growth.

Although foreign presence influences mean wage growth, it is possible that it confers the largest benefits on skilled workers and consequently exacerbates wage gaps. If this is true then the effect of foreign presence on mean wage growth may stem largely from the upper end of the wage distribution. Recently developed methodology (see Juhn et al., 1993) allows us to decompose the source of wage growth at several percentiles and enables a more comprehensive examination of the effect of foreign investment on wage growth. The procedure involves the use of Table 6 estimates to predict wage distributions which attribute wage growth to changes in rewards, changes in endowments and changes in the error structure. The overall change in rewards (endowments) may be further decomposed into its constituent components.[28]

Wage growth and its basic decomposition into reward and endowment changes at various percentiles is displayed in Figure 1.[29] Wage growth is positive at all percentiles and ranges from 4.3 percent at the 10^{th} to 11.2 percent at the 70th percentile.

[28] That is, the overall changes in rewards (endowments) may be attributed to changes in rewards to human capital, fixed capital and foreign presence (knowledge capital).

[29] The contribution of changes in the error structure to wage growth were minuscule.

Growth is generally higher above the median, suggesting that there may have been an increase in wage gaps. Similar to the mean decomposition, the bulk of the increases in wages at all pecentiles may be attributed to changes in rewards to the same endowments. For instance, at the 10th (70th) percentile around 96 (78) percent of the overall wage growth may be attributed to changes in rewards.

To isolate the contribution of foreign presence the total change in rewards is further decomposed into its constituent components.[30] This is presented in Figure 2. Higher returns to human capital are a key component driving wage growth during this period. At all percentiles returns to this component have increased and wage growth at the upper percentiles seems to be particularly associated with higher returns to human capital. The effect of foreign presence (FDI_JV) on wage growth is positive and its contribution to the total change in rewards ranges between 66 percent at the 10^{th} to 34 percent at the 70^{th} percentile. The effect of this variable is stronger at the lower percentiles and may in fact be contributing to lower wage gaps. At the very least, the results display that the benefits of foreign presence percolate through to the entire wage distribution and do not appear to be responsible for any increases in wage inequality.

6. CONCLUSION

Our aim in this paper was to examine the effect of foreign direct investment on wages and wage growth in Poland. The results presented in this paper suggest that there is a link between foreign presence in an industry and wages. We find that wages are higher in industries with greater foreign participation and that workers in industries with greater foreign participation also experience faster wage growth. A caveat is that we are unable to identify whether these positive wage and wage growth effects stem from domestic and foreign firms or are restricted only to foreign firms.

An important element of our work was an analysis of the effect of foreign presence on wage growth at different percentiles of the wage distribution. We find that foreign presence has a fairly uniform effect all along the wage distribution suggesting that it is not associated with increases in wage inequality. Overall, the results that we obtain

[30] We also decomposed the total change in endowments into its constituent components. Since its contribution to wage growth is muted we chose not to present the detailed estimates.

are consistent with the notion that foreign direct investment serves as a channel for diffusing knowledge to developing countries.

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TABLES

Table 1

Means of Selected Variables - Industry Data

(Std. Dev.)

Variable	Combined Data	1994	1995	1996
Monthly Wages	477.29	452.34	473.03	506.51
FDI	(120.34)	(108.92)	(117.23)	(132.65)
	15.81	12.56	16.08	18.78
FDI_FO	(10.27)	(8.55)	(10.03)	(11.50)
	5.25	3.80	5.28	6.69
FDI_JV	(4.40)	(3.79)	(4.30)	(4.75)
	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.

Table 2
Means of Selected Variables - Individual Data
(Std. Dev.)

Variable	1994	1995	1996
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

Table 3a
Correlations between wages and FDI

	Monthly wages	Monthly wages
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 - 1996. Correlations in column 2 exclude the coal and petroleum refining industry.

Table 3b
Correlations between wage premiums and FDI

	Wage premium	Wage premium
FDI	-0.3755	0.1596
FDI_FO	-0.4357	-0.2761
FDI_JV	-0.1922	0.4134
N	42	39

Notes: Correlations in column 1 are across 14 manufacturing subsections for the years 1994-96. Correlations in column 2 exclude the coal and petroleum refining industry.

Table 4
The influence of foreign presence on wages
(Std. Errors)

Variable	(1)	(2)	(3)	(4)
Constant	7.225	8.246	5.502	6.553
	(1.566)	(1.428)	(1.407)	(1.276)
Net fixed capital	-0.024	-0.035	-0.026	-0.036
	(0.025)	(0.023)	(0.022)	(0.019)
Prices	-0.176	-0.361	0.164	-0.029
	(0.327)	(0.295)	(0.292)	(0.263)
FDI	-0.004	.	0.0005	.
	(0.003)		(0.002)	
FDI_FO	.	-0.027	.	-0.020
		(0.006)		(0.005)
FDI_JV	.	0.002	.	0.006
		(0.003)		(0.003)
N	69	69	66	66
R^2	0.043	0.245	0.028	0.242

Note: Dependent variable - log of net monthly wages.

Table 5
The influence of foreign presence on wage premiums
(Std. Errors)

Variable	(1)	(2)	(3)	(4)	(5)	(6)
Constant	-1.180	-0.807	-1.005	-0.759	-0.120	-1.464
	(0.518)	(0.532)	(0.499)	(0.528)	(0.659)	(0.760)
Net fixed capital	0.025	0.013	0.018	0.010	-0.005	0.056
	(0.009)	(0.011)	(0.009)	(0.011)	(0.013)	(0.025)
Prices	0.137	0.080	0.114	0.076	-0.028	0.140
	(0.105)	(0.105)	(0.101)	(0.104)	(0.122)	(0.125)
FDI	0.002	.	0.003	.	.	.
	(0.001)		(0.001)			
FDI_FO	.	-0.002	.	0.000	-0.009	0.0008
		(0.002)		(0.002)	(0.004)	(0.005)
FDI_JV	.	0.004	.	0.004	0.006	0.005
		(0.001)		(0.001)	(0.002)	(0.002)
N	39	39	39	39	39	39
R^2	0.213	0.294	0.197	0.236	0.387	0.503

Notes: Dependent variable - industry wage premiums. These estimates exclude the coal and petroleum refining industry.

Table 6
The influence of foreign presence on wages-1994 to 1996
(Std. Errors)

Variable	1994 (1)	1994 (2)	1995 (3)	1995 (4)	1996 (5)	1996 (6)
Constant	5.736	5.763	5.946	6.010	5.606	5.737
	(0.096)	(0.102)	(0.098)	(0.107)	(0.102)	(0.095)
University	0.386	0.386	0.337	0.337	0.400	0.399
	(0.019)	(0.020)	(0.028)	(0.028)	(0.019)	(0.019)
Post Secondary	0.170	0.170	0.156	0.155	0.203	0.200
	(0.040)	(0.040)	(0.031)	(0.031)	(0.036)	(0.037)
Secondary Vocational	0.093	0.093	0.098	0.099	0.102	0.102
	(0.012)	(0.012)	(0.010)	(0.010)	(0.010)	(0.010)
Secondary General	0.081	0.080	0.094	0.094	0.105	0.105
	(0.016)	(0.015)	(0.015)	(0.015)	(0.017)	(0.017)
Vocational	0.042	0.042	0.052	0.053	0.038	0.039
	(0.005)	(0.005)	(0.007)	(0.006)	(0.009)	(0.009)
Experience	0.008	0.008	0.009	0.009	0.008	0.007
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Exp. 2*100	-0.011	-0.011	-0.012	-0.012	-0.008	-0.008
	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.002)
Firm Size 6-20 emp.	-0.004	-0.004	0.015	0.015	0.035	0.036
	(0.013)	(0.013)	(0.015)	(0.015)	(0.010)	(0.010)
Firm Size 21-50 emp.	0.024	0.024	0.061	0.061	0.072	0.073
	(0.029)	(0.029)	(0.018)	(0.018)	(0.013)	(0.013)
Firm Size 51-100 emp.	0.014	0.014	0.052	0.052	0.076	0.074
	(0.025)	(0.025)	(0.011)	(0.011)	(0.013)	(0.013)
Firm Size > 100 emp.	0.067	0.067	0.117	0.114	0.163	0.157
	(0.028)	(0.028)	(0.018)	(0.018)	(0.017)	(0.018)
Net fixed capital	0.007	0.004	0.008	0.001	0.016	0.002
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)
FDI	0.0001	.	0.0004		0.002	.
	(0.002)		(0.002)		(0.001)	
FDI_FO	.	-0.001	.	-0.002	.	-0.002
		(0.002)		(0.002)		(0.002)
FDI_JV	.	0.001	.	0.002	.	0.005
		(0.003)		(0.002)		(0.002)
N	12,619	12,619	17,104	17,104	16,741	16,741
R^2	0.324	0.328	0.328	0.328	0.352	0.354

Note: Dependent variable - log of net monthly wages. These estimates exclude workers in the coal and petroleum refining industry. Other regressors include an urban indicator, three variables capturing city size, an indicator variable for each of Poland's 49 states, nine occupational indicators and thirteen industry indicators.

Table 7

Decomposition of mean real log wage growth - 1994 to 1996

Source	Rewards (1)	Endowments (2)	Rewards (3)	Endowments (4)
Human Capital (HC)	-0.042	-0.004	0.051	-0.004
Net Fixed Capital (NFC)	0.072	0.000	-0.019	0.000
Knowledge Capital				
FDI	0.032	0.007	.	.
FDI- FO	.	.	-0.004	-0.004
FDI- JV	.	.	0.036	0.001
Total	0.062	0.003	0.064	0.001

Table A1
Wages and share of foreign employment

	1994			1995			1996		
Industry	Wages	FDI_FO	FDI_JV	Wages	FDI_FO	FDI_JV	Wages	FDI_FO	FDI_JV
Food, Beverages	382.66	4.110	8.720	399.74	5.360	10.500	425.88	6.650	11.700
Tobacco	582.36	2.230	0	622.37	2.630	0	799.96	3.600	0
Textiles	348.05	1.980	1.260	353.61	2.620	2.510	366.75	3.590	1.970
Apparel	301.50	17.000	7.700	297.24	17.900	8.240	298.77	17.550	8.130
Leather, Leather Products	305.86	5.000	0.869	318.33	7.440	2.240	337.38	7.710	3.330
Wood, Wood Products	357.65	3.280	5.710	366.93	5.140	5.750	380.60	6.490	5.890
Pulp, Paper Products	458.21	2.830	24.000	522.19	4.340	26.900	551.57	6.090	27.300
Publishing, Printing	508.17	6.680	8.670	533.46	8.540	9.410	582.38	11.940	6.970
Coal, Refined Petroleum	806.84	0	0	854.55	0.250	0	863.13	0.663	0
Chemical Products	514.22	2.830	4.490	562.37	3.240	7.800	610.50	4.650	10.400
Rubber, Plastic Products	445.78	3.010	4.290	472.08	9.930	14.600	479.15	11.770	20.900
Non-metal Mineral Products	404.79	1.410	15.700	430.15	3.190	16.300	457.19	3.870	17.500
Basic Metals	535.35	0.067	6.540	557.03	0.127	7.810	598.33	0.115	8.990
Fabricated Metal Products	395.84	2.100	10.900	416.72	3.070	8.440	440.62	4.160	10.300
Machinery & Equipment	410.03	0.881	6.320	433.74	1.360	8.240	466.60	1.900	9.580
Office Machinery	488.10	8.010	19.400	483.40	4.550	24.300	534.31	4.670	22.400
Electrical Machinery	450.60	4.620	12.500	467.94	9.690	12.700	502.27	12.300	17.500
Telecom, TV's and Radios	435.73	4.040	20.600	467.50	5.060	25.300	506.76	12.400	25.100
Precision Instruments	454.07	2.350	2.500	475.13	5.580	2.900	498.94	6.090	7.790
Motor Vehicles	441.57	1.360	19.100	460.40	2.380	30.560	511.82	4.900	37.200
Other transportation equipment	456.84	0.509	0.288	472.79	0.782	0.396	496.93	0.963	0.855
Furniture, other manufacturing	344.54	10.100	6.160	355.50	13.420	8.610	368.99	15.500	8.190
Recycling and Utilization	575.13	2.930	15.500	556.55	4.850	14.700	570.93	6.120	16.000

Figure 1: Wage Growth Decomposition

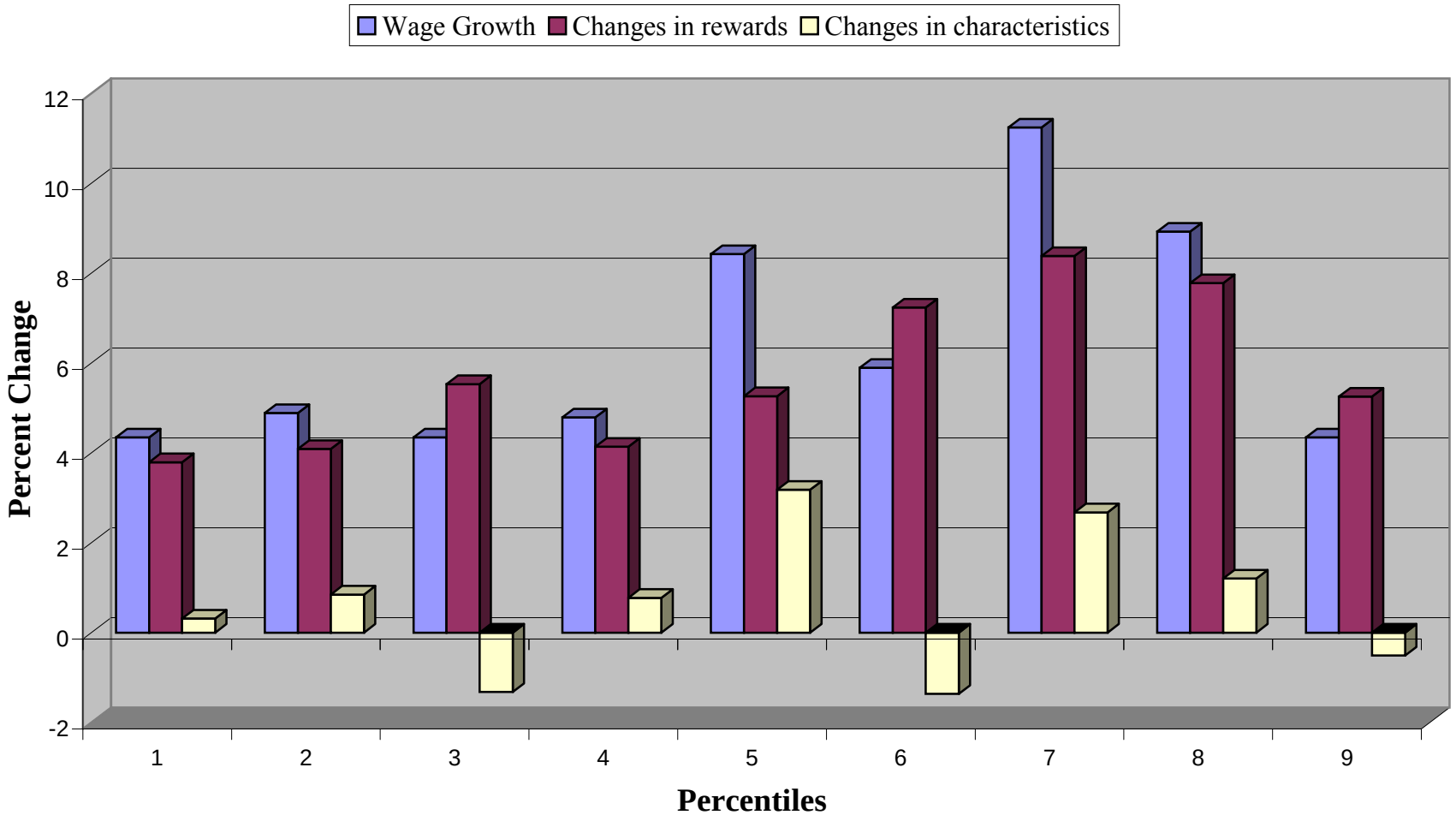

Figure 2: Wage Growth - Changes in Rewards