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Business Demography, Job Flows and Productivity in Poland's Enterprise Sector

Introduction

The economy together with its component markets and institutional structures, including the enterprise sector, is a system that remains in a state of dynamic equilibrium, which means that the number and form of its component entities is volatile. This volatility is an effect of new businesses being established (i.e. entering the system) and the existing ones being liquidated (exiting the system).

The dynamic changes among enterprises are well explained in economic theory, especially by Schumpeter's process of creative destruction. These theories hold that new firms use new technology and innovation to replace (compete with) incumbent firms. This is particularly so in transition economies where old fashioned state-owned enterprises are replaced by new modern private units[1].

Research indicates that the population of enterprises in some industries is highly volatile and that it depends on the "maturity" of a given industry (its stage of development), the level of innovation (technology used) and the phase of the business cycle[2].

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1 For other theories of enterprise flows see e.g. Jovanovic [1982] and Ericson Pakes [1992].

2 The observation of economic regions shows that the leading regions (e.g. the Silicon Valley) are characterized by a considerable diversity of organizational forms of enterprises and very high dynamics of the population (the so-called demographic turnover ratio), Carroll, Hannan [2000].

The dynamic changes in the enterprise population are of interest per se but they also affect the labor market. The parallel processes of establishing new businesses as well as the exiting ones (bankruptcy and liquidation) make the economy experience large job flows even if the level of employment is constant. Most research studies show that the job creation and job destruction rates never fall to zero (even in the period of economic boom or recession). That is why labor market analysis based only on state variables (e.g. the number of unemployed, the unemployment rate) may lead to misleading conclusions since those measures may fail to provide a full picture of the dynamics of economic processes.

The aforementioned processes of creative destruction affect aggregate productivity growth. The decomposition of productivity growth between those enterprises that survived and those that exited industry or entered the market helps understand the sources of gross productivity enhancement at the aggregate level. Research (e.g. Masso et al. 2004) confirms that during the transition period creative destruction processes play a primary role in productivity growth.

Since the beginning of the 1990s intensive work has been conducted in the United States on analyses based on enterprise level data. As a result, a large number of valuable indexes have been defined, which makes it possible to measure entry/exit, job flows and productivity changes at the enterprise level (see e.g., Foster et al. [1998], Davis et al. [1992], [1996], Griliches, Regev [1992]).

The analysis of enterprise turnover, job flow rates and productivity changes provides an additional dynamic view of the economic processes. The freedom of entering and exiting a branch of industry is one of the components of economic flexibility that enables entrepreneurs to use capital and labor the most effectively and to react promptly to developments in demand on specific markets. Job creation and destruction rates as well as reallocation rates are of crucial importance for the assessment of labor market flexibility and the intensity of barriers to entrepreneurship in an economy. The analysis of the rates may be a part of monitoring the flexibility of the economy. These analyses provide synthetic information on the actual job flows[3] and changes in the structure of the economy by sector. In addition, Hamermesh [1993] shows that job creation and job destruction processes are likely to have a significant impact on the elasticity of the labor demand function.

The transition period in Poland offers a unique opportunity to compare the dynamic changes in an economy under transition with mature economies. Using three indexes: the enterprise turnover rate, job flow rates and productivity growth decomposition, we have tried to show that the transition processes have exerted a positive effect on the Polish enterprise sector, though there is still a lot of work to be done. These three indexes help understand the structural

[3] For example, if in a particular year, the job creation rate stood at 10% and the job destruction rate was also 10% this means that total employment did not change and, at the same time, during the year, at least 10% of the work force changed their status – lost their job or started a new job, causing large flows on the labor market, which is not documented in the aggregate statistics (see Davis et al [1996], page 12).

changes that occurred during the transition from a socialist economy to an open market economy in Poland.

The layout of the article is as follows: the second section sheds some light on the methodology. The third section presents basic information on the statistical database used in the study. The next section shows our own results, and the final part presents conclusions and a summary.

Methodology

Business demography

The development of the enterprise population in an industry is usually analyzed with several indices. The first of these is the **gross entry rate** to the industry. The entry rate is defined as the ratio of the number of entities (enterprises) which commenced activity in an industry in year t to the number of entities functioning in industry j as of moment $t - 1$, expressed as a percentage. In the case of the gross entry rate, it is assumed that no enterprises were liquidated in the period under research.

Similarly, the **gross exit rate** from an industry is calculated as the ratio of the number of entities which discontinued activity in industry j in year t to the number of entities operating in industry j as of moment $(t - 1)$.

A net ratio is used in order to allow for both trends of changes in the dynamics of the enterprise population – establishment of new enterprises and withdrawal of the existing ones. The **net entry rate** to an industry in period t is calculated as the quotient of the difference in the number of enterprises at the end of the period studied (t) to the number of entities at the end of the previous period $(t - 1)$, expressed as a percentage. The rate expresses the growth in the number of entities and of liquidated enterprises in a given year. Moreover, a **turnover rate** is also calculated, defined as a sum of entry and exit rates, construed as an index of the industry's openness.

In order to determine the entry, exit and survival of the firm we have to apply a procedure recommended by Bartelsman et al. [2003]. The firm was considered as an entrant when it was observed in the dataset as *out*, *in*, *in* in period $(t - 1, t\ t + 1)$. The exiting firm was defined as *in*, *in*, *out* in period $(t - 1, t\ t + 1)$, and continuing firms were present in all three periods (in, in, in). All enterprises that do not meet these requirements were dropped from the dataset.

Job flows

Job creation and destruction processes can be analyzed using several measures. The most important ones include *job creation rate*, *job destruction rate*, *net job creation rate*, gross *job reallocation rate* and *excess job reallocation rate* (for detailed definitions of these measures and discussion see Cahuc et al. [2004], Davis et al. [1992], [1996]).

The **job creation** rate is calculated by dividing employment gains at new and expanding establishments by average employment from the present and previous periods.

The **job destruction** rate is calculated by dividing employment losses at exiting and shrinking establishments by average employment from the present and previous periods.

The **net job creation** rate is measured as the difference between the job creation rate and the job destruction rate in a given year.

The **reallocation rate** is computed by summing up the job creation and destruction rates.

The **excess job reallocation** rate is computed as the difference between the reallocation rate and the absolute net rate value.

As there are usually various misunderstandings we would like to stress that the analyses were done on micro unit data from enterprises. Such analyses make it possible to measure job flows by simply summing up employment level changes in individual units and periods. In this way we measure the so-called *job flows* in the sense of e.g. Davis et al. [1996]. These measures are different from the so-called *worker flows*. Similar to Davis et al. [1996], we treat changes in the employment level (in enterprises) as changes in filled employment positions.

Productivity decomposition

Empirical literature offers various methods of the calculation and decomposition of productivity growth (see e.g. Baily et al. 1992 (BHC method), Foster et al. 1998 (FHK method), Griliches, Regev 1992 (GR method)). In the text we follow two of them (FHK and GR). Due to a lack of reliable data about cost shares as well as major problems with exact deflators at the disaggregated level, we have decided to use labor productivity as a measure of productivity. Labor productivity has been defined as the difference between the logarithm of real production (output or log of value added) and the logarithm of the number of employees in the establishment at the end of the year.

$$lp_{it} = q_{it} - l_{it}$$

where

lp_{it} – log of labor productivity in establishment i in period t;

q_{it} – log of production (real output or value added) in establishment i in period t;

l_{it} – log number of employees in establishment i in period t.

We are aware that this index has several drawbacks, but it is less sensitive to measurement errors, which are the biggest problem in a transition economy.

All the quantitative variables in the study were used in constant prices, whereas adequate price indexes at two-digit NACE code levels were used as deflators.

The aggregated productivity level in period t in a sector or industry is measured in the following way:

$$\Pr od_t = \sum_i w_{it}\, prod_{it}$$

where:

$\Pr od_t$ – aggregate productivity in industry,
w_{it} – **firm's weight (output share or employment share),**
$prod_{it}$ – **productivity index at firm level (labor productivity).**

The two most popular methods of decomposing the aggregated productivity indexes were used. The method proposed by Foster et al. [1998], which measures changes in productivity, decomposes in the following way:

$$\Delta \Pr od_{t,t-k} = \Pr od_t - \Pr od_{t-k} = \sum_{i\in S} w_{it-k}\Delta prod_{it} + \sum_{i\in S}\Delta w_{it}(prod_{it-k} - \Pr od_{t-k}) + \sum_{i\in S}\Delta w_{it}\Delta prod_{it} +$$
$$+ \sum_{i\in E} w_{it}(prod_{it} - P_{t-k}) - \sum_{i\in X} w_{it-k}(prod_{it-k} - \Pr od_{t-k})$$

where: S – survivors, E – entrance, X – exiters during period $t-k$ to t.

The individual sums are interpreted as follows:

- contribution to productivity growth from surviving enterprises (first three terms),
- contribution to productivity growth from entering companies,
- contribution to productivity growth from exiting enterprises.

The first term related to continuing firms is described as the *within effect* and it shows their contribution to productivity growth under the assumption that the firm's market shares are fixed. The second term, called the *between effect*, captures productivity growth due to shifts in shares. If surviving firms with higher-than-average productivity in the base increase the market share it is positive. The third term is *covariance*. The authors of the article [Foster et al., 1998] argue that this decomposition method is quite sensitive to measurement errors. That is why we also use another method of productivity growth decomposition in the study. This method is less vulnerable to measurement problems (as suggested by Griliches and Regev 1992). The identity can be expressed in the following way:

$$\Delta \Pr od_{t,t-k} = \Pr od_t - \Pr od_{t-k} = \sum_{i\in S} \overline{w}_i \Delta prod_{it} + \sum_{i\in S}\Delta w_{it}(\overline{prod}_i - \overline{\Pr od}) + \sum_{i\in E} w_{it}(prod_{it} - \overline{\Pr od}) -$$
$$- \sum_{i\in X} w_{it-k}(prod_{it-k} - \overline{\Pr od})$$

Where all the symbols mean the same as in the previous equations and the bar over the variable means the simple average.

In both these decomposition methods, by analyzing the contribution made by entering and exiting firms we can test the hypothesis of creative destruction. In the case of positive net contribution, the hypothesis that creative destruction has a positive impact on productivity in Polish enterprises, can be confirmed. Contrary to most international studies, because of major methodological changes in 1999, all these decompositions have been made for four-year productivity changes. The study uses the most recent period for the decomposition, that is 2000-2004. As the four-year time frame is the longest period we can use, we compare our results with those yielded by five-year studies.

Statistical data

The study relies on micro data coming from corporate financial reports (F-01 form[4] – *profit and loss account*) collected by the Polish central statistical office, GUS. The data covers medium-sized and large enterprises from the corporate sector[5], as defined by GUS, not including the results of agricultural, hunting, forestry and fishing establishments, financial intermediation agencies and higher education institutions. Apart from financial data, the reports contain information about the employment level at the end of the reporting period, which has been used to calculate job flows and labor productivity.

The available data set covered businesses from all non-financial segments of the corporate sector (with NACE codes from 10 to 92). The biggest advantage of the study is that it covers the whole non-financial corporate sector without focusing on a selected industry. Given the availability of statistical data, international studies mainly concern the manufacturing sector, even though the service sector plays the biggest role in developed economies (in terms of employment and output).

In Poland the corporate sector is still the largest *employer* in the economy and one of the largest institutional sectors in the Polish National Accounts. According to GUS, there were 12.7 million employees in the Polish economy as of December 31, 2004. It is estimated that the corporate sector accounted for over 60%[6] of the total work force. The available data sets covered from

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4 Data collected by GUS relate to businesses keeping account books and employing 50 or more persons. The data do not include the results of agricultural, hunting, forestry and fishing establishments, financial intermediation agencies and higher education institutions.

5 In line with the GUS definition, the corporate sector encompasses establishments engaged in business activity in the field of forestry, fishery; mining; manufacturing; power, gas and water generation and supply; construction; retail and wholesale trade; hotel and restaurants; transport, storage and communications; real estate services, rental of machinery and rental of personal and household goods, information technology, other business activities; sewage disposal and treatment, waste management, other sanitary and related services; activities related with culture, sports, recreation and other services (source: methodological notes of the Statistical Bulletin of Poland's Central Statistical Office, GUS).

6 Due to methodological issues, it is extremely difficult to assess the exact level of employment in the corporate sector. According to the 2005 Concise Statistical Yearbook of Poland, at the end of 2004 approximately 7.8 million people were employed in the Polish corporate sector, excluding administration, education, financial intermediation and health care services.

3.5 to 4.5 million employees depending on the year. Therefore, the analysis performed on the available database covered a considerable part of the Polish economy.

Table 1

Basic information about the population of enterprises in the dataset*

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Number of enterprises in the dataset	21267	22948	25171	16170	16566	15592	14878	14887	14680
Number of employees (in thousands) – figures from dataset	4297	4227	4182	4005	3901	3598	3439	3465	3509
Number of employees (in thousands) in enterprise sector as at December 31 – GUS data	5841	5877	5919	5846	5337	5094	4999	4827	4849
Dataset to population ratio	74%	72%	71%	69%	73%	71%	69%	72%	72%

(*) The dataset was cleared for the calculations (details in the text).

Sources: GUS and author's own calculations

During the transformation period, businesses tend to change their ownership and organization form as well as legal status, often without altering their corporate structure in a major way. Besides, companies undergo mergers and acquisitions. This leads to apparent entries and exits of businesses, which overstate their job creation and destruction rates. The filtration of the data set (according to the Bartelsman et al. [2003] procedure) was necessary to avoid the so-called inflation of individual rates. The original set was cleared and rid of businesses that were, for example, undergoing restructuring (especially in the mining and energy industries) as well as businesses whose statements raised objections (for example, businesses reporting zero employment). The average number of excluded units in each year did not exceed 2% of the overall population in the dataset and 4% of the employees. The cleared dataset used in the calculations covered from 3.3 million to over 4.3 million employees.

Essentially, it should be remembered that the research was made on businesses with 50 or more employees, which means that small businesses were poorly represented[7]. It seems that, given its size, the set may be the basis for conducting methodologically appropriate calculations – bearing in mind that

[7] Businesses in which employment falls below 50 persons during the year are obligated to submit the form until the end of the calendar year. This means that the set includes some establishments with fewer than 50 employees.

the analysis covers medium-sized and large units. Most international surveys are also marred by limited access to data on micro enterprises.

The variables used in the calculations were expressed in 1996 constant prices, and the price indices for individual divisions were used as deflators, according to the two-digit Polish Classification of Activities (PKD), based on the Statistical Classification of Economic Activities in the European Union (NACE).

Results

Enterprise turnover

The literature review (see Chmiel 1997, 1999, 2001 summarized in Rogowski, Socha, 2005) shows that the available knowledge on demographic processes in Polish industries covers the first half of the 1990s (until 1997) and shows a relatively high rate of entry and exit in manufacturing industries, especially in the early transformation period. Probable distortions in data files and changes in methodology do not permit an exact determination of the trend in the mid-'90s. However, the research made at the NBP [Rogowski, Socha, 2005] suggests that at the beginning of the 21st century the rates stabilized at around 12-13% per annum.

The calculation of the changes in the enterprise population in this study was conducted for the period 1996-2004 (for more information about the databases used and a discussion of the methodology, see [Rogowski, Socha, 2005]).

The biggest advantage of this research is that the analysis focused not only on manufacturing businesses but the entire enterprise sector. Moreover, the market services sector was singled out for a detailed analysis.

The detailed results for entry and exit processes for the whole population are given in Table 2 and the results for the manufacturing and service sectors[8] can be found in Appendix 1 (Tables 1 and 2).

Table 2

The entry and exit rates in the Polish enterprise sector in 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Mean[9]
	in %								
Entry rate	18.0	18.8	15.8	15.1	9.9	8.6	12.6	11.9	13.8
Exit rate	14.3	14.4	15.2	12.7	15.9	13.3	12.5	13.2	13.9
Net entry rate	3.7	4.4	0.5	2.4	-6.0	-4.7	0.0	-1.3	-0.1
Turnover rate	32.3	33.1	31.0	27.8	25.8	21.9	25.1	25.1	27.8

Source: GUS data, authors' own calculations

[8] The service sector covers all enterprises in the data set that operate in industries with a two-digit NACE code equal or higher than 50. This includes mainly firms from industries such as trade, hotels and restaurants, transport, storage and communication, real estate, renting and business activities.

[9] The arithmetic mean for the analyzed period.

In light of the results of our calculations, the entry rates for Polish firms in 1997-2004 remained at a relatively high level (between 8.6% and 18.8%). Since 1998, a downward trend has been noted in the entry rate, with a minimum of 8.6% in 2002 (a period of economic slowdown), followed by an increase to about 12% in the last two years of the analyzed period. The exit rate seems more stable and it reached its peak of 15.9% in 2001. The mean net rate in the whole period is close to zero, but we can distinguish three periods. In 1997-2000 the rate was positive, due to economic prosperity. The economic slowdown of 2001 and 2002 brought the rate down below zero. In 2003 the rate was close to zero, whereas in 2004 it was slightly negative. The turnover rate decreased from more than 30% to just around 22% in 2002 and since then it has stabilized at 25%.

The firms' turnover rates and GDP growth figures (see Figure 1) show that in the analyzed period the net entry rate was strongly correlated[10] with the GDP figures (a correlation coefficient of 0.8). This means that entrepreneurship in Poland is extremely sensitive to economic performance. It seems that the improvement in the economic climate increases the entry rate in the Polish enterprise sector. This relationship can be caused by several factors. The good economic climate encourages people to set up new businesses because growing economic demand opens new markets. Moreover, the capacity of the existing markets is increasing substantially, which allows new units to enter the market. On the other hand, the decreasing exit rate means that the probability of bankruptcy during an economic boom is lower, so setting up new businesses is safer than during an economic slump[11].

The observed leap may also be related to changes in the structure of the economy. After the entrepreneurship boom at the beginning of the transformation period, the Polish economy bore increasing resemblance to mature Western economies, which accounts for the drop in the entry and exit rates. The deceleration of the entry rates at the end of the analyzed period can be attributed to an increasing number of regulations in the economy. The findings made by Paczocha and Rogowski [2005] show that the number of regulatory restrictions for doing business has increased constantly. The restrictions mean that companies were subject to: concessions, business activity permits and licenses, admissions of products, goods and equipment to the market, admissions to a profession, limitations on production or sales and notifications of economic activity. The number of restrictions in business law increased from 403 in 1989 to 607 in 2003 [Paczocha, Rogowski, 2005]. This means that several business areas are protected from competition from external firms by bureaucracy burdens. The numerous rules also mean higher costs of starting a business in the regulated industry.

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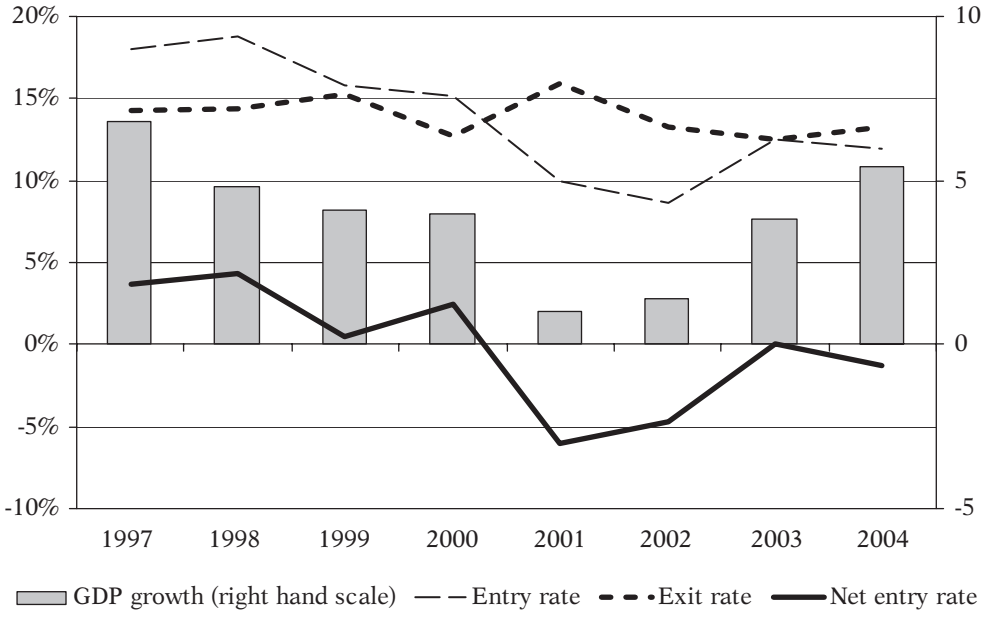
10 The correlation coefficients were calculated for only eight observations, so the formal conclusion based on such a sample may be doubtful.

11 The formal model of a relationship between entrepreneurship and economic growth can be found in Acs, Audretsch [2005].

Figure 1. Entry and exit rates in the enterprise sector and GDP growth



Source: GUS data, authors' own calculations.

Summing up, in the first half of the '90s, the entry/exit rates for Polish industries were among the highest, compared with other countries. In recent years, the average rate in Poland has been lower than in Britain and the United States, but higher than in most major mature Western economies. The observed correlation with GDP growth as well as the Martin Jaumandreu (1998) findings suggest that we can expect the rates to increase in the next few years. Poland's EU entry and the ongoing economic boom may lead to a rise in entrepreneurship in the country.

Job Flows

Discussing the job flows in the Polish enterprise sector, we should mention certain important assumptions made in the study.

First of all, the computed rates are net rates, which means they do not take into account job turnover during a year. If a firm hired and fired employees during the year but had the same employment level at the end of period $t - 1$ and t then the computed rates are zero. This is due to database constraints since establishments do not report the actual job turnover but only the employment level at the end of each period. Such a problem is encountered by most researchers dealing with job flows (see Davis et al. [1992], [1996], Dunne et al. [1989], Kõrösi [2003]). This will lead to understating the actual job creation and destruction rates, as shown in studies by researchers such as Hamermesh et al. [1994].

Second, as we have already mentioned, the data set does not encompass the smallest establishments. This may also lead to understating the rates as the small-business population is generally more dynamic and shows higher firm turnover (see Dunne et al. [1988], in Poland Rogowski, Socha [2005]). International studies by researchers such as Davis and Haltiwanger [1992] confirm that the smallest businesses record higher-than-average job creation and destruction rates. Yet, given the data availability, most of the cited studies concern medium-sized and large businesses.

The presented results (see Table 3) show that the job creation rate in the 1997-1999 period stood at a relatively high level (above average). On the other hand, economic slowdown in 2001-2002 pushed the job creation rate down below 9%. Although we have only eight observations to base on, it may be concluded that the job creation rate is strongly correlated positively with GDP growth (the correlation coefficient is 0.9).

Table 3

Job flow rates in Poland's enterprise sector

	1997	1998	1999	2000	2001	2002	2003	2004	Mean
	in %								
Job creation rate	13.5	11.3	12.1	10.7	8.1	8.4	10.4	10.3	10.6
Job destruction rate	13.4	12.8	14.6	13.4	16.3	12.1	10.2	9.5	12.8
Net job creation rate	0.0	-1.6	-2.5	-2.7	-8.3	-3.8	0.2	0.7	-2.2
Reallocation rate	26.9	24.1	26.8	24.1	24.4	20.5	20.6	19.8	23.4
Excess job reallocation rate	26.9	22.5	24.3	21.4	16.1	16.7	20.4	19.1	21.2

Source: GUS data, authors' calculations

The job destruction rate in Poland in the analyzed period was counter-cyclical. In 2001 it reached its highest level of 16.3%, whereas in 2004 it dropped to only 9.5%.

While analyzing the net rate we should bear in mind that the average rate for the whole period was negative. The largest employment loss was noted in 2001, with a net rate of -8.3%, due to the highest job destruction rate in the analyzed period (16.3%) and the lowest job creation rate (8.1%). The net rate was positively correlated with GDP growth.

The job reallocation figures show that the period of dynamic changes in the labor market in 1997-2000 (reallocation rate exceeding 20%) was followed by a slowdown in reallocation processes (reallocation rate around 16%); however, when the economy improved, the rate rebounded to almost 20%. The excess reallocation rate, which is often interpreted as a measure of deep restructuring, dropped significantly in 2001-2002 but then stabilized at around 20% in the next few years.

Summing up, we can say that despite the slowdown in the analyzed rates, they stay at a relatively high level compared with other countries (for

a comparison with other studies see Socha 2006). The job flow rates for the manufacturing and services sectors are given in Appendix 1, Tables 3 and 4; for other sectors of the economy see also Socha 2006.

In order to observe changes within continuing firms, job creation and destruction rates have been computed for units that continued their operations in two adjacent periods (see Appendix 1, Table 5). This procedure eliminates the problem of any spurious entries and exits of enterprises. Such rates do not take into account job creation by businesses entering the market (new establishments) or job destruction by firms exiting the market; thus the obtained rates are underestimated with respect to the whole population. The results show that the job creation and job destruction rates are indeed lower than for the whole population but at the same time the net rate is much higher (in absolute terms) and is negative all the time. This means that firms continuing their operations embarked on profound employment restructuring and tended to lay off employees more often than the population as a whole. Not accounting for job creation by new entrants deteriorates the picture of the labor market considerably. The analyses show that the job creation and destruction rates were less correlated with GDP growth than for the whole population. This shows that the business cycle phase played a less crucial role in the case of continuing businesses. The high (negative) net rate shows that these establishments restructured employment considerably in the analyzed period, regardless of the type of business activity they pursued. This shows just how deep the restructuring processes have been. On the other hand, the results testify to the influence of the creation and destruction of enterprises on job flows. Without a positive contribution from enterprise turnover, the picture of the job flow rates deteriorates significantly.

The rather high job flow rates calculated in the study mean that the Polish labor market, which is generally perceived as relatively rigid, may in fact be much more flexible than it seems, in particular from the enterprises' perspective (see also Rutkowski [2002]). Indeed, in the analyzed period, the labor market was dominated by job destruction processes; however, it was not a period of complete market stagnation, and many businesses created new jobs (the job creation rate never dropped below 8%).

The results obtained for the job flow rate confirm the picture of the transformation obtained in the analysis of the enterprise turnover rates: a period of good performance in the late '90s, followed by a significant drop during an economic slump, and an improvement under a recovery.

Productivity decomposition

In this part of the paper we will focus on an analysis of the effect caused by enterprise and job flows on aggregate productivity growth. As shown earlier in the text, the enterprise sector has experienced huge structural changes during the transformation in Poland. The analyzed period was characterized by high enterprise turnover and job flow rates. This suggests that enterprises

have undergone deep restructuring. In this section, we check if these creative destruction processes had a significant effect on the productivity of enterprises.

Due to problems with calculating the cost shares and the unavailability of exact deflators, we had to focus exclusively on labor productivity, with TFP and MFP calculations left for further research. We will focus on two kinds of measures of labor productivity (gross output per employee and value added per employee). Each of these indexes has its advantages and drawbacks. The output measured labor productivity can be more prone to between-industry measurement biases, but on the other hand such a measure is straightforward and can be better received by the audience. The value added measure is superb for between-industry comparisons, but it is not directly observed and has to be somehow calculated.

The biggest problem during the analysis in a transition economy is the availability of the proper data set. Most empirical examples of productivity decomposition concern five-year periods, but due to methodological changes in the data files (with a threshold change in 1999), our analysis has been conducted for four-year periods. For the purpose of this analysis, we have chosen the most recent data available, for the 2000-2004 period. The coverage of the data file is coherent for that period, and the information set is quite constant. The statistical form does not change dramatically.

Table 4

Labor productivity growth in Poland's enterprise sector (yoy changes)

	Labor productivity (Output per employee)		Labor productivity (Value added per employee)	
	Weights			
Year	Employment	Output	Employment	Output
2001	-0.2	5.3	-2.7	1.6
2002	12.4	5.1	11.8	6.1
2003	6.3	12.5	4.3	9.3
2004	7.9	10.1	9.3	14.5

Source: Authors' calculations.

The general pattern indicates that during the analyzed period Polish enterprises underwent deep restructuring, mainly through labor force reductions. The overall drop in the labor force has exceeded 10% since 2000, while production has risen by more than 20% in real terms. As a result, labor productivity has increased by 30%. Due to labor shedding, capital intensity increased dramatically in the analyzed period, by more than 50% in real terms. Table 4 shows that both productivity measures are sensitive to the weighting method (output or labor) and the differences may be substantial.

Table 5 offers general information on the role of entering and exiting enterprises. The calculated relative productivity levels are the weighted

productivity levels of each type of firm referred to the weighted productivity level of the surviving firms in 2000. The output and labor shares for entries and exits shows the importance of the "births" and "deaths." Moreover, the data shows that exiters are generally smaller than entrants. The relative productivity indicators of entrants, exiters and survivors indicate that exiters have lower productivity than entrants as well as incumbent firms. The low relative productivity of the exiters shows that exit processes could have a positive effect on gross productivity growth (through the exit of the least efficient units). All the measures used show a similar pattern if we compare survivors with substantial productivity gains. Appendix 1 (Tables 6 and 8) shows the shares and relative productivity of the manufacturing and service sectors. The general pattern for manufacturing is the same as for the whole population, whereas in the service sector exiters seems more productive than survivors in period $t - 4$.

Table 5

Output, employment shares and relative productivity in Poland's enterprise sector

		Shares		Relative productivity			
		Exiters	Entries	Exiters	Entries	Survivors ($t-4$)	Survivors (t)
		in %					
Labor productivity (Output per employee)	labor	24	25	98.7	101.9	100.0	106.8
	output	22	23	98.7	105.6	100.0	105.3
Labor productivity (Value added per employee)	labor	24	25	94.7	100.0	100.0	107.2
	output	21	20	101.0	99.8	100.0	109.2

Source: GUS data, authors' calculations

The most straightforward conclusion from the decomposition of labor productivity (see Table 6) is that the results are extremely sensitive to the weighting method. However, all the methods indicate that the most important factor affecting labor productivity during the analyzed period was the *within effect*. The second important factor is the *net entry* effect, but in our view the high enterprise and job flow rates computed earlier could suggest an even higher contribution of creative destruction processes to productivity growth. These unsatisfactory results can be explained by the rather small size of the entrants and exiters, compared with survivors, and the rather moderate relative productivity level of the entries. Almost all the results point to a significant and positive impact of *net entry* on productivity, leading to the conclusion that creative destruction processes had an undoubtedly positive effect on the Polish enterprise sector during the analyzed period.

The detailed analysis of the enterprise population reveals huge heterogeneity. The productivity decomposition in the manufacturing sector shows a pattern similar to that applying to the gross population, the biggest *within effect* and an important positive *net entry effect* (see Tables 6 and 7, Appendix 1). The

results for the service sector are not unequivocal. We can observe an extreme positively *within effect*, but the *net effect* changes in magnitude and nature with the calculation method. The problem with the stability of the results can be partly explained by the poor quality of the output deflators[12]. The considerable heterogeneity of service production explains why the labor productivity of enterprises in narrowly defined sectors can vary substantially. Moreover, labor outsourcing in the service sector is more popular than in the manufacturing sector, which may also affect the results.

Table 6

Decomposition of labor productivity growth in Poland's enterprise sector (four-year period, 2000-2004)

FHK method								
Index	Weights	Overall growth	within	between	cross	entry	exit	Net entry
Labor productivity (Output per employee)	employment	26.4	92.2%	34.2%	-39.6%	9.1%	4.1%	13.2%
	output	33.0	49.3%	-3.5%	26.2%	24.0%	4.1%	28.1%
Labor productivity (Value added per employee)	employment	22.8	143.4%	15.7%	-78.4%	4.8%	14.5%	19.2%
	output	31.5	79.5%	-7.8%	31.8%	-1.2%	-2.4%	-3.5%
GR method								
Index	Weights	Overall growth	within	between	cross	entry	exit	Net entry
Labor productivity (Output per employee)	employment	26.4	72.4%	14.7%	–	-3.2%	16.1%	12.9%
	output	33.0	62.4%	9.8%	–	12.5%	15.2%	27.8%
Labor productivity (Value added per employee)	employment	22.8	104.2%	-23.1%	–	-7.5%	26.4%	18.8%
	output	31.5	95.4%	7.6%	–	-10.9%	7.9%	-3.1%

Source: GUS data, authors' calculations

To sum up the results of the decomposition, we can say that the most important factors affecting productivity growth in the Polish enterprise sector are the *within* and *net entry* effects. The productivity decomposition results, along with substantial enterprise turnover and job flows, confirm that creative destruction played an important role in productivity growth. The literature (e.g. Baily et al. 1992, Foster et al. 1998) suggests that the contribution of individual groups of enterprises depends on the phase of the business cycle. In

[12] Due to historic reasons, Poland's central statistical office, GUS, has much better statistics on the manufacturing sector.

the analyzed period, the Polish economy started to revive after a slump. The year 2001 marked the bottom of the recession (see the GDP series in Fig. 1) and the country's economic performance has improved ever since then. That is why we can suspect that the stronger within effect has been caused by economic growth. However, proper data are only available for a short time span, so we are unable to make calculations for the downturn period and check the robustness of the results. The shorter period of time covered by the decomposition, compared with other studies, also plays a role. The *net entry* effect becomes more significant if the comparison period is longer.

Conclusions

Using a unique data set from Polish non-financial enterprises, we have calculated several resource reallocation indexes. The first conclusion is that the 1996-2004 period marked huge resource reallocation in Poland.

The entry/exit rate shows that enterprise flow rates in Poland in 1997-2004 remained at a relatively high level. The entry rate was between 8.6% and 18.8%, and the exit rate ranged from 12.7% to 15.9%. The average net rate in the entire period was close to zero. The turnover rate decreased from more than 30% to just around 25% in the last two years under analysis.

International comparisons of entry rates for industries are difficult, because the data acquisition methods are different. In the first half of the 1990s, the entry rates of Poland's industries were among the highest in the OECD – see Bartelsman et al. [2003], [2004]. The rates of entry to and exit from industries have been lower in recent years, but their average level, though lower than in Britain and the United States, has been higher than in most mature Western European economies. As Poland strengthens its status as an EU member, entrepreneurship in the country may increase still further.

In the analyzed period, job creation and destruction processes in Poland were strongly correlated with GDP growth. Periods of favorable economic trends drove the job creation rate up, while reducing the job destruction rate.

The study confirms international findings that job creation and destruction processes are highly dynamic. The average job creation rate in Poland's corporate sector in the 1997-2004 period exceeded 10%, while the job destruction rate was higher than 12%. The fact that the job destruction rate was higher than the job creation rate resulted in an aggregate job loss, and the average net rate was around -2%. The reallocation rate amounted to 23%. These figures are close to the values noted in highly dynamic developed countries, and they exceed the reallocation rate recorded in stable Western European countries such as Austria and Germany. This confirms the findings of Rutkowski [2002] and proves that the Polish labor market is relatively flexible and that job creation and destruction processes in enterprises are not subject to rigidities.

General knowledge suggests that jobs are created in a period of dynamic economic growth and destroyed in a period of economic recession. Yet, this analysis and international research show that job creation rates never fall to

zero. In Poland, even in a period of economic recession, job creation rates stood at around 8%. Similarly, in a period of dynamic economic growth, job destruction rates did not fall below 9%. Still, the results confirm the pro-cyclical pattern in job creation and (less clear) counter-cyclicality in job destruction.

Due to data constraints in the study, labor productivity has been calculated, while the TFP and MFP indexes have been left for further investigation. The general pattern of productivity growth shows that Polish enterprises have undergone deep restructuring. Labor shedding and production growth caused labor productivity to rise by more than 20%. The decomposition of that growth shows that its basic source is the *within* effect. The net entry effect was generally significant and positive. The instability of the obtained results seems to be the biggest problem in our case.

The large enterprise flows observed as well as job flows and their positive effect on productivity growth confirm the importance of creative destruction processes in a transition economy. Resource reallocation adds substantially to productivity enhancement.

The reallocation of resources is a natural and necessary trend in an efficient economy. It is an effect of economic restructuring and an inherent part of stable economic growth. This means that economic programs aimed at sustainable economic growth should be focused on eliminating barriers and encouraging entrepreneurship and investment. On the other hand, activities aimed at restraining the reallocation of resources (in particular from ineffective industries) by making product and labor markets more rigid will slow down productivity growth and economic progress.

Appendix 1

Table 1

Entry and exit rates in Poland's manufacturing sector, 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Mean
	in %								
Entry rate	16.7	17.9	14.4	14.5	10.3	9.6	14.1	12.8	13.8
Exit rate	12.0	12.1	13.1	12.6	15.0	13.4	12.6	12.5	12.9
Net entry rate	4.6	5.9	1.3	1.9	-4.7	-3.8	1.5	0.3	0.9
Turnover rate	28.7	30.0	27.6	27.0	25.3	23.0	26.7	25.3	26.7

Source: GUS data, authors' calculations

Table 2

Entry and exit rates in Poland's service sector (market services), 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Mean
	in %								
Entry rate	18.8	20.4	17.8	18.0	12.3	10.6	15.8	14.6	16.0
Exit rate	16.6	17.5	17.3	13.5	18.8	13.5	13.8	14.7	15.7
Net entry rate	2.2	2.9	0.5	4.6	-6.6	-3.0	2.0	-0.1	0.3
Turnover rate	35.5	37.8	35.1	31.5	31.1	24.1	29.6	29.4	31.7

Source: GUS data, authors' calculations

Table 3

Job flow rates in Poland's manufacturing sector, 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Mean
	in %								
Job creation rate	13.0	10.4	11.1	10.8	8.6	10.5	12.8	12.8	11.2
Job destruction rate	13.0	14.0	17.9	17.1	18.0	13.5	11.7	9.9	14.4
Net job creation rate	-0.1	-3.6	-6.8	-6.2	-9.4	-3.0	1.1	2.9	-3.1
Reallocation rate	26.0	24.4	29.0	27.9	26.6	23.9	24.4	22.7	25.6
Excess job reallocation rate	25.9	20.7	22.2	21.7	17.2	20.9	23.3	19.8	22.5

Source: GUS data, authors' calculations

Table 4

Job flow rates in Poland's service sector (market services), 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Mean
	in %								
Job creation rate	16.1	16.0	17.1	13.3	10.8	9.4	11.7	10.6	13.1
Job destruction rate	17.1	10.9	11.0	9.6	15.6	11.4	9.5	10.0	11.9
Net job creation rate	-1.0	5.1	6.1	3.7	-4.8	-2.0	2.3	0.6	1.2
Reallocation rate	33.2	26.8	28.1	23.0	26.5	20.7	21.2	20.5	25.0
Excess job reallocation rate	32.3	21.7	21.9	19.3	21.6	18.8	18.9	19.9	23.8

Source: GUS data, authors' calculations

Table 5

Job flow rates for continuing enterprises in Poland's enterprise sector, 1997-2004

	1997	1998	1999	2000	2001	2002	2003	2004	Mean
	in %								
Job creation rate	4.3	4.1	5.1	4.2	3.3	4.5	4.9	5.5	4.5
Job destruction rate	8.0	9.3	11.0	9.9	10.8	8.1	6.7	6.2	8.7
Net job creation rate	-3.6	-5.2	-5.8	-5.7	-7.5	-3.6	-1.8	-0.7	-4.2
Reallocation rate	12.3	13.4	16.1	14.1	14.1	12.6	11.7	11.7	13.3
Excess job reallocation rate	8.7	8.2	10.3	8.5	6.5	9.0	9.9	11.1	9.0

Source: GUS data, authors' calculations

Table 6

Output and employment shares and relative productivity in the Polish manufacturing sector

		Shares		Relative productivity			
		Exiters	Entrants	Exiters	Entrants	Continuing ($t-4$)	Continuing (t)
		in %					
Labor productivity (Output per employee)	labor	25	25	96.2	106.9	100.0	107.0
	output	21	23	96.3	102.1	100.0	106.0
Labor productivity (Value added per employee)	labor	25	25	91.3	105.1	100.0	108.3
	output	17	19	82.8	93.3	100.0	108.3

Source: Authors' calculations

Table 7

Decomposition of labor productivity growth in Poland's manufacturing sector (four-year period, 2000-2004)

FHK method								
Index	Weights	Overall growth	within	between	cross	entry	exit	Net entry
Labor productivity (Output per employee)	employment	36.8	60.1%	9.8%	-3.5%	24.4%	9.2%	33.5%
	output	34.0	56.5%	-9.3%	31.0%	11.4%	10.5%	21.9%
Labor productivity (Value added per employee)	employment	33.9	63.4%	5.9%	-4.8%	18.5%	17.0%	35.5%
	output	39,4	55.0%	-16.8%	41.4%	-8.6%	29.0%	20.4%
GR method								
Index	Weights	Overall growth	within	between	cross	entry	exit	Net entry
Labor productivity (Output per employee)	employment	36.8	58.4%	7.7%	–	12.1%	21.8%	33.9%
	output	34.0	72.0%	6.9%	–	0.0%	21.2%	21.2%
Labor productivity (Value added per employee)	employment	33.9	61.0%	3.2%	–	6.2%	29.6%	35.9%
	output	39,4	75.7%	5.0%	–	-18.2%	37.5%	19.3%

Source: Authors' calculations

Table 8

Output and employment shares and relative productivity in the Polish service sector

		Shares		Relative productivity			
		Exiters	Entrants	Exiters	Entrants	Continuing ($t-4$)	Continuing (t)
		in %					
Labor productivity (Output per employee)	labor	19	33	105.0	100.0	100.0	108.0
	output	25	31	107.4	110.4	100.0	106.1
Labor productivity (Value added per employee)	labor	19	33	97.0	99.7	100.0	105.3
	output	23	31	132.3	112.6	100.0	108.0

Source: Authors' calculations

Table 9

Decomposition of labor productivity growth in Poland's service sector (four-year period, 2000-2004)

FHK method								
Index	Weights	Overall growth	within	between	cross	entry	exit	Net entry
Labor productivity (Output per employee)	employment	18.9	159.4%	80.0%	-114.8%	-6.9%	17.8%	-24.7%
	output	32.6	34.0%	23.1%	20.0%	47.9%	25.0%	22.9%
Labor productivity (Value added per employee)	employment	13.1	400.0%	-12.7%	-301.3%	2.3%	11.8%	14.0%
	output	8.3	368.4%	-72.2%	8.3%	80.6%	285.2%	-204.5%
GR method								
Index	Weights	Overall growth	within	between	cross	entry	exit	Net entry
Labor productivity (Output per employee)	employment	18.9	102.1%	29.2%	–	-23.3%	8.0%	-31.3%
	output	32.6	44.0%	36.3%	–	32.3%	12.6%	19.7%
Labor productivity (Value added per employee)	employment	13.1	249.3%	-156.7%	–	-14.1%	-21.5%	7.4%
	output	8.3	372.6%	-64.0%	0.0%	65.1%	273.7%	-208.6%

Source: Authors' calculations

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BUSINESS DEMOGRAPHY, JOB FLOWS AND PRODUCTIVITY IN POLAND'S ENTERPRISE SECTOR

Summary

The article deals with Poland's transition to a market economy in the 1990s and compares the changes that took place in the Polish economy at the time with developments in mature economies. Using three indexes – the enterprise turnover rate, job flow rates, and productivity growth decomposition – the authors attempt to show that transition processes in Poland have had a positive effect on the country's enterprise sector, though there is still a lot of work to be done. These three indexes help understand the structural changes that occurred during the transition from central planning to an open market economy in Poland.

Using a unique set of data from Polish companies, the authors calculated several measures of resource reallocation, along with enterprise entry and exit rates, and job flow rates. Moreover, they computed the labor productivity growth rate. The high rates of resource reallocation suggest that the Schumpeterian processes of creative destruction have played a major role in productivity enhancement. Surprisingly, labor productivity decomposition shows that the "within effect" influenced productivity the most, while the net entry effect was significant and positive. The poor availability of data explains why the authors were unable to calculate more sophisticated measures of productivity growth. The quality of the data may be also responsible for the substantial sensitivity of the results to the productivity decomposition method.

Keywords: entry and exit rates, employment, job flow, productivity growth, manufacturing