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# LICOS

## Centre for Transition Economics

### LICOS Discussion Paper

Discussion Paper 87/2000

#### A Regional Analysis of Wage Determination in Poland

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# **A Regional Analysis of Wage Determination in Poland\***

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## **Abstract**

A simple model of wage setting and restructuring predicts that the average wage level in a regional labour market in Poland, among other factors, will be negatively related to the unemployment rate and positively related to the degree of regional restructuring. As in Blanchflower and Oswald (1994), the estimated unemployment elasticity of pay across regions is approximately - 0.1. Workers in low unemployment regions earn more pay indicating the presence of profit sharing. Workers in more restructured regions are shown to receive higher premiums in pay indicating compensation for exposure to risk during restructuring.

*Keywords:* Wage Determination, Unemployment, Restructuring and Polish Regions.

*Journal of Economic Literature:* Classification Numbers J6, L0 and O5.

## I INTRODUCTION

In this paper we explore the determinants of average monthly wage levels across the regions of Poland during transition. Throughout our analysis we treat each region (voivodship) of Poland as an independent labour market. This is justified on the grounds that inter-regional worker migration flows have been virtually absent. We set out to examine the effects of varying unemployment and restructuring levels on average pay across the regions of Poland.

As pointed out by Scarpetta (1995), regions inherited a rather idiosyncratic socio-economic structure coming out of planning. We argue throughout the paper that such an inheritance drove variations in restructuring, unemployment and average pay in a systematic way across regions of Poland. The advantage of a regional analysis within Poland, compared to a study across CEE countries, is that while the inherited regional socio-economic structures varied widely across regions, the micro-economic institutional changes and macroeconomic environment during transition were the same over all regions.

In Section I we outline the taxonomy, developed by Lehmann and Walsh (1999), that classifies regions of Poland by their stage of socio-economic development during the transition period. It is well known that the quality of social capital, such as access to telecommunications, varies widely across the regions of Poland. With the exception of Warsaw and Lodz, eastern regions were historically more disadvantaged in this respect. What is less popularised is the heterogeneous nature of firm populations across regions. Until the reforms in 1990, eastern regions mainly traded within the planned CMEA market and enjoyed a privileged position in terms of allocation of resources over the forty

years of central planning. They had a high concentration of Mining, Defence and Natural Resource Extraction industries. A stylised eastern region is one with a large industrial conglomerate surrounded by private agricultural. Exposure to globalisation and the collapse of the CMEA market rendered restructuring difficult. Products became hopelessly outdated in the face of import competition and attracted little or no investment flows. Yet, as shown by Repkine and Walsh (1999), Poland produced many products for export to the EU outside the CMEA before 1990. These EU oriented products were shown to be the main force behind the observed recovery of industrial production in many CEE countries, including Poland. Western regions mainly inherited firms producing such products and attracted the bulk of investment flows. Regions that historically traded with high quality products to the EU were also endowed with better social capital. We use the taxonomy to rank regions by indicators of socio-economic development. We argue that this ranking was predetermined by initial socio-economic conditions.

In section II, we write down our theoretical framework. Due to the nature of privatisation in Poland profit sharing was at the centre of the wage setting process in traditional firms. Workers councils took effective control of state owned firms during the reforms in 1990. The reforms lead to insider worker majority ownership and the distribution of profits among workers in the form of wages. However, majority insider privatisation did not lead to automatic restructuring of firms. Two conditions have to be satisfied. The first is a *risk aversion* condition introduced by Aghion and Blanchard (1994). The expected income for workers, ex-post restructuring, must be at least as great as the current income in the non-restructured state. Workers will only undertake the risk of becoming unemployed during restructuring if the chance of being employed in the

restructured firm came with a high enough risk premium. Secondly, a *viability* condition requires that retained workers have the technology to induce a profit flow that covers the costs of restructuring. In general equilibrium the model predicts a testable proposition. In the presence of decentralised profit sharing, the average wage level in a regional labour market, among other factors, will be negatively related to the unemployment rate (instrumented) and positively related to the degree of regional restructuring (predetermined by initial conditions).

In section III we specify and estimate our econometric model of wage determination. Across the regions of Poland we estimate the impact of regional unemployment rates (instrumented) and restructuring levels on average monthly wages, while controlling for other unobservable deterministic factors using panel data techniques. As outlined in Blanchflower and Oswald (1994) to test for a negative relationship between wage and unemployment levels, a wage curve, is an indirect test of profit sharing in wage setting. In addition we test whether the stage of regional restructuring induces risk premiums in wage setting as predicted by our theory. Compared to the work of Blanchflower and Oswald (1995) we model wages and unemployment at the same level of aggregation. Rather than defining wages at the level of the worker we work at the region level. Our level of aggregation is still lower than the country and time series work on aggregate wage curves surveyed by Layard, Nickell and Jackman (1991) and Phelps (1990).

Our results suggest that a wage curve does exist across Poland. Employees who work in regions of high unemployment earn less, other things constant, than those who are surrounded by low unemployment. This is taken as indirect evidence that profit

sharing is at the centre of wage setting in firms. As in Blanchflower and Oswald (1994), the estimated unemployment elasticity of pay is approximately - 0.1. This suggests that the degree of wage flexibility across Poland to outside labour market conditions is similar to that found in most developed countries. In addition, we find evidence that workers in more restructured regions receive risk premiums in their wages as compensation for undergoing the restructuring process. Section IV puts forward some conclusions.

## **II. A TAXONOMY OF SOCIO-ECONOMIC DEVELOPMENT**

Some previous studies have developed regional labour market taxonomies of Poland, for example, Huber and Scarpetta (1994) and Góra and Lehmann (1995). In this section we outline the taxonomy of Polish regions developed by Lehmann and Walsh (1999), based on the level of socio-economic development attained by 1996. Our taxonomy ranks all 49 voivodships (the highest regional administrative units) in a continuum of restructuring. We also bundle voivodships into four groups which represent development from Group I (least developed) to Group IV (the most developed) for use in our summary statistics.

Our classification scheme ranks voivodships by seven socio-economic development indicators. Using a Borda electoral scheme, the sum of the best six rankings establishes the score for each region. Thus, the highest possible score possible is 6, when a region is always ranked number one, and the worst score possible is 294, when a region is always ranked last, 49. The regions are then sorted in ascending order. Large discrete breaks in the score of voivodships determined the hiatus between our four regional groupings, leading to the regional taxonomy of Table 1.



< Table 1 about here >

In Table 2 we provide summary statistics of the seven indicators of development within our taxonomy of regions. Each indicator is designed to capture the degree of socio-economic regional development achieved over transition. As suggested by the correlation matrix in Table 2, these development indicators tend to be highly correlated across the 49 regions. We now discuss each indicator in turn.

< Table 2 about here >

*A: Share of Services in Total Regional Employment, per cent in 1996:* A developed service sector is an important part of social capital infrastructure. The most (least) developed region has 63 (26) per cent of employment classified as services.

*B: Share of Males in Regional Employment with Job Tenure greater than ten years, per cent in 1996:* Using the labour force survey in 1996 we rank regions by the percentage of males in employment who have not changed jobs since the beginning of transition. Workers in CMEA oriented regions are likely to resist change given their lack of options in the labour market. The most (least) developed region has 27 (61) per cent of males remaining in the same pre-transitional job in 1996.

*C: Number of Telephones in a region per 100 inhabitants in 1996:* Restructuring in firms is likely to be influenced by the quality of social capital such as the quality of public infrastructure in the region. One simple indicator for this is the number of telephones per 100 inhabitants. The most (least) developed region has 31 (8) phones per 100 inhabitants.

*D: Domestic Investments per 1000 inhabitants, percentage distribution across regions in 1996:* Regions with viable western products will have attracted domestic investment flows over the transition period. This contrasts with regions that hosted privileged Soviet Bloc oriented trade in the planning system, which in addition lose their subsidies. The most (least) developed region has 15 (0.5) per cent share of the investment funds made available to the economy.

*E: Foreign Direct Investments per 1000 inhabitants, percentage distribution across regions in 1996:* As documented in Repkine and Walsh (1999), firms that were EU oriented at the start of transition attracted a large amount of FDI from the European market. The most (least) developed region has 38(0) per cent share of FDI in the economy.

*F: Share of Building and Construction in Total Regional Employment, per cent in 1996:* With development one would expect greater development of new offices, hotels, housing and restaurants. In Table 2 the most (least) developed region has a 8 (2) per cent share of Building and Construction in total regional employment.

*G: Share of Agriculture in Total Regional Employment, per cent in 1996:* The agricultural sector was largely privately owned before transition, had a very low capital/output ratio, and was characterised by a substantially lower level of productivity than other sectors of the economy. Restructuring of this sector was urgently required with the opening up of Poland to world markets. A relatively high employment share of agriculture in a region at the end of 1996 is therefore indicative of a relative lack of restructuring of the agricultural sector in that region. There exists another mechanism that relates the share of agricultural employment to restructuring. Much of private agriculture

that remained during transition was subsistence farming, which served as a buffer for labour shed in industry, Leiprecht (1997). However, as more restructuring occurs, more opportunities exist elsewhere and, *ceteris paribus*, the lower should be the employment share of agriculture. The most (least) developed region has 6 (62) per cent share of Agriculture in total regional employment.

In summary, five of the seven indicators are based on stock and the two investment indicators are based on flow values, which reflect unequivocally the relative stage of development in 1996. Yet, one can show that the rankings of regions reflect a persistent pattern when based on values of these indicators in preceding years. The taxonomy reflects a systematic ranking of regions in their stage of development that persists during the transition period. The ranking of regions is geographically portrayed in chart 1.

*< chart 1 about here >*

In chart 1 we show that, with the exception of Warsaw and Lodz, all regions in our regional groupings I and II are located in eastern regions of Poland. Eastern regions mainly inherited CMEA oriented firms and poor social capital while western regions mainly inherited EU oriented firms and superior social capital. Workers in western regions undertook more restructuring over the transition period when compared to workers in eastern regions. In the next sections we examine average monthly wages and unemployment rates across our regional groups that are conditioned on distinct stages of socio-economic development, the legacy of history.

## II. THEORY

In this section we set out to model the determinants of the average wage level within an independent labour market undergoing a transition to a market economy. Due to the lack of inter-regional worker mobility we can assume independence of labour markets across the regions of Poland. We model wage determination and restructuring in the presence of decentralised profit sharing within a firm in partial equilibrium. Using partial equilibrium outcomes we model the outside (expected) wage level in a regional labour market in general equilibrium.

During the reforms in 1990, majority insider privatisation ensured workers took control of firms and distributed profits among workers in the form of wages. Two conditions had to be satisfied before workers would vote for restructuring. The first is a *risk aversion* constraint introduced by Aghion and Blanchard (1994),

$$rV_N \leq \lambda rV_R + (1 - \lambda)rV_U \quad (1)$$

The expected income stream for a worker, ex-post restructuring, must be at least as great as the current income stream in the non-restructured state,  $rV_N$ . A worker is given a probability  $\lambda$  of remaining in the restructured firm, earning an income stream of  $rV_R$ , and a probability  $(1-\lambda)$  of becoming unemployed with an expected income stream of  $rV_U$ . The second is a *viability* constraint that requires retained workers to induce an profit stream that covers labour rents and restructuring costs ex-post restructuring,

$$\pi_R \geq (rV_R - rV_U)\lambda L + \sigma \quad (2)$$

where  $\pi_R$  is the ex-post profit stream,  $\lambda L$  the retained portion of the inherited employment stock and  $\sigma$  the sunk costs associated with restructuring to create a profit flow that induces condition (2) to hold.

We first examine the implication of condition (1) for wage setting. The expected income stream after restructuring must compensate the worker for the risk of becoming unemployed and for the forgone expected income stream from the non-restructured state. The expected income stream in the event of a flow into unemployment,  $rV_U$ , is written down as,

$$rV_U = b + \left( \frac{H}{U} \right) \left( \frac{\bar{W}}{r} - V_U \right) \quad (3)$$

The expected income of a worker in unemployment is the sum of the benefit level,  $b$ , and an expected capital gain, the uncertain discounted income gain from a probability of being employed earning an average wage of  $\bar{W}$  in the outside labour market. The probability of being employed from unemployment is determined by the numbers hired in the outside labour market,  $H$ , from the unemployment stock,  $U$ . The expected income stream for a worker in the state of unemployment in (3) can be rewritten as the following,

$$rV_U = \Omega = \frac{1}{\phi} b + \frac{\phi - 1}{\phi} \bar{W} \quad (4)$$

where  $1 \leq \phi \leq \infty$ . If the probability of being hired in the outside labour market is zero,  $(H/U)=0$ , then  $\phi=1$  and the expected income stream for a worker in unemployment,  $\Omega$ , is just the benefit level,  $b$ .

The expected income stream for a worker in the non-restructured state,  $rV_N$ , is modelled as an outcome of a simple rent sharing model. The firm sets a wage for their

inheritance of insider workers  $L$  subject to the constraint that the flow of labour rent,  $(W - \Omega)L$ , reflects the flow of product market rent,  $\pi_N$ , in the non-restructured state. We express the expected income of workers in a non-restructured firm as the following,

$$W_N = rV_N = \Omega + \frac{\pi_n}{L} = \Omega + C \quad (5)$$

If workers are to vote for restructuring, condition (1) must hold. The minimum ex-post income stream,  $rV_R$ , necessary to induce a vote for restructuring ex-ante can be found by substituting outcomes in (4) and (5) into (1), written as follows,

$$W_R = rV_R = \Omega + \frac{C}{\lambda} \quad (6)$$

Workers require a premium for exposing themselves to the risk of becoming unemployed during the restructuring process, as  $0 < \lambda < 1$ . This additional labour rent is a form of an efficiency wage payment, as defined in Konings and Walsh (1994), if it induces more product market rent via restructuring. There is always an ex-ante expected income stream that induces a worker vote for restructuring, meeting condition (1), but there must also be a required increase in the ex-post profit stream that can finance the retained workers income stream and restructuring costs, condition (2). The minimum ex-post profit stream necessary in the presence of condition (1) holding is found by substituting (4) and (6) into (2),

$$\pi_R = (W_R - \Omega)\lambda L + \sigma = \pi_N + \sigma \quad (7)$$

The retained workers must be able to induce a profit stream that is at least as big as the profit stream in the non-restructured state plus the sunk cost associated with increasing profitability. The total labour rent in the firm ex-post restructuring is not higher, but the rent per retained worker has increased reflecting the required premium for

undertaking the risk of restructuring. In order for (7) to hold, the following restructuring technology must exist,

$$\pi_R = e(\sigma)\lambda\pi_N = \pi_N + \sigma \quad (8)$$

Retained workers must increased profitability by a factor  $e(\sigma)\lambda$ , where  $e'(\sigma) > 0$ . From (8) we can solve for maximum layoffs,  $(1 - \lambda_{\max})$ , allowed by the restructuring technology and restructuring costs in the case that conditions (1) and (2) are both just justified,

$$\lambda_{\max} = \frac{1}{e(\sigma)} \left\{ 1 + \frac{\sigma}{\pi_N} \right\} \quad (9)$$

If a restructuring technology does not exist restructuring would not be considered,  $e = 1$  and  $\sigma = 0$ , inducing a full retention of all the inherited labour force  $\lambda = 1$ . The retention rate decreases in restructuring costs,  $\sigma$ , and in the responsiveness of profitability to sunk cost expenditures,  $e'(\sigma) > 0$ . Low restructuring costs and a good restructuring technology will induce workers ex-ante to vote for restructuring even in anticipation of a low retention rate, as ex-post profitability and labour income per retained worker will be high enough to satisfy conditions (1) and (2).

We assume that both  $\sigma$  and  $e(\sigma)$  are determined by exogenous factors that we consider to be an socio-economic inheritance of a firm coming out of planning. The sunk cost of restructuring and the resultant increase in profitability generated from a reduced labour force is related to the quality of social capital that a firm has access to in a regional labour market, such as telecommunications, banking and legal infrastructures. In addition it can be related to the amount of obsolete capital and the nature of the product a firm has inherited from the planning system. A Polish firm that historically traded poor quality

products within the CMEA market located in eastern regions is less likely to restructure due to an absence of a restructuring technology and in addition a lack of access to social capital. In contrast, a Polish firm that historically traded with high quality products to the EU from western regions endowed with better social capital is more likely to restructure.

The required jump in profitability may not be possible in some firms due to these external inheritances. This will leave a proportion,  $\rho$ , of traditional firms non-restructured and a proportion,  $(1-\rho)$ , of firms restructured in regional labour markets. Within each region we assume a homogenous grouping of non-restructured and restructured traditional firms determined by an exogenous regional inheritance.

We define the average wage  $\bar{W}$  paid by firms in the outside labour market as the average wage paid across restructured and non-restructured traditional firms,

$$\bar{W} = \rho W_N + (1 - \rho) W_R \quad (10)$$

By substituting (5) and (6) into (10), and rearranging, we can express the average wage as follows,

$$\bar{W} = W_R + \left( \frac{C\rho(\lambda - 1)}{\lambda} \right) \quad (11)$$

If  $\rho > 1$ , some proportion of firms are restructured and the average wage is,  $W_N < \bar{W} < W_R$ . We solve for the average wage  $\bar{W}$  in general equilibrium, using (4) and (11), as follows,

$$\bar{W} = b + \phi \frac{C}{\lambda} (1 + \rho(\lambda - 1)) = b + \left[ 1 + \frac{H}{U} \frac{1}{r} \right] \frac{C}{\lambda} (1 + \rho(\lambda - 1)) \quad (12)$$

The average wage is driven by factors that reflect profit sharing, restructuring in traditional firms and outside labour market conditions. The restructuring of traditional



firms increases the average wage in the regional labour market reflecting wage premiums that compensate retained workers for undertaking the risk of job loss during restructuring.

The restructuring parameters in the model are treated as an outcome of the initial condition of socio-economic structures across the regions of Poland. The evolution of hiring and unemployment in the outside labour market are also treated as exogenous in this model. The better the conditions in the outside labour market, the lower the average wage for any stage of regional restructuring.

Yet, increases in the outside wage, induced by restructuring in traditional firms, are likely to constrain hiring in the outside labour market and reflect layoffs from traditional firms that flow into unemployment. Thus the unemployment rate is likely to depend on the rate of restructuring, among other factors. In summary, within a simple model of wage setting and restructuring across independent regional labour markets, we predict the following testable proposition:

*In the presence of decentralised profit sharing, the average wage level in a regional labour market, among other factors, will be negatively related to the unemployment rate (instrumented) and positively related to the degree of regional restructuring.*

### **III. ECONOMETRIC EVIDENCE**

We first report summary statistics of the average monthly wages and unemployment rates across Polish regions during the period from 1991 to 1996. All data

are taken from Polish Regional Statistical Yearbooks produced annually by the Central Statistic Office.

*< Table 3 about here >*

Table 3 presents the evolution of average month wages across time and regional groupings. Nominal wages are expressed in thousands of Polish Zloty. We observe that wage levels increase as we move from Group I to IV the most developed region, in each time period. In addition wages also increase within each regional grouping overtime but more so in the more advanced groupings, thus increasing the wage disparity across regions overtime.

*< Table 4 about here >*

Table 4 presents the evolution of the unemployment rate across time and regions ranked by their development level. The unemployment rate is based on the number of workers who are eligible for unemployment benefits and are looking for a job. We observe that the unemployment rate seems to follow an inverse U-shape during transition. Unemployment increases as we move from Group I to Group III and then falls in the most developed regions in each time period. In addition unemployment also follows this pattern within each regional grouping overtime. In Figure 1 we plot the Unemployment Rate against regions ranked by their degree of development in 1996. Rank 1 is the most developed region.

*< Figure 1 about here >*

The inverse U-shape pattern is observable. Lehmann and Walsh (1999) provide evidence, using the same regional taxonomy outlined in Table 1, that regional unemployment turnover is systematically related to the degree of regional development

alongside human capital characteristics of workers and other deterministic factors. This highlights a potential simultaneity problem in the specification of the wage curve relationship as wages and unemployment maybe driven by the stage of development across regions.

*< Figure 2 about here >*

In Figure 2 we plot regional wage levels against regional unemployment rates in 1996. There seems to be evidence of a wage curve in the raw data. In what follows we provide econometric evidence for the assertion that wage levels are determined by unemployment and restructuring levels across regions and time while controlling for simultaneity problems and the presence of other deterministic but omitted factors.

We have information on 49 voivodships over a 6 year period giving us a total of 294 observations. We estimate the impact of the log of the unemployment rate in region  $i$  and period  $t$ ,  $UR_{it}$ , on the log of the average monthly wage,  $W_{it}$ , in region  $i$  and period  $t$  while controlling for the rank,  $RANK_i$ , of region  $i$  in terms its ability to restructure during the transition period among other deterministic factors. The wage curve model is written as follows,

$$\log W_{it} = \alpha + \beta_1 \log UR_{it} + \beta_2 RANK_i + v_i + \varepsilon_{it} \quad (9)$$

Unobserved heterogeneity in region  $i$  is controlled for by the inclusion of a unit specific residual,  $v_i$ , that is comprised of a collection of factors not in the regression that are specific to region and constant over time. For example, we have no data to control for the average human capital levels of regions and other region specific factors. Leaving out such effects would lead to overestimated coefficients in the regression.

The random effect specification is justified on the basis of a Hausman test. The intercept and time dummies, in addition to the random effects, are also included in the regression to control for the evolution of the unobservable macroeconomic deterministic factors over time, such as inflation. The results of our wage curve regressions across Polish regions are presented in Table 5 and Table 6.

*<Insert Table 5>*

In Table 5 we report results that do not control for the possibility of regional specific omitted variables. In the final column we instrument the unemployment rate with RANK, RANK squared time, and regional dummies. The unemployment elasticity is estimated to be in the region of -0.2. Tests for AR1 in the residuals indicate that model specifications are not valid. It is likely that the same regional specific omitted variables in each year are driving the auto-regressive processes.

*<Insert Table6>*

In Table 6 we report the results from our random effect models that control for the presence of region specific unobserved deterministic heterogeneity. Results from the Hausman specification test verify the appropriateness of our random effect models. In the final column of Table 6 we instrument the unemployment rate. The unemployment elasticity of pay for Poland is in the region of  $-0.12$ . The results indicate the presence of imperfectly competitive wage setting across regions and the presence of risk premiums for workers in restructured firms. Workers earn higher levels of pay, on average, in regions that have lower unemployment and have undertaken more restructuring during transition.

## V. CONCLUSION

In this paper we explore the determinants of average monthly wage levels across the 49 (voivodships) regions of Poland over the period 1991-96. We examine the effects of unemployment and restructuring on average pay levels across regions of Poland, while controlling for other unobservable deterministic factors using panel data techniques. A simple model of wage setting and restructuring predicts a testable proposition. In the presence of decentralised profit sharing, the average wage level in a regional labour market, among other factors, will be negatively related to the unemployment rate (instrumented) and positively related to the degree of regional restructuring. It is argued that the ranking of regional restructuring during transition is predetermined by the initial conditions of social-economic structures across regions and is captured by a regional taxonomy developed in Lehmann and Walsh (1999).

Our results suggest that a wage curve exists and risk premiums are given to workers that have undertaken restructuring. Employees who work in regions of high unemployment earn less, other things constant, than those surrounded by low unemployment. As in Blanchflower and Oswald (1994), the estimated unemployment elasticity of pay is approximately -0.1. The outside labour market on wage determination induces a similar degree of wage flexibility found in most developed countries. In addition, workers in more restructured regions receive higher pay, as compensation for enduring the risks of restructuring. Overall, models of imperfectly competitive wage determination and their interaction with models of product market restructuring seems to be a fruitful way of modelling wage determination in economies undergoing a transition to a market economy.

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Table 1

Taxonomy of Polish regions <sup>a</sup>

I	II	III	IV
41. Ciechanowskie	25. Czestochowskie	8. Katowickie	1. Warszawskie
42. Ostroleckie	26. Bialostockie	9. Zielonogorskie	2. Szczecinskie
43. Krosnienskie	27. Plockie	10. Legnickie	3. Poznanskie
44. Sieradzkie	28. Suwalskie	11. Bydgoskie	4. Wroclawskie
45. Przemyskie	29. Kaliskie	12. Opolskie	5. Krakowskie
46. Bialskopodlaskie	30. Rzeszowskie	13. Koszalimskie	6. Lodzkie
47. Siedleckie	31. Piotrkowskie	14. Bielskie	7. Gdanskie
48. Lomzynskie	32. Chelmskie	15. Jeleniogorskie	
49. Zamojskie	33. Kieleckie	16. Olsztynskie	
	34. Radomskie	17. Walbrzyskie	
	35. Tarnowskie	18. Slupskie	
	36. Koninskie	19. Elblaskie	
	37. Skierniewickie	20. Gorzowskie	
	38. Nowosadeckie	21. Lubelskie	
	39. Tarnobrzeskie	22. Torunskie	
	40. Wloclawskie	23. Leszczynskie	
		24. Pilskie	

<sup>a</sup> Ranked in ascending order by a rank score that sums the best six ranked positions in seven development indicators outlined summarised by the above taxonomy in Table 2.



Table 2

Summary Statistics of Development Indicators by Regional Group (RG)

Indicator	A	B	C	D	E	F	G
<b>RG I</b>							
Mean	28.0	53.1	10.0	00.7	00.4	02.7	53.3
Std. Dev.	01.9	03.3	01.6	00.2	00.5	00.8	06.3
Min	24.5	48.4	08.0	00.5	00.0	01.6	41.2
Max	30.6	58.1	14.0	01.0	01.7	03.8	62.0
<b>RG II</b>							
Mean	32.4	50.5	12.0	01.3	00.6	04.1	42.2
Std. Dev.	03.8	04.6	02.0	00.5	00.5	00.7	05.0
Min	24.8	43.4	10.0	00.5	00.0	03.2	32.8
Max	40.0	60.4	18.0	02.3	01.5	06.2	50.4
<b>RG III</b>							
Mean	44.2	39.4	13.0	02.2	01.4	05.6	21.8
Std. Dev.	04.6	05.7	01.8	02.4	01.5	01.6	07.6
Min	36.1	26.5	11.0	00.7	00.3	03.3	06.4
Max	51.9	52.0	17.0	11.0	06.1	09.7	36.9
<b>RG IV</b>							
Mean	54.4	36.5	21.0	05.2	08.9	07.0	12.1
Std. Dev.	05.3	03.1	05.6	04.6	13.0	01.1	05.2
Min	49.0	31.9	16.0	02.4	01.7	04.9	05.7
Max	65.0	41.4	31.0	15.4	38.0	08.2	21.0

A: Share of Market and Non-Market Services in Total Regional Employment, per cent in 1996

B: Share of Males in Regional Employment with Job Tenure greater than ten years, per cent in 1996

C: Regional Telephones per 100 inhabitants in 1996.

D: Investments per 1000 inhabitants, percentage distribution across regions in 1996.

E: Foreign Direct Investments per 1000 inhabitants, percentage distribution across regions in 1996.

F: Share of Building and Construction in Total Regional Employment, per cent in 1996

G: Share of Agriculture in Total Regional Employment, per cent in 1996

Correlation	A	B	C	D	E	F	G
A	1.0						
B	-0.86	1.0					
C	0.74	-0.50	1.0				
D	0.51	-0.31	0.63	1.0			
E	0.47	-0.34	0.69	0.84	1.0		
F	0.70	-0.52	0.56	0.62	0.40	1.0	
G	-0.92	0.83	-0.65	-0.53	-0.39	-0.80	1.0

Table 3

Summary Statistics of the Average Monthly Wage by Regional Restructuring

	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
<b>Group I</b>	158.9	254.6	337.5	446.2	588.3	740.0
<b>Group II</b>	162.7	260.8	347.9	467.1	617.4	776.3
<b>Group III</b>	171.0	272.8	363.6	487.1	630.5	806.5
<b>Group IV</b>	182.6	298.0	396.6	530.1	700.9	897.9

Group I is the least restructured grouping and Group VI the most restructured grouping.

Table 4

Summary Statistics of the Average Unemployment Rate by Regional Restructuring

	<b>1991</b>	<b>1992</b>	<b>1993</b>	<b>1994</b>	<b>1995</b>	<b>1996</b>
<b>Group I</b>	13.0	14.3	17.7	16.8	16.2	14.1
<b>Group II</b>	13.0	14.9	18.0	17.7	17.1	15.3
<b>Group III</b>	14.0	17.0	20.9	20.7	19.3	17.3
<b>Group IV</b>	8.7	10.8	12.3	12.0	11.1	9.4

Group I is the least restructured grouping and Group VI the most restructured grouping.

Table 5

OLS Regressions across Polish Regions 1991-96

	<b>OLS</b>	<b>OLS</b>	<b>2SLS**</b>
	<b>Log Wage</b>	<b>Log Wage</b>	<b>Log Wage</b>
<b>R<sup>2</sup></b>	0.97	0.98	0.98
<b>Constant</b>	5.4 (13.0)*	5.4 (15.3)*	5.4 (15.1)*
<b>Log Unemployment Rate</b>	-.28 (7.6)*	-.20 (6.3)*	-.21 (6.4)*
<b>Restructuring Rank</b>		-.003 (10.6)*	-.003 (6.4)*
<b>Year Dummies</b>	YES	YES	YES
<b>Observations</b>	294	294	294
<b>Heterosced.</b>	$\chi^2(55) = 14.7$	$\chi^2(56) = 13.0$	$\chi^2(56) = 13.3$
<b>AR1</b>	$\chi^2(1) = 189.0$	$\chi^2(1) = 169.1$	$\chi^2(1) = 171.5$

T-statistics in parenthesis, \* indicates significance at the 5% level.

\*\* Instruments include RANK, RANK squared , time and regional dummies.

Table 6

GLS Regressions across Polish Regions 1991-96

	<b>GLS</b>	<b>GLS</b>	<b>GLS**</b>
	<b>Log Wage</b>	<b>Log Wage</b>	<b>Log Wage</b>
<b>R<sup>2</sup> (Within )</b>	0.99	0.99	0.99
<b>R<sup>2</sup> (Between)</b>	0.19	0.44	0.45
<b>R<sup>2</sup> (Overall)</b>	0.97	0.98	0.98
<b>Constant</b>	5.3 (8.4)*	5.3 (9.3)*	5.4 (15.3)*
<b>Log Unemployment Rate</b>	-.15 (2.6)*	-.12 (2.4)*	-.12 (2.7)*
<b>Restructuring Rank</b>		-.004 (4.8)*	-.003 (4.7)*
<b>Random Effects</b>	YES	YES	YES
<b>Year Dummies</b>	YES	YES	YES
<b>Observations</b>	294	294	294
<b>Hausman test</b>	$\chi^2(6) = 4.7$	$\chi^2(6) = 2.55$	$\chi^2(6) = 0.51$
<b>Heterosced.</b>	$\chi^2(55) = 5.4$	$\chi^2(56) = 5.8$	$\chi^2(56) = 6.2$
<b>AR1</b>	$\chi^2(1) = 1.7$	$\chi^2(1) = 1.7$	$\chi^2(1) = 1.7$

T-statistics in parenthesis, \* indicates significance at the 5% level.

\*\* Instruments include RANK, RANK squared , time and regional dummies.

Figure 1

**Unemployment and the ranking of Polish regions by degree of restructuring**

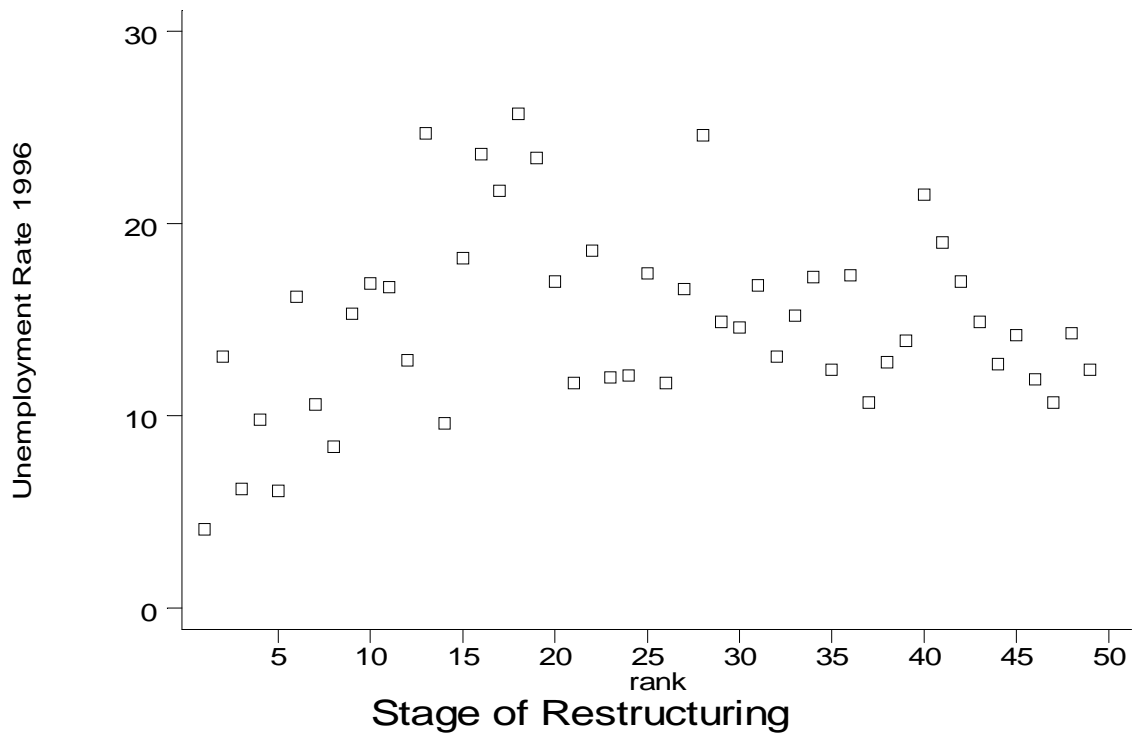
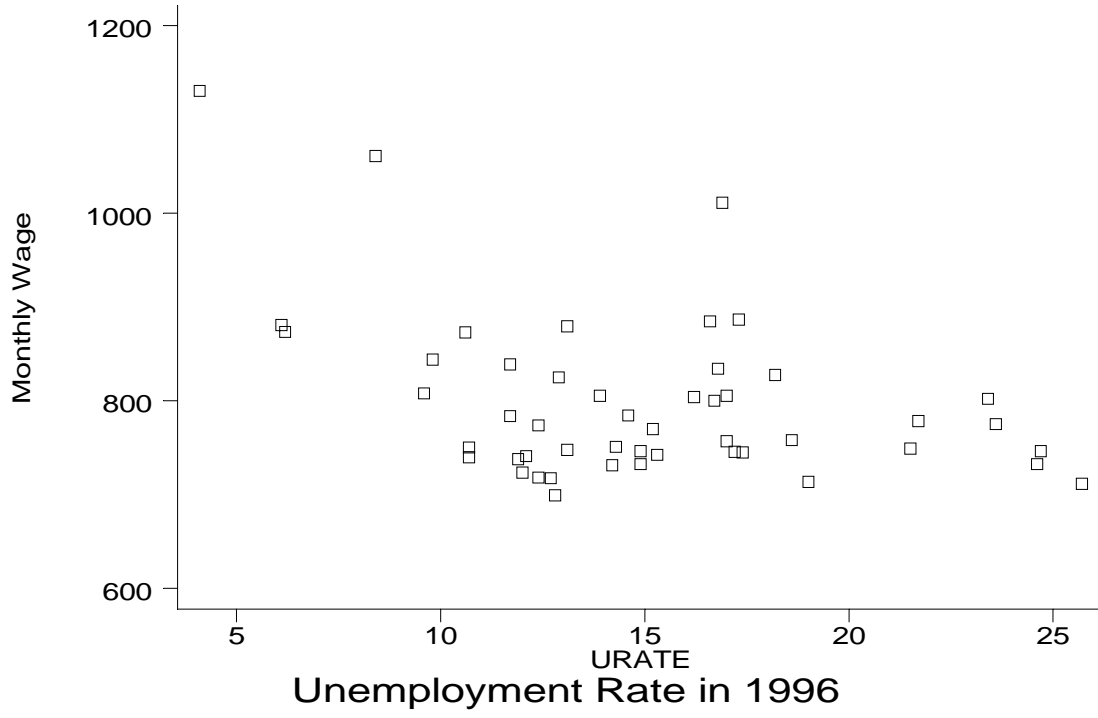
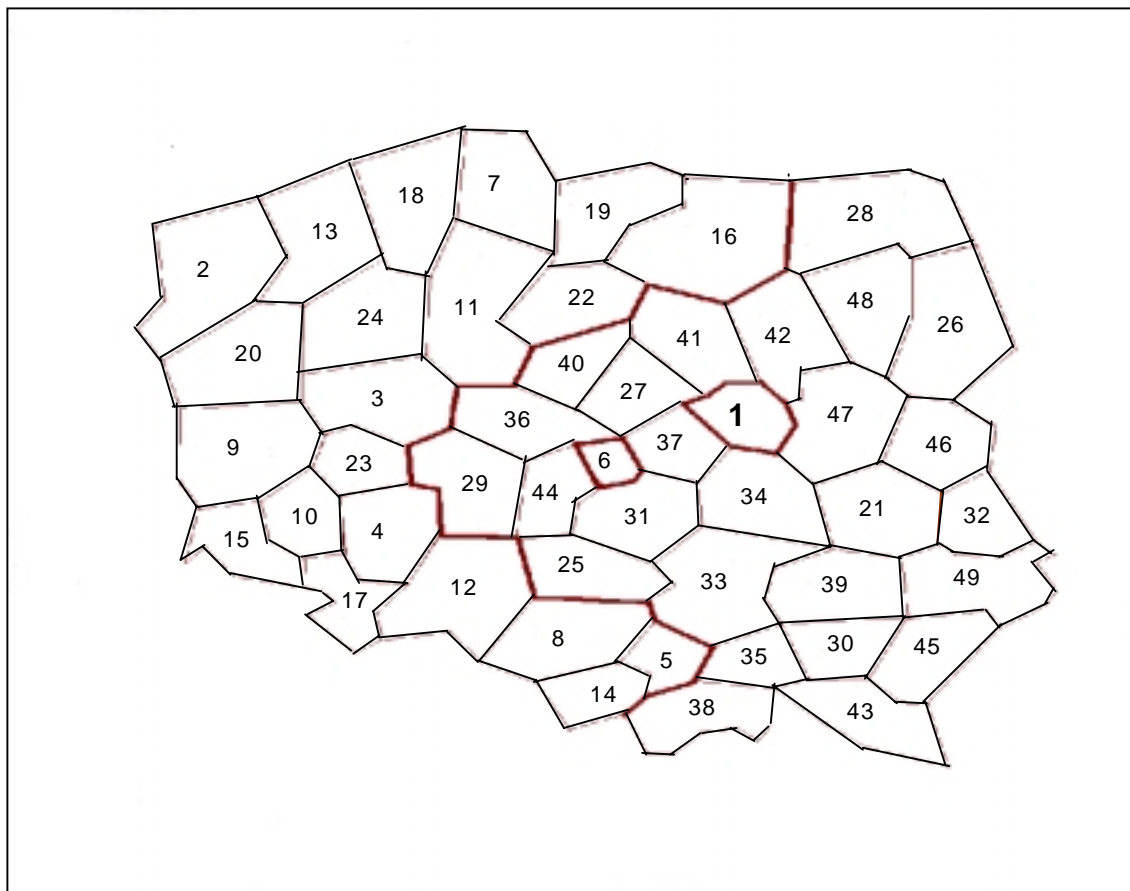


Figure 2

**Regional Wage Levels and Unemployment Rates in 1996**





\*Ranked in ascending order by a rank score that sums the best six ranked positions in seven employment restructuring indicators outlined summarised by the taxonomy in Table 1.

<b>1</b>	<b>Warszawskie</b>	<b>19</b>	<b>Elblaskie</b>	<b>37</b>	<b>Skierniewickie</b>
<b>2</b>	<b>Szczecinskie</b>	<b>20</b>	<b>Gorzowskie</b>	<b>38</b>	<b>Nowosadeckie</b>
<b>3</b>	<b>Poznanskie</b>	<b>21</b>	<b>Lubelskie</b>	<b>39</b>	<b>Tarnobrzeskie</b>
<b>4</b>	<b>Wroclawskie</b>	<b>22</b>	<b>Torunskie</b>	<b>40</b>	<b>Wloclawskie</b>
<b>5</b>	<b>Krakowskie</b>	<b>23</b>	<b>Leszczynskie</b>	<b>41</b>	<b>Ciechanowskie</b>
<b>6</b>	<b>Lodzkie</b>	<b>24</b>	<b>Pilskie</b>	<b>42</b>	<b>Ostroleckie</b>
<b>7</b>	<b>Gdanskie</b>	<b>25</b>	<b>Czestochowskie</b>	<b>43</b>	<b>Krosnienskie</b>
<b>8</b>	<b>Katowickie</b>	<b>26</b>	<b>Bialostockie</b>	<b>44</b>	<b>Sieradzkie</b>
<b>9</b>	<b>Zielonogorskie</b>	<b>27</b>	<b>Plockie</b>	<b>45</b>	<b>Przemyskie</b>
<b>10</b>	<b>Legnickie</b>	<b>28</b>	<b>Suwalskie</b>	<b>46</b>	<b>Bialskopodlaskie</b>
<b>11</b>	<b>Bydgoskie</b>	<b>29</b>	<b>Kaliskie</b>	<b>47</b>	<b>Siedleckie</b>
<b>12</b>	<b>Opolskie</b>	<b>30</b>	<b>Rzeszowskie</b>	<b>48</b>	<b>Lomzynskie</b>
<b>13</b>	<b>Koszalimskie</b>	<b>31</b>	<b>Piotrkowskie</b>	<b>49</b>	<b>Zamojskie</b>
<b>14</b>	<b>Bielskie</b>	<b>32</b>	<b>Chelmskie</b>		
<b>15</b>	<b>Jeleniogorskie</b>	<b>33</b>	<b>Kieleckie</b>		
<b>16</b>	<b>Olsztynskie</b>	<b>34</b>	<b>Radomskie</b>		
<b>17</b>	<b>Walbrzyskie</b>	<b>35</b>	<b>Tarnowskie</b>		
<b>18</b>	<b>Slupskie</b>	<b>36</b>	<b>Koninskie</b>		

**Chart 1 Location of Regions by their rank**