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ABSTRACT

Individual Pay and Outside Options: Evidence from the Polish Labour Force Survey*

Using Polish Labour Force Survey data, we examine whether competition for labour has induced individual pay to depend on outside options, availability and quality of jobs. Exploiting the lack of inter-regional job and worker flows we estimate the elasticity of individual pay, amongst a rich set of individual characteristics, to be approximately -0.1 for local unemployment (job shortages) and + 0.1 for local job reallocation (restructuring). Variations in local labour market conditions explain approximately 50 per cent of the differences in expected individual earnings across regions, while differences in inherited human capital and occupation structures explain the rest.

JEL Classification: J6, L0, O5

Keywords: Wage determination, unemployment, job reallocation and polish regions

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Introduction

The introduction of competition for labour in the countries of Central and Eastern Europe (CEE) theoretically should induce individual earnings, for any given ability, to reflect outside earning options. In this paper we match regional, firm and individual level data to explore whether this has been a reality in Poland during transition.

While the full benefits of labour market liberalisation have been constrained by the lack of inter-region worker and job flows this has the advantage of allowing us to model outside earning options to depend solely on local (regional) labour market conditions[2]. In addition, intra-region structural rigidities may also have constrained the role of competition in local labour markets. An important feature of local labour markets in Poland is that they inherited idiosyncratic structures coming out of planning[3]. While local labour markets have the same economic institutions and macroeconomic environment, we can expect unemployment (job shortages) and job reallocation (restructuring) to evolve differently across local labour markets during transition. We intend to exploit the cross section variation in local labour market conditions in our analysis of outside earning options and individual pay.

[2] Inter-regional job and worker flows (adjustments) have been virtually absent during transition (see Faggio and Konings, 1999, and Boeri and Scarpetta 1996). The absence of migration flows ensures our econometric work will not have to concern itself with the standard Harris-Todaro critique, the need to model migration as a key labour supply determinant of regional wage and unemployment levels.

[3] Boeri and Scarpetta (1996) explain growing polarisation in employment performance across Polish regions as an outcome of the inherited and rather idiosyncratic firm structures. Exposure to world markets rendered the capital accumulated by many firms hopelessly out-of-date. Many eastern regions of Poland tended to be historically CMEA market oriented and enjoyed a privileged position in terms of allocation of resources over the forty years of central planning. These regions 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 holdings with capital not easily adaptable to the market economy. Yet, many western regions of Poland had produced goods for export outside the CMEA before 1990 and had developed better infrastructure and inherited capital that was more adaptable in the global economy. Repkine and Walsh (1999) estimate the empirical relevance of historical trade links to be very significant in the modelling of industrial production.

Using regional data, we first identify conditions in local labour markets that explain differences in expected (average) earnings across the regions of Poland during transition. We model conditions in local labour markets using local unemployment rates calculated from Labour Force Survey (LFS) data and local job reallocation rates calculated from Amadeus Company Accounts data. The former empirically captures the tightness of the labour market or job shortages. The latter captures the speed at which new and restructured firms are replacing non-restructured firms in local firm populations. The composition change in labour demand increases the number of good jobs in local labour markets. In section I we review the theoretical and empirical literature that have used unemployment in wage equations, and motivate why one should also consider using job reallocation.

In section II we evaluate the impact of (instrumented) local labour market conditions on average monthly wage levels using regional data across 49 (voivodships) regions of Poland over the period 1991-96, while controlling for other unobservable deterministic factors using panel data techniques. We find that employees who work in regions of high unemployment earn less, on average, other things constant, than those surrounded by low unemployment. The elasticity of average pay with respect to local unemployment is approximately -0.1. In addition, we find that workers in more restructured regions receive higher pay, on average, other things constant, than those surrounded by non-restructured firms. The elasticity of average pay with respect to local job reallocation is approximately + 0.1. In terms of local labour market conditions job shortages do not tell the whole story. The nature of the jobs in the firm populations also matter for wage determination.

In section III we evaluate the impact of (instrumented) local labour market conditions, human capital, and occupation characteristics on individual earnings using a panel of males from the Polish LFS data over the period 1994-1996.[4] Our empirical approach has a number of innovations. First, we match local unemployment and job reallocation rates to the individual data and instrument to avoid simultaneity bias in our results. Second, we correct for sample selection bias by conditioning our earnings equation on a participation model. Finally, we include a rich set of education categories and occupation controls.

The unemployment and job reallocation elasticity of individual pay is estimated to be approximately -0.1 and +0.1, respectively, while controlling for a rich set of human capital and occupation characteristics, among other factors. Large regional variation in unemployment and job reallocation rates induce large differences in expected individual earnings, for any given ability, across the various regions of Poland. Local outside earning options explain approximately 50 per cent of the differences in expected individual earnings across regions, while differences in inherited human capital and occupation structures explain the rest.

A secondary issue investigated, is to what extent past investments in human capital and choice of occupation under planning are rewarded in terms of earning potential during the transition period. Normally in mature market economies we would expect investment in human capital to target high wage occupations. This selection bias is

[4] The general consensus within firm level CEE studies to date, as reviewed by Svejnar (1999), is that there is little evidence of a detectable "wage curve" effect across CEE countries. Yet, Basu et al (1997) for example, using firm level data, finds the wage elasticity with respect to the local or (district-level) unemployment rate is statistically significant, a negative coefficient of 0.03 for Poland. In contrast to Basu et al, using individual data from the Polish Labour Force Survey we model individual earnings to depend on (instrumented) local labour market conditions (local unemployment and job reallocation rates), human capital and workplace characteristics.

not a strong feature of this data as most human capital and occupation structures were an outcome of the planning era. However we do test which educational and occupational specific work experience yield high returns from the market economy.

Our findings support the consensus that technical (specialist) education under the communist regime is not as well rewarded as academic (broad) education during transition. One should not use years of schooling but rather categorical variables, since the type of education under planning is important. Jobs for life and full participation under planning ensures that using the number of years of working age is a good proxy for work experience. While experience earnings profiles are very flat, only young workers, under the age of 25, get a positive return to experience. These results again point to the lack of return from years of work experience under planning. We find there are occupational specific returns. For example, Hotels and Restaurants, Education, and Health pay the same low pay as Agriculture, while Retailing, Transport and Construction pay up to 20 per cent more and Finance, Motor Cars and Public Administration get over 20 per cent more than Agriculture. Finally, we also report nice interaction effects between human capital and occupation characteristics and local labour market conditions. Individuals with youth, academic education or in high wage occupations have elastic responses to outside labour market conditions rather than unitary responses. Individuals that are older, technically trained or in low wage occupations are found to have inelastic responses to outside labour market conditions. This is strong evidence of intra-regional structural rigidities, legacies of planning that mitigate the ability of certain individuals to take advantage of their recent right to take up outside options and benefit from competition in their local labour market.

Section I: Literature Review

The relationship between the wage and local unemployment levels has been debated for many generations. From the beginning of the 1970s, the first generation of papers, summarised in Table 1, argued that regions with high unemployment also experience high wage levels. The theoretical foundations for such a relationship can be found in Harris and Todaro (1970)[5]. Hall (1970, 1972), using data for twelve U.S. cities in 1966, found a positive relationship between expected pay and unemployment when estimating wage equations across cities. Reza (1978), Adams (1985) and Marston (1985) also found that there was a positive relationship using individual level data.

However, by the end of the 1980s this accord began to crumble. The problem in the earlier literature was a failure to control for regional fixed effects. Regional dummies were not included in the estimated wage equations. Including these effects led to new evidence in a second generation of papers, summarised in Table 2, which suggested that regional pay and unemployment were in fact negatively correlated[6]. Using British data Blackaby and Manning (1987, 1990a,b,c) find evidence of a negative spatial relationship between joblessness and workers' remuneration. Freeman (1988) used American and more disaggregated British data to find similar results. Card (1990) used Canadian data to establish the negative relationship.

Using larger microeconomic datasets, summarised in Table 3, Blanchflower and Oswald (1994) document a negative empirical relationship between local unemployment

[5] Their argument is based on Adam Smith's theory of "compensating differentials" and a long run zero migration equilibrium.

[6] This correlation refers to levels of unemployment and wages and not changes in these variables found in a conventional regional Phillips curves.

and pay determination which they term a "Wage Curve". What emerges from the authors' pooled cross-sectional regressions on micro-data is a pattern linking individual pay to regional unemployment, with a typical wage curve described by the following specification;

$$\ln W_{it} = \beta_0 - 0.1 \ln U_{jt} + \beta_2 X_{it} + \beta_2 D_j + \beta_3 D_t + \varepsilon_{it} \qquad (1.1)$$

The natural logarithm of individual i in period t hourly/monthly/yearly earnings, $W_{it,}$ is explained by the natural logarithm of regional unemployment rate, $U_{jt,}$ a vector of workplace & human capital characteristics, $X_{it,}$(age, education, work experience and occupation), regional and time dummies, $D_{j,}$ and $D_{t,}$, respectively. Regression results on samples across 12 countries suggest that the unemployment elasticity of pay approximates, –0.1. A hypothetical doubling of unemployment is associated with a drop in pay of 10%. Empirical estimates show that a worker who is employed in an area of high unemployment earns less than an individual who works in a region with low joblessness when controlling for other individual and regional specific factors. This highlights the importance of the *tightness* of the outside labour market on the ability of individuals to earn.

In general equilibrium models of unemployment, where the conventional labour supply curve is replaced with a wage setting curve, a negative relationship between pay and unemployment is clearly predicted. The macroeconomic models of Layard, Nickell and Jackman (1991) and the microeconomic efficiency wage model of Shapiro and Stiglitz (1984) are good examples of modelling wage and unemployment outcomes with conventional labour demand equations and imperfectly competitive wage setting

behaviour. The expected wage set in general equilibrium reflects an aggregation over firms that reward productivity and pay labour rents.

The relationship between the wage and local job reallocation across firm populations has not yet been studied. Yet, Belzil (2000), at the country level for Denmark, finds a strong empirical link between real wages and job reallocation, amongst other factors including unemployment. Planned economies were oversized in terms of Industrial and Agricultural employment. Mass inter-sector job flows were anticipated. In addition, the downsizing and restructuring of traditional firms and the entry of new firms was expected to induce even greater intra-sector job reallocation over-time. In transition economies, structural change in employment was clearly needed for economic efficiency. Aghion and Blanchard (1994) write down a strong theoretical link relationship between wage determination, unemployment and job reallocation from the previously Sate Owned Sector (SOS) to the New Private Sector (NPS)[7]. Their model predicts that the expected wage level in a labour market, among other factors, will be negatively related to the unemployment rate and positively related to job reallocation. Unemployment reduces expected earnings in the economy by blocking restructuring in the previously SOS and inducing wage constraint in the NPS. Workers do not vote for restructuring due to a low probability of re-employment after a possible layoff during restructuring. Yet, strong NPS growth will induce restructuring of the previous SOS and reallocate jobs away from the previous SOS towards the NPS. Given that wages, unemployment and job

[7] This approach incorporates an imperfectly competitive model of restructuring and insider wage determination in the labour market to model expected earnings in the previously state owned, the new private sector and in unemployment. This builds on Konings and Walsh (1994, 2000) and Bughin (1996) who explicitly model interactions of imperfections in product and labour markets in partial equilibrium.

reallocation are clearly jointly determined outcomes we will have to choose a good instrument in the empirical sections of the paper to clearly identify the relationship.

We use the Amadeus Company Accounts Data is used to construct regional job reallocation rates[8]. We use the regional job reallocation rates constructed by Faggio and Konings (1999). They use the indices developed in Davis and Haltwinger (1992). We define a discrete measure of firm *i* growth over the period *t-1* to *t* in region *j* as follows:

$$g_{ijt} = \left(\frac{y_{ijt} - y_{ijt-1}}{(y_{ijt} + y_{ijt-1})/2} \right) \tag{1.2}$$

To examine the contribution of expanding and declining firms to the overall evolution of regional employment we sum the growth rates of each growing firm (POS), weighted by firm employment size, S_{ijt}, and sum the absolute growth rates of each declining firm (NEG) weighted by firm size S_{ijt},

$$\begin{aligned} POS_{jt} &= \sum_{i=1}^{n} S_{ijt} g_{ijt} \qquad if\ g_{ijt} > 0,\ and \\ NEG_{jt} &= \sum_{i=1}^{n} S_{ijt} \left| g_{ijt} \right| \qquad if\ g_{ijt} < 0. \end{aligned} \tag{1.3}$$

The annual net change, NET_{jt}, in regional employment is a net outcome that is induced by employment growth in expanding firms being offset by employment falls in declining firms. The reallocation of jobs across firms within regional employment is captured by the RES_{jt} index calculated as follows:

$$\begin{aligned} NET_{jt} &= POS_{jt} - NEG_{jt} \\ RES_{jt} &= POS_{jt} + NEG_{jt} - \left| NET_{jt} \right| \end{aligned} \tag{1.4}$$

[8] The data consist of incorporated companies across all sectors that satisfy one of the following conditions: Employment > 100, Total Assets > 16 million US dollars and operating revenues > 8 million US dollars. The data set does exclude small firms. This is likely to underestimate the job reallocation rate but can be expected to track trends in local job reallocation rates extremely well.

Faggio and Konings (1999) analyse and model regional job reallocation rates across five CEE countries including Poland. They find that the vast majority of job reallocation occurs within region and not between regions. This indicates the lack of job mobility across regions of Poland. In addition, striking differences in job flows are observed within regions. For example in Warsaw the annual job creation rate was 4.7 per cent, the annual job destruction rate was 5.4 per cent, leading to an annual job reallocation rate of 9.7 per cent. Annually, nearly 10 per cent of employment is reallocated away from one set of firms towards another during each year of transition. In contrast in Zamoj, one of the weakest regions, the annual job creation rate was 2 per cent, the annual job destruction rate was 4 per cent, leading to an annual job reallocation rate of 4 per cent. The factors behind intra-regional simultaneous job creation and destruction at each point of the transition process were also examined. Most of the job flows were intra-sector and not inter-sector. Firm level dynamics were driven mainly by, downsizing of large firms, changing ownership structures and the market orientation of production.

Job reallocation rates are pure compositional shifts in the firms that host jobs in the regional employment pool over a period of a year. Restructuring requires that traditional firms either exit or move towards their production possibility frontier and induce new firms to enter. Over-time, more jobs should find themselves in either new or restructured firms. The job reallocation index captures this move to efficiency in firm populations extremely well. Job reallocation rates in narrowly defined sectors in mature economies are even larger than those reported for transition economies[9]. This index is also likely to reflect compositional changes in firm populations that induce efficiency and

[9] Baldwin et al. (1998) for the US and Walsh and Whelan (2000) for Ireland, using rich plant level data, calculate annual job reallocation rates of persistently around 15 per cent, 1973 to 1994.

increase average pay. The nature of the composition shift will be different, but the effect on wages should the same. In the next section we present our empirical model of average regional wages.

Section II: Empirical Model of the Outside Option

Table 4 presents average monthly wage, unemployment rates and job reallocation rates, averaged over the period 1994 to 1996 across six groupings of Polish regions based on public infrastructure deficits, outlined in Annex I. Nominal wages are expressed in Polish Zloty. We observe that wages and restructuring increase as we move from Group I to VI (the most developed region in each year). Increases in wages and job reallocation also increase within each regional grouping overtime, but more so in the more advanced groupings, thus increasing the disparity in wage and restructuring levels across regions overtime. The evolution of the unemployment rate across time and regions ranked by their development level 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. Walsh (2000) provides evidence, using the same regional taxonomy, that regional unemployment inflows increase and duration shortens with regional job reallocation (instrumented by our regional public infrastructure ranking), alongside other deterministic factors, inducing an inverse U-shape during transition. This highlights the potential simultaneity in the determination of wages, unemployment and restructuring, joint outcomes driven by initial conditions of public infrastructure deficits across regions.

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, UR_{jt}, and job reallocation rate, RES_{jt}, in region j and period t, on the log of the average monthly wage, W_{jt}, in region j and period t while controlling for other factors. Job reallocation and unemployment rates are jointly determined by RANK, RANK squared and RANK cubed, regional and year controls to avoid an endogeneity problem. RANK takes on a value of 1 to 49, the public infrastructure ranking of the regions in Annex I. The local job reallocation rate controls for the rate at which non-restructured firms are been replaced with restructured firms during transition, this increasing the number of good jobs in the local labour market. The local unemployment rate controls for job shortages in the local labour market. The outside earnings (average monthly regional wages) model is written as follows,

$$\ln W_{jt} = \alpha + \beta_1 \ln UR_{jt} + \beta_2 \ln RE_{jt} + \beta_3 D_t + v_j + \varepsilon_{jt} \qquad (2.1)$$

Unobserved heterogeneity in region j is controlled for by the inclusion of a unit specific residual, v_j, that is comprised of a collection of factors not in the regression that are specific to region and constant over time, for example, human capital and occupation structures of regions, amongst other region specific factors.

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 expected outside earning regressions across Polish regions are presented in Table 5 and Table 6.

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 and job reallocation rates. The unemployment elasticity is estimated to be in the region of -0.7 and the job reallocation elasticity is estimated to be in the region of 0.8. 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. In Table 6 we report the results of our random effect models, which 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 and the job reallocation rate. The unemployment elasticity of pay for Poland is in the region of –0.08 and the job reallocation elasticity is estimated to be in the region of +0.8. Workers earn higher levels of pay, on average, in regions that have lower unemployment and where firm populations have undertaken more restructuring during transition. Given that the job reallocation and unemployment rate are key determinants of expected regional monthly wages (outside earning options) we now turn to examine their impact on individual earnings when controlling for human capital and occupations characteristics, among other factors[10].

Section III: The Outside Option and Individual Earnings

The data used in this section is the Polish LFS data for the years 1994 to 1996. The Polish LFS is a quarterly household survey, February, May, August and November, starting in May 1992. This paper uses three data waves of the survey, corresponding to

[10] We do check whether the unemployment rate is really a proxy for demographic variables such as population density. Such variables are not significant in our regional or individual earnings regressions.

the November 1994, 1995 and 1996. The survey includes individuals older than 15 years and there is no upper age limit. However it does omit individuals living in military barracks and dormitories, and any household members residing abroad. The Polish LFS does not differ from the usual western survey. It contains more than 50 questions and allows one to distinguish between the employed, the unemployed and those not in the labour force according to ILO/OECD definitions. From May 1993, the introduction of the rotating panel resulted in one half of the current sample being used in the survey for the next quarter, and the other half being used in the same quarter the following year. This allows us to create a panel to track individuals overtime. We have deliberately excluded females in this panel as they are more affected by short-term supply side considerations than their male counterparts. The total number of observations in the survey is 75,204 and the panel is 14,203 male individuals over 1994, 1995, and 1996. For each observation we have a record of age (year of birth), type of completed education, regional location (voivodship), occupation (previous occupation) in the reference week and wage which corresponds to their net earnings in the previous month from a main job measured in thousands of polish zloty[11]. In annex II we outline the categories of education and 2-digit occupation dummies used. We have imposed on this panel the time varying local job reallocation rate (*RES*) and the local unemployment rate *(UR)* used in the last section of the paper.

[11] In Poland, wages are not automatically linked to the consumer price index so our analysis is based on nominal as opposed to real wage levels. A potential criticism of our work is that to measure real wages in different regions one should have regional consumer price data. However, Blanchflower and Oswald (1995) postulate that "nominal wages are likely to be sufficient whenever year and regional dummies can be included in the regression equations". We have amended our model to include such dummies.

In Tables 8 and 9 we present results at the individual level using Polish LFS data for the years 1994-1996. In Table 8 we estimate an augmented wage curve, assuming a random selection process to employment, described by the following specification,

$$\ln W_{it} = \beta_0 + \beta_1 \ln UR_{jt} + \beta_2 \ln RES_{jt} + \beta_3 X_{it} + \beta_4 D_j + \beta_5 D_t + \varepsilon_{it} \qquad (3.1)$$

The natural logarithm of individual *i* previous months net earnings from a principal job[12], $W_{it,}$ in period *t* is explained by the natural logarithm of the regional unemployment rate, $UR_{jt,}$ and the regional job reallocation rate, RES_{jt}. Both are instrumented using RANK, identified as regions 1-49 in annex I, RANK squared, RANK cubed, region and time dummies. This will allow us to test whether unemployment and restructuring levels in local labour markets have similar effects on the expected earnings of individuals, as on average regional wage levels estimated in the previous section, while controlling for a rich set of human capital and occupation characteristics. These include non-linearity's in individual age/education and occupation dummies, X_{it}, regional and time, $D_{j,}$ and D_t, respectively.

In the model we have chosen not to include a measure of work experience gained by each individual, years of tenure in a current job, or in their last job if out of employment. Under planning, most individuals stayed in the same job for the duration of their working age and the participation rate was high. Working age and job tenure were perfectly correlated. The transition period has started to break down this traditional correlation. Yet, as documented in Table 7, one can calculate the percentage of males in regional employment who have not changed jobs since the beginning of transition. The most developed region has around 35 per cent of males and the least developed region

[12] Admittedly, it does not include fringe benefits or any payments of wages in kind.

around 60 per cent of males remaining in the same pre-transitional job in 1996. Those that resist job changes, apart from being in less advanced regions, are in older age groups. Much of the work experience gained under communism by older workers may not be rewarded so well in a market economy. Younger age groups have less work experience but any work experience accumulated, particularly during transition, may be highly rewarded in the market economy. We test for such a non-linearity in return to age, or a flat experience and earning profile as documented for many other CEE countries[13].

Using the same rationale it may also be the case that returns to education gained under a communist regime may not be as good as those found using data from a western economy. Flanagan (1994) using pre and post-transition data for the Czech Republic, includes education in the form of categorical variables, and finds a decrease in the rate of return to vocational education from 0.11 to 0.07 and an increase in the rate of return to university education from 0.31 to 0.39. Chase (1997) using similar data for the Czech Republic finds that the returns to technical education/training greatly diminished while returns to academic education experienced a large increase during transition. We intend to test for such hypothesises using our categorical variables of education.

However when regressing monthly earnings of individuals on a vector of human capital characteristics, the analytical problem of selectivity bias must be acknowledged. The estimated rate of return to human capital characteristics might in fact be underestimated because workers who expect the lowest pay choose not to participate.

[13] Flanagan (1994) finds that the return to work experience gained under planning declined during the first few years of transition in the Czech Republic. Chase (1997) using micro-data for the Czech Republic and Slovakia also finds that returns to work experience fell during transition as young workers were favoured in jobs created during transition. Kreuger and Pische (1995) and Bird et al. (1994) for east Germany and Halpern and Korosi (1997) for Hungary document very flat experience earning profiles. Return to experience gained under planning clearly fell during transition.

The large drop in participation rates documented by Boeri (1999) for many former socialist economies may suggest that there could be some sort of sample selection at work. Bias in the estimates of a restricted sample is a well-known problem. An important assumption that is made in the earnings regression is violated, and so the expected value of the disturbance term will not be zero in the presence of an omitted variable. To overcome this selectivity or omitted variable bias we run a Heckman (1979) two-step estimation procedure. Correcting for sample selection bias can theoretically change the sign, magnitude or significance of the relationships found in regression (3.1), assuming a random selection into the workforce. Our selection model is written as the following,

$$Z_{it} = \beta_0 + \beta_1 \ln U_{jt} + \beta_2 \ln RES_{jt} + \beta_3 X_{it} + \beta_4 D_j + \beta_5 D_t + \varepsilon_{it} \qquad (3.2)$$

where Z_{it} = 1 if an individual is working, and zero otherwise. We include a dummy for marriage an additional individual specific variable to identify the instrumentation. The Heckman lambda, λ_i, is computed for each individual in the selected sample. In Table 9 we estimate an augmented wage curve, conditioned on the probability of participating in employment, described by the following specification.

$$\ln W_{it}\Big|_{Z_{it}} = \beta_0 + \beta_1 \ln U_{jt} + \beta_2 \ln RES_{jt} + \beta_3 X_{it} + \beta_4 D_j + \beta_5 D_t + \beta_6 \lambda_i + \varepsilon_{it} \qquad (3.3)$$

The regression models the contributions of our explanatory variables to the expected earnings of all males of working-age as it is conditioned on the probability of participating in employment.

The unconditioned results in the second column of Table 8 and the conditioned results in the second column Table 9 are very similar. No evidence of sample selectivity bias was found. We find that the impact of the outside labour market has the same estimated impact on pay even when we control for a rich set of individual and occupation

characteristics and sample selection bias. The estimated unemployment elasticity of pay is -0.11 and restructuring elasticity of pay is estimated to be 0.07. Regional unemployment rates can be as high as 25 per cent and as low as 3 per cent, while regional job reallocation rates can be higher than 10 per cent and lower than 1 per cent. Both of these rates dictate the availability and quality of the jobs in terms of pay in the outside local labour market. For any given occupation and human capital characteristics, individuals can expect to have large differences in expected earnings across the various regions of Poland. For example, Warsaw paid 30 per cent more, on average, than the average pay across all other regions during the period 1994-1996. Outside local labour market conditions are estimated to explain 51 per cent of this differential, and individual characteristics the remaining 49 per cent, where local job reallocation accounts for 34 per cent and local unemployment rate 17 per cent, respectively.

In addition, given the nature of local labour markets, we find that individuals get higher pay due to certain human capital and workplace characteristics, among other factors. We report the estimated rate of return to human capital and workplace characteristics in Table 10. We find that earnings, holding other factors constant, increase by 22 per cent for those with at least academic primary education, 25 per cent with academic secondary schooling and 57 per cent with university education. The returns to vocational primary at 17 per cent, technical secondary at 18 per cent and technical college at 38 per cent, are clearly less than the corresponding academic training. This supports a general consensus that during transition, technical education under the communist regime is not as well rewarded as academic education during transition.

We measure work experience as years of working age. While experience earnings profiles are very flat, only young workers, under the age of 25, get a positive return to experience, 1 per cent for every year. The return to work experience declines slowly in every year up to 55 years of age and declines at a rate of 5 per cent thereafter. These results again point to the lack of return from years of work experience under planning. Finally, we test the rate of return from inheriting certain occupational skills. We find there are occupational specific returns. In table 10 we group these into occupations that get the same, up to, and above 20 per cent of Agricultural pay.

Given that certain human capital and occupation characteristics yield a higher expected return than others, it may be the case that the response of individual pay to outside labour market conditions may not be uniform. Intra-regional structural rigidities may mitigate the ability of certain individuals to take advantage of outside options. In table 11 we report the elasticity of expected individual pay with respect to local labour market conditions when estimating the model (3.3) on different groupings of the data by age, sector and education. Males when grouped by youth, academic education, or a service sector job have elastic responses to outside labour market conditions rather than unitary responses. Groupings by older, technically trained or agriculture/manufacturing sectors are found to have inelastic responses to outside labour market conditions. This is strong evidence of intra-regional structural rigidities resulting from planning. Apart from the market system not rewarding certain human capital and occupation types, they are also less able to exploit outside earning opportunities created by the market economy.

Conclusion

The benefits of competition in the Polish labour market have been inhibited by the lack of inter-region worker and job flows and intra-region structural rigidities. Yet, these legacies of planning have allowed us to study the role of competition in the labour market in an environment far less complex than that observed in mature market economies. This paper provides us with a clear picture of the importance of competition and outside options in labour markets undergoing a transition to a market economy. Overall the liberalisation of the market has allowed individuals, by varying degrees, to earn more by exploiting the presence of outside earning options in local labour markets.

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Table 1

First Generation Papers 1970s and 1980s

Author	Data	Result (Pay & Unemployment relationship
Hall (1970, 1972)	BLS* 12 U.S. cities in 1966 Sample size = 12 regions	Positive
Reza (1978)	BLS* 1970-1972 U.S. data sample size = 18 regions	Positive
Adams (1985)	U.S. Panel Study of Income Dynamics 1970-1 Sample size = 2000	Positive
Marston (1985)	Current Pop. Survey (1970s) Sample size = 0.5 million	Positive

* Bureau of Labour Statistics

Table 2

Second Generation Papers late 1980s and 1990s

Author	Data	Country	Result
Blackaby & Manning (1987, 1990a, 1990b, 1990c)	General Household Survey 1964-1984 Microeconometric wage equations Sample: 7,288 employed males	U.K.	Negative
Card (1990)	Sample of 1293 Canadian labour contracts 1968-1983 Uses OLS & instrumental variable methods	Canada	Negative
Freeman (1988)	G.H.S & C.P.S*	U.K. & U.S.A.	Negative
Janssens & Konings (1999)	Social Economic Panel 1985, 1988 & 1992 Sample: 6,727 households	Belgium	Negative
Blanchflower & Oswald (1994)	See table 3	12 countries	Negative

G.H.S. General Household Survey & C.P.S. Current Population Survey

Table 3

Blanchflower & Oswalds' Wage Curves in 12 Nations

Country	Dependent Variable	Data-set	Coefficient on LogU	Fixed Effects	Sample size
USA	Annual Earnings	Current Population Survey 1963-1990	-0.1	Yes	1,730,175
UK	Monthly Earnings	General Household Survey 1973-90	-0.8	Yes	175,500
Canada	Gross annual earnings	Survey of Consumer Finances 1972-87	-0.9	Yes	82,739
S. Korea	Gross Monthly Earnings	Occupational Wage Surveys 1971-86	-0.4	Yes	1,359,387
Austria	Gross monthly earnings	ISSP** 1986-89	-0.9	Some	1,587
Italy	Gross monthly earnings	ISSP 1986-89	-0.1	Yes	1,041
Holland	Net monthly earnings	ISSP 1988-91	-0.12	Some	1,867
Switzerland	Net monthly earnings	ISSP 1987	-0.12	No	645
Norway	Gross yearly earnings	ISSP 1989-91	-0.8	Some	2,599
S. Ireland	Net monthly earnings	ISSP 1988-91	-0.36	No	1,363
Australia	Weekly income	IDS 1986	-0.19	No	8,429
Germany	Gross monthly earnings	ISSP 1986-91	-0.13	Yes	4,629

**ISSP= International Social Survey Programme
Column 4: Coefficients on local unemployment variables in micro-econometric wage equations.
Column 5: Fixed effects refer to controls for region or occupations. In all equations, personal variables are included as controls.

Table 4

Job Reallocation Rates and Unemployment Rates and Wage Levels by Regional Social Development Groupings

	Regional Grouping	Job Reallocation Rate	Unemployment Rate	Monthly Wage
1994	I	1.03	16.8	446.2
	II	2.12	16.9	461.3
	III	2.56	18.8	474.7
	IV	3.48	22.6	500.0
	V	4.37	18.9	512.8
	VI	6.94	12.1	530.1
				Min 425.1 Max 657.3
1995	I	2.19	16.2	588.2
	II	4.44	16.6	610.4
	III	4.45	17.7	626.3
	IV	4.63	21.0	630.0
	V	5.71	17.8	667.8
	VI	7.98	11.1	700.9
				Min 566.3 Max 876.7
1996	I	2.57	14.1	740.0
	II	4.51	14.9	769.7
	III	4.81	15.9	784.8
	IV	5.45	18.4	790.4
	V	5.87	16.2	844.0
	VI	8.44	09.4	897.9
				Min 713.4 Max 1130.6

Source: Amadeus Company Accounts Data and Polish Year Books. Group I is the least developed and Group VI the most developed grouping.

Table 5

OLS Regressions across Polish Regions 1991-96

	OLS	OLS	2SLS**
	Log Wage	**Log Wage**	**Log Wage**
R^2	0.99	0.98	0.98
Constant	3.4 (18.0)*	3.3 (15.6)*	3.2 (15.2)*
Log Unemployment Rate	-.12 (7.6)*	-.11 (6.6)*	-.07 (5.0)*
Log Job Reallocation Rate		.02 (2.8)*	.08 (11.0)*
Year Dummies	YES	YES	YES
Observations	294	294	294
Heterosced.	$\chi2(55) = 14.7$	$\chi2(56) = 11.8$	$\chi2(56) = 13.3$
AR1	$\chi2(1) = 188.7$	$\chi2(1) = 188.6$	$\chi2(1) = 169.1$

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

	GLS	GLS	GLS**
	Log Wage	**Log Wage**	**Log Wage**
R^2 (Within)	0.99	0.99	0.99
R^2 (Between)	0.19	0.19	0.48
R^2 (Overall)	0.99	0.98	0.99
Constant	3.3 (12.1)*	3.2 (9.7)*	3.2 (8.9)*
Log Unemployment Rate	-.06 (2.6)*	-.06 (2.2)*	-.08 (2.2)*
Log Job Reallocation Rate		.02 (1.6)	.08 (4.9)*
Random Effects	YES	YES	YES
Year Dummies	YES	YES	YES
Observations	294	294	294
Hausman test	$\chi2(6) = 4.8$	$\chi2(6) = 3.5$	$\chi2(6) = 0.01$
Heterosced.	$\chi2(55) = 5.4$	$\chi2(56) = 2.9$	$\chi2(56) = 2.94$
AR1	$\chi2(1) = 1.7$	$\chi2(1) = 1.7$	$\chi2(1) = 1.7$

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

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

Table 7

Age Composition of Job Tenure by Regional Group 1996

	Job Tenure	*15-24 years*	*25-34 years*	*35-44 years*	*>44 years*
I	*48 < 7 years*	25	35	28	12
	52 > 7 years	0	27	38	35
II	*49 < 7 years*	23	37	25	15
	51 > 7 years	0	25	36	39
III	*51 < 7 years*	23	38	26	13
	49 > 7 years	0	21	44	35
IV	*55 < 7 years*	28	33	24	15
	45 > 7 years	0	21	41	38
V	*48 < 7 years*	25	32	28	15
	52 > 7 years	0	24	44	32
VI	*58 < 7 years*	23	32	27	18
	42 > 7 years	0	16	35	49

Source: Polish Labour Force Survey

Table 8

Wage Curve Regressions across Polish Individuals.

	2SLS	**2SLS**
	Log Wage	**Log Wage**
R^2	0.87	0.89
Constant	6.5 (6.2)*	8.1 (8.4)*
Log Unemployment Rate**	-.15 (9.3)*	-.11 (7.6)*
Log Job Reallocation Rate**	.07 (4.3)*	.07 (4.6)*
Age	.13 (18.4)*	.08 (12.4)*
Age^2	-.003 (15.6)*	-.002 (9.7)*
Age^3	.00002 (13.8)*	.00001 (7.8)*
Education		.49 (23.3)*
$Education^2$		-.10 (15.9)*
$Education^3$		.01 (13.6)*
Regional Dummies	YES	YES
Occupation Dummies	YES	YES
Year Dummies	YES	YES
Observations	26,404	26,404

T-statistics in parenthesis, Assuming Random Selection 1994-1996
* indicates significance at the 5% level.
** Instruments include RANK, RANK squared, RANK cubed, time and regional dummies

Table 9

Earning Regression Conditioned on Probability of Participating 1994-1996

Log Wage	**Heckman Selection Model**	**Heckman Selection Model**
Constant	6.5 (6.2)*	7.9 (6.4)*
Log Unemployment Rate**	-.16 (5.4)*	-.11 (4.1)*
Log Job Reallocation Rate**	.06 (3.4)*	.07 (3.6)*
Age	.13 (19.6)*	.08 (12.4)*
Age^2	-.003 (16.9)*	-.002 (9.6)*
Age^3	.00002 (15.3)*	.00001 (7.8)*
Education		.50 (23.4)*
Education^2		-.10 (16.1)*
Education^3		.01 (13.7)*
Probit		
Constant	2.5 (7.2)*	2.3 (6.3)*
Log Unemployment Rate**	.11 (1.9)	.09 (1.5)
Log Job Reallocation Rate**	.04 (0.8)*	.05 (.09)
Age	-.13 (6.1)*	-11 (4.9)*
Age^2	.003 (7.2)*	.003 (6.1)*
Age^3	-.00003 (9.2)*	-.00003 (8.1)*
Married	-.03 (1.6)	-.03 (1.6)
Education		.42 (4.9)*
Education^2		-.14 (5.4)*
Education^3		.01 (4.9)*
Regional Dummies	YES	YES
Occupation Dummies	YES	YES
Year Dummies	YES	YES
Rho	-.28	-.02
Heckman Lamba	-.10 (13.1)*	-.009 (.013)
Observations	42,621	42,621

Z-statistics in parenthesis

* indicates significance at the 5% level.

** Instruments include RANK, RANK squared, RANK cubed, time and regional dummies

Table 10

Rate of Return to Human Capital and Occupation Characteristics
(Relative to the default in bold).

Not Completed Primary	
Primary Education (Hauptschule)	.22
Technical Training (Meister, Geselle)	.17
Technical High School (Technisches Gymnasium)	.18
High School (Gymnasium)	.25
Technical College	.38
University	.57
Age 15	
Age 20	.01
Age 25	.00
Age 35	-.02
Age 45	-.04
Age 55	-.05
Age 65	-.05
Agriculture*	
2, 9,12, 24,29,30, 31, 32, 33	*Value* < 0
4,7,8,10,14,15,16,17,18,20,22,23,25,27	0 > *Value* < 0.2
5,6,11,13,19,21,28,26,	*Value* > 0.2

*ANNEX II OCCUPATION CATEGORIES

Table 11

Elasticity of Pay with respect to Local Unemployment and Local Job Reallocation by Human Capital and Occupation Groupings.

	Local Unemployment	**Local Job Reallocation**
Age		
< 34	-0.15	+0.10
> 34	-0.09	+0.08
Sector		
Agriculture	*Not Significant*	*Not Significant*
Manufacturing	-0.05	+0.06
Services	-0.13	+0.12
Education		
Academic	-0.14	+0.08
Technical	-0.01	+0.06

*Regressions as in Table 9, splitting data by Human Capital and Occupation Groupings.

ANNEX I. RANKING OF REGIONS BY INHERITED PUBLIC INFRASTRUCUTRE

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 based on the level of public infrastructure development that persisted across regions up to 1996. Our taxonomy ranks all 49 voivodships (the highest regional administrative units) in a continuum of public infrastructure development. We also bundle voivodships into six groups which represent development from Group I (least developed) to Group VI (the most developed).

Our classification scheme ranks voivodships by six infrastructure indicators. Using a Borda electoral scheme, the sum of the best six rankings establishes the overall score for each region. Thus, the highest possible score is 6, when a region is always ranked number one, and the worst possible score is 294, when a region is always ranked last, at 49. The regions are then sorted in ascending order. Large discrete breaks in the score of voivodships determined the hiatus between our six regional groupings, leading to the regional taxonomy of Table A1.

< Table A1 here >

The taxonomy reflects a systematic ranking of regions by their infrastructure development that persists during the transition period. With the exception of Warsaw and Lodz, all regions in our regional groupings I, II and III are located in eastern regions of Poland. Eastern regions mainly inherited poor infrastructure, while western regions inherited superior infrastructure.

TABLE A1

Taxonomy of the Inherited Public Infrastructure of Polish regions [a]

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

[a] Ranked in ascending order by a rank score that sums the ranked positions in six indicators summarised by the above taxonomy in TableA2.

A: Number of Telephones in a region per 1000 inhabitants : A developed telephone network is an important part of the social capital infrastructure within a region. Measuring the number of telephones in a region per 1000 inhabitants is a simple indicator of the quality of public infrastructure in the region. The most (least) developed region has 391.5 (136.2) phones per 1000 inhabitants.

B: Number of Fax Machines in a region per 1000 inhabitants: Related to the provision of a telephone network is the availability of fax machines within a region. The most (least) developed region has 60 (16.9) fax machines per 1000 inhabitants.

C: Number of Railways in a region per 100km squared: Another simple indicator of the quality of public infrastructure in a region is the number of railways in that region per 100 km squared. The most (least) developed region has 21.8 (2.7) railways per 100 km squared.

D: Number of Public Roads per 100km squared: The quality of public infrastructure is also enhanced by the number of public roads per 100 km squared in a region. The most (least) developed region has 180.1 (43.4) per 100km squared.

Share of Population in Urban Areas: A relatively high share is indicative of decentralised economic activity. The most (least) developed region has 93 (31) per cent of populations in urban areas

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

ANNEX II EDUCATION AND OCCUPATION CATEGORIES

1 Not Completed Primary
2 Primary Education (Hauptschule)
3 Technical Training (Meister, Geselle)
4 Technical High School (Technisches Gymnasium)
5 High School (Gymnasium)
6 Technical College
7 University

2 Digit Occupational Codes

- *AGRICULTURE, FISHING AND FORESTRY*

2 Forestry, logging and related service activities.
3 Agriculture, hunting and related service activities.
4 Fishing, operation of fish hacteries and fish farms.

- *MINING*

5 Mining & Extraction of coal and lignite, crude petroleum and natural gas, uranium & thorium ores, metal ores.
6 Other quarrying.

- *MANUFACTURING*

7 Food products & beverages
8 Tobacco products
9 Textiles, wearing apparel, tanning and dressing of leather, manufacture of luggage, handbags, saddlery, harness and footwear.
10 Wood, (and of products of wood and cork except furniture), pulp, paper and paper products.
11 Publishing, printing and reproduction of recorded media.
12 Coke, refined petroleum products and nuclear fuel.
13 Chemicals and chemical products.
14 Rubber and plastic products.
15 Other non-metallic mineral products.
16 Basic metals.
17 Machinery, & equipment , office machinery and computers, electrical machinery, manufacture of medical, precision & optical instruments, watches and clocks.
18 Manufacture of fabricated metal products.
19 Manufacture of motor vechicles & other transport equipment.
20 Other manufacturing: including manufacture of furniture, and recycling.

- *ELECTRICITY, GAS AND WATER SUPPLY*

21 Electricity, gas, steam and hot water supply. Collection purification and distribution of water

- *CONSTRUCTION*

22 Construction

- *WHOLESALE & RETAIL TRADE*

23 Retail & wholesale trade, repair of household and personal goods.

- *HOTELS & RESTAURANTS*

24 Hotels and restaurants.

- *TRANSPORT STORAGE AND COMMUNICATION*

25 Land transport, water transport, air transport, cargo handling and storage, other supporting transport activities, activities of transport agencies.

- *FINANCIAL INTERMEDIATION.*

26 Financial intermediation, insurance and pension funding, except compulsory social security, activities auxiliary to financial intermediation.

27 Real estate activities, renting of machinery and equipment.

- PUBLIC ADMINISTRATION AND DEFENCE

28 Public administration and defence.

- EDUCATION

29 Education.

- HEALTH & SOCIAL WORK

30 Health and social work.

- OTHER SERVICES

31 Other Community, social and personal service activities Sewage & refuse disposal, sanitation, recreational , cultural and sporting activities, other service activities, Private households with employed persons.

32 Private Households With Employed Persons.

33 Extra-territorial organisations and bodies.

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