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Abstract

Unemployment continues to bedevil Poland, albeit with striking sub-national differences, which this paper seeks to explain using random effects error component two-stage estimation for the country's NUTS 4 level powiats. Given the economy's peculiar configuration under communism, with its large private agricultural sector, emphasis is placed on rural-urban differences. While less densely populated areas do suffer higher unemployment rates, the effect is moderated by hidden unemployment in farming. On the other hand, powiats that housed the ex-state farms suffer a negative long-term legacy. Other notable results include an evident positive impact of foreign capital on local labour market fortunes.

1. INTRODUCTION

Unemployment in transition economies has been regarded as a sign that restructuring is underway and that labour is being freed by the public sector for more productive use in the private sphere (Blanchard *et al.*, 1994). Nonetheless, it was also recognised that the associated economic modernisation must not force workers into prolonged periods of idleness, if the twin risks of social upheaval and wasted human capital are to be avoided. In the event, Poland's headline unemployment rate has been consistently amongst the highest within the ten Central and Eastern Europe (CEE) countries that have recently acceded to the European Union (EU). Furthermore, in 2005 it housed four of the ten NUTS-2 **(***nomenclature des unites territoriales statistiques***)** regions with the highest unemployment rates in the then to be EU-27, none of which lay in Bulgaria or Romania (Mładý, 2006).[1]

The general flavour of these observations is not particularly novel, of course, and there have been quite a large number of studies of Poland's national and major regional (voivodship) unemployment problems (e.g. Newell, 2006; Pastore, 2004; Walsh, 2003; Rutkowski and Przybyla, 2002; Newell and Pastore, 2000; Ingham *et al*., 1998; Kwiatkowski and Kubiak, 1998; Lehmann *et al*., 1997; Góra and Lehmann, 1995; Czyż, 1993; Lehmann *et al*., 1991). However, much less has been written about unemployment at more finely disaggregated spatial levels and detailed analysis of them has been rarer still. The purpose of this paper is therefore to examine the problem at the level of the powiat. This accords better with the EU's ambition to reduce spatial unemployment disparities

[1] The four French overseas regions (Guadeloupe, Martinique, Guyane and Réunion) are excluded from this comparison.

and its recognition of the need to enlist local actors in the process (CEC, 2005).

While the topic is of intrinsic interest, the study is also motivated by the greater opportunity that analysis at the powiat level affords to cast further light on what is widely recognised as the marked and enduring rural-urban divide within Poland (OECD, 2006, 2004; FDPA, 2002; CEC, 1997). Important facets of this for current purposes include the fact that the raw statistics from the Labour Force Survey, although compiled on somewhat different conventions to the data utilised here, indicate that unemployment among the non-farm rural population exceeds that among urban dwellers (e.g. GUS, 2002; 2001). On the other hand, private sector agriculture has often been seen as a buffer zone shielding workers from the external labour market and economic upheavals of recent years (Ingham and Ingham, 2004). However, while the underlying data he used will be subject to wide margins of measurement error, Frenkel (2001) suggested that the pattern is not uniform across the country and it is hoped that the current work will generate further insights into this.

The next section outlines the basic administrative structure of Poland. This is followed by a consideration of the powiat as a labour market. Section 4 contains an overview of theoretical explanations of within country spatial unemployment differences, including those focusing on transitional economies. Section 5 reviews various atypical features of the Polish economy, which suggest that standard models of systemic change should be applied with care. Thereafter, the empirical specification to be applied in the current analysis is developed in Section 6, while Section 7 turns to the econometric issues to be confronted. The results of the estimation exercise are presented in Section 8. A summary and conclusions close the paper.

2. THE TERRITORIAL DELINEATION OF POLAND

While democracy was tentatively gained through the 1989 Round Table agreement and further hardened by the adoption of a new mini constitution in 1992, democracy was not, of itself, sufficient in the eyes of many. The Polish elite, if not always the population at large, was also determined to pursue membership of the EU as the next step in the country's 'return to Europe'. In order to achieve this goal, the country needed to comply with the *acquis communautaire*, including the requirement that new members be in a position to participate in the Structural Fund programmes and Cohesion Fund actions from the date of entry. This mandatory stipulation is obviously central for poorer applicant countries and its fulfilment dictates that a NUTS consistent classification of their territory be established, which the prevailing local government structure in Poland was not. While other factors were also at work, this dictated the need for a thoroughgoing and domestically controversial local government reform (Gorzelak and Jałowiecki, 2000).

The ultimate result was the Local Government Reform Act that came into effect on 1 January 1999. This created sixteen NUTS 2 regions by reducing the number of voivodships from the previous 49 and re-introduced the powiat tier of government that had been abolished in 1974 as NUTS 4 (LAU 1 units from 2003). As a point of reference, the powiats, with an average population size of just over 103,000, are about three-quarters of the size of the districts that represent NUTS 4/LAU 1 regions in the UK. Amalgamations of powiats known as sub-regions represent the NUTS 3 tier, but these are largely a statistical artefact. In addition, the reform retained 2,489 NUTS 5 (now LAU 2) level gminas. Unfortunately, the reorganization made labour market analysis of the

voivodships much less informative; for example, the coefficient of variation of their registered unemployment rates fell from 115.7 per cent to just 27.5 per cent under the old and new boundaries at December 1998 (GUS, 1999).

3. THE POWIAT AS A UNIT OF ANALYSIS

Unemployment was first recognised officially in Poland in 1990. As the only measure that can be made available on a comprehensive and reliable basis at lower levels of spatial disaggregation, the current work seeks to model jobless rates based on the count of individuals who register their position at the local powiat labour office.[2] In order to avoid problems with boundary changes and the re-classification of agricultural activity, discussed further below, the current analysis focuses upon an eight quarter, balanced panel covering the years 2000 and 2001. Nationally, the unemployment rate stood at 14.0 per cent in 2000, rising to 16.2 per cent in the following year, with more than three million people on the register (GUS, 2007).[3] As shown in Table 1, the corresponding powiat unemployment rates ranged from a low of 2.8 per cent in 2000 to a high of 35.7 per cent in 2001.

Table 1 here

Utilising data at the level of the powiat is subject to the important caveat that functional local labour markets, defined as 'nodal areas, the boundaries of which are traced with the goal of containing the inter-relations between its constituent entities' (OECD, 2000: 34), have not been defined for Poland. A typical way of constructing them is on the basis of the commuting patterns of

[2] ILO consistent self-certification data are available from the quarterly Labour Force Survey, but they cannot be used at the local level.
[3] These figures can be compared to the lows achieved in 1998, when 1.6 million people were out of work.

workers. Examples of this approach are the Employment Zones for France, the Travel-To-Work Areas (TTWAs) for the UK, the Local Labour Systems for Italy and the Economic Areas for the United States. In practice, it is normally not possible to divide countries into an exhaustive set of labour markets and the UK, for example, adopts a criterion of 75 per cent self-containment for its TTWAs.[4] That is, the number of people who both work and live within the boundaries of a TTWA should account for at least three-quarters of both the number who work in the area and of the number of workers living there. Additionally, the UK imposes a minimum restriction of 3,500 on the working population of a TTWA.

In general, the boundaries of TTWAs are not co-terminus with those of administratively defined districts. Using local authority areas that are not TTWAs can therefore render the calculation of unemployment rates problematic whenever, as here, the data on unemployment and employment come from different sources: local labour offices for the former and establishment surveys for the latter.[5] While controls designed, at least in part, to counter this difficulty will be introduced in the empirical work to follow, it should be noted that the correlation of recorded powiat unemployment rates with residence based rates, defined as the unemployed stock divided by the working age population, as preferred by ONS (2002), was 0.81 in 2000 and 0.86 in 2001. These coefficients are highly significant. Furthermore, local authority areas tend to have powers of policy intervention that abstractly constructed TTWAs typically do not.

[4] In areas where the working population exceeds 20,000 a level of containment of 70 per cent is deemed acceptable.
[5] The only definition of a local labour market used in Poland is in fact based on powiat boundaries.

4. THEORETICAL APPROACHES TO SPATIAL UNEMPLOYMENT DISPARITIES

Numerous theoretical approaches to the explanation of regional unemployment differentials exist, although those in the mainstream have common antecedents and therefore tend not to be mutually exclusive. They do, however, emphasise different factors as the major explanation of the failure of the labour market to achieve a situation under which flexible wages coupled with perfect capital and labour mobility combine to ensure that there is no unemployment other than that which is purely frictional. Nevertheless, in most European countries at least, inequalities across spatial units often persist over very long periods of time (e.g. Elhorst, 2003; Badinger and Url, 2002) and Poland represents no exception (Huber, 2006). What follows reviews certain influential strands in the literature that seek to rationalize this.

One approach looks to compensating differentials to explain persistent differences in unemployment rates (Harris and Todaro, 1970). In such models, a zero migration equilibrium comes about as a result of some compensation (relatively high wages, social benefits, transaction costs or good regional amenities) offsetting a high risk of unemployment. In other words, utility is equalised across space and high wages (or non-wage benefits) are associated with high unemployment rates and the relationship persists over time. This approach has also been labelled the amenity model (Marston, 1985).

Search models, on the other hand, predict a negative relationship between unemployment and the real wage (Elhorst, *op*. *cit*.). The central idea is that individuals maximise expected wages net of search costs, which underpins their reservation wages. The optimal search strategy is then to accept the first wage offer in excess of the latter. Migration and commuting expenses are transaction

costs to be added to search costs, while the regional distribution of job vacancies is seen as part of the opportunity set. Unemployment benefits raise the reservation wage, thereby prolonging search and raising the level of unemployment. Within this framework, the size and dynamics of the local labour market matter, with large or growing labour markets affording higher vacancy rates and better job access, both of which speed up the job matching process.

Sector based models are also quite common explanations of spatial unemployment disparities, with areas in which declining industries are concentrated predicted to suffer relatively high unemployment rates. The malaise persists through the depreciation of human capital stocks and deficiencies in the adaptation of skill portfolios to the needs of growing sectors (Gripaios and Wiseman, 1996). A related hypothesis is that the level of unemployment within an area is likely to depend negatively on the degree of industrial diversity, insofar as the latter promotes greater opportunities for labour redeployment in the face of discriminatory demand shocks (Neumann and Topel, 1991).

The embarkation of numerous countries on the route from central planning to a more or less free market configuration inspired various attempts to cast the attendant unemployment in a new light. One notable example, following *inter alia* Aghion and Blanchard (1994), is that focusing upon the Optimal Speed of Transition (OST). In essence, such models seek to establish the level of unemployment that is compatible with both the rate at which the state sector divests itself of labour and that with which the profit seeking private sector is willing to absorb it. A major conclusion is that the rate of release of workers by the former cannot be too fast, otherwise new firms will not be prepared to accept the tax burden implied by the unemployment benefits required to support those

made redundant and the transition will fail. In turn, this lends support to a preference for gradualist rather than big-bang approaches to transformation.

The focus of attention on initial conditions, the rate of restructuring and intra-labour market flows implied by the OST approach are obviously potentially important considerations for analyses of transitional labour markets. It is a moot question, however, whether the differences between their situation and those involving transformations in other economic systems are often more than ones of degree. The impact of the closure of British coalfields during the 1980s and 1990s on their local labour markets (Fieldhouse and Hollywood, 1999; Beatty and Fothergill, 1996) represents just one example where similar concerns might be said to have arisen. What is more, OST was not originally conceived as a theory of regional unemployment differentials, although Walsh (*op. cit.*), Newell and Pastore (*op. cit.*) and Lehmann and Walsh (1999), amongst others, have sought to explore its implications at the spatially disaggregated level.

This aside, formulations in this tradition have been criticised for their over-simplicity, with Boeri (2006), for example, highlighting the need for the re-consideration of more traditional supply side rigidities in addition to the OST emphasis on demand factors, if a firmer understanding of the behaviour of transitional labour markets is to be achieved. As various surveys of the OST literature already exist, including Ferragina and Pastore (2006) and Boeri (*op. cit.*), this brief overview will not be developed further. Instead, the following section undertakes a review of certain features of the Polish economy that would indeed suggest the need for caution in applying the OST methodology too literally in that country. The discussion will also serve as a prelude to the empirical work that follows.

5. THE POLISH BACKGROUND

While obviously a convenient simplification, basic OST models assume that transition involves the reallocation of labour from an omnipresent state sector to an *ab initio* private one. In fact, following an initial failed attempt to impose agricultural collectivisation, Poland always had a sizeable private sector in the post-war era in the form of its family farms, which employed 4.2 million workers by 1989 or about one-quarter of all employment (GUS, 1997).[6] What is more, controls on private enterprise were relaxed somewhat in the 1980s and, by 1989, the private sector non-agricultural workforce accounted for nine per cent of all jobs. To these rather stark departures from the normal characterisation of the socialist economies must, of course, be added the underground activity that was a ubiquitous feature of central planning. It is therefore unrealistic to view state restructuring as necessarily preceding the emergence of the private sector.

Nevertheless, Poland did display many of the intended characteristics of the planning process, including forced industrialisation whereby particular areas were turned over to the production of a limited range of commodities In addition, most agricultural activity – although not all of it (Wilkin, 1989) – was concentrated in the countryside, which gave rise to a frequently noted urban-rural dichotomy that partially reflected the uneasy relationship of the authorities with the private farming community. This does indeed then suggest that initial conditions might be important in determining future development trajectories,

[6] Notwithstanding the private ownership of the farms, the state did, however, at various times exert a strong influence over their activities, although this waned in the 1980s (Wilkin, 1989).

while at the same time highlighting the importance of structural change for the transition process.[7]

Caution is also necessary regarding the assumption that unemployment was a phenomenon to emerge instantaneously. In truth, as might be expected in a labour market characterised by excess demand and narrow wage differentials, job changes were frequent.[8] Unemployment was not recognised as a labour market state, but the authorities did report the existence of a small number of job seekers. Admittedly, these were always minute in relation to the number of vacancies seemingly registered with the labour offices, although it might be noted that Witkowski (1993) presents official figures showing that an annual average of 1.8 million workers were placed in employment by the labour offices over the years 1985-1989. In fact, the same source notes that labour turnover (hires plus quits) amounted to 36 per cent of total employment in the socialised sector of the economy over that period, with Mach *et al*. (1994) providing further independent support for this instability.[9] In addition, Poland exhibited very high levels of disguised unemployment, amounting to at least a quarter of the work force and perhaps much more (Góra and Rutkowski, 1990).

The last observation suggests a concern that simple OST models ignore productivity growth and posit a constant wage differential between the public and private sectors. However, successful transition hinges on improved economic performance and increased living standards for the population. As Table 2 makes

[7] One can only wonder what the trigger will be that turns the more advanced transition states into low income market economies. The European Commission's original 1997 Opinion on Poland's application for EU membership considered it to be a functioning market economy (CEC, 1997).
[8] Sometimes generous company specific non-pecuniary benefits constitute one possible caveat to this argument.
[9] In fact, the planned economies have long been known to have exhibited all forms of unemployment other than that associated with business cycles (Bornstein, 1978).

clear, Poland has achieved strong gains in labour productivity since the reforms began and, of itself, this would be expected to hasten the pace at which the private sector might grow, provided the advances were more heavily concentrated within the private sector.[10]

Table 2 here

At the same time, it is unrealistic to assume that the public sector withers to nothing at the close of the transition process and it is therefore more helpful to think in terms of restructured and unrestructured activities. Thus, as shown in Table 3, public sector employment in Poland over the first four years of the current decade appeared relatively stable at something more than 3.5 million workers. At the same time, inflows to the unemployment pool have not emanated solely or even mainly from the public sector. As Table 3 makes clear, the state sector only accounted for half of those on the unemployment register even in 1992 and the proportion declined thereafter.

Table 3 here

Finally, it can be noted that the Aghion and Blanchard (*op. cit.*) assumption of a fixed labour force sits ill at ease with the facts. In particular, the Polish economic activity rate declined quite markedly in the years after 1989 (GUS, 2002b). Some part of this was undoubtedly attributable to an inflation of payrolls during the communist epoch. More important, however, was the liberal policy regime surrounding the granting of early retirement and invalidity pensions as a means of easing the personal burdens of transition; a practice that is still attracting critical comment from the OECD (2006a). On the other hand, the working age population continued to increase throughout the 1990s as a result of

[10] In the context of Aghion and Blanchard (1994), the hiring function should drift upwards.

an earlier baby boom.

6. AN EMPIRICAL MODEL OF POWIAT UNEMPLOYMENT

Modelling unemployment across powiats controls for a good deal of the intra-regional variation that is suppressed in voivodship level studies, as Table 4 makes clear for 2001. However, the availability of data with which to test hypotheses regarding the determinants of unemployment is less rich at the more disaggregated level. For current purposes, there are two important examples where this impinges. The first is in the field of employment statistics where, with the exception of farming, only employment in enterprises with more than nine employees is reported for the powiats. The second lays in the absence of labour force participation data. Such problems sometimes therefore necessitate the use of proxy measures. Nevertheless, the model developed in this section retains theoretical underpinnings and the findings from the associated analysis should yield further insights on the determinants of local unemployment disparities in Poland.

Table 4 here

Rurality

Rural development remains a priority concern in Poland (Ingham and Ingham, *op. cit.*). Unfortunately, there is no unambiguous definition of rurality, with adopted classifications based on administrative, contextual and functional criteria all being common and frequently yielding dissimilar territorial divisions. Given the motivation for this paper and the fact that alternative measures can convey different pieces of information, some attention is devoted to capturing different facets of what might constitute rural Poland.

The approach adopted by the OECD is straightforward. It defines NUTS-5 level communities as rural if they possess population densities of less than 150 people per square kilometre.[11] Area classification under Eurostat conventions is somewhat more complex. It is based on a three-tier hierarchy of the degree of urbanisation with various additional area, location and population criteria (see European Commission, 1997).[12] In Poland, rural areas are actually defined as 'territory situated outside town administrative boundaries' (MARD, 2002). Using this definition, the Polish Ministry of Agriculture calculated that 38.1 per cent of the country's population and 93.4 per cent of its land would be classified as rural whereas, under the OECD definition, the corresponding figures are 35 per cent and 91.7 per cent, respectively (*ibid*.).[13] The basic unit of enumeration for such calculations is the gmina, although their actual division is not simply into urban and rural communities. Thus, while such are defined, there is an additional category of mixed urban and rural gminas. The practice in official Polish publications is to classify these sub-populations separately in computing urban and rural population totals.

Seemingly arbitrary schema aside, probably the simplest approach to classification is the continuous one relying on population density. At the very least, it is a measure that has been subject to a good deal of rationalisation in the labour market literature. Krugman (1991) and Fagerberg *et al*. (1997) consider the possibility that more densely populated areas generate greater agglomeration and scale economies and thereby exhibit stronger growth and create more jobs

[11] At higher levels of spatial aggregation, the Organization's definitions focus on the percentage of the population living in rural communities (European Commission, 1997).
[12] The definition in fact approaches, but does not face head-on, the important issue of peripherality.
[13] The implied difference of 1.4 million people has been considered 'insignificant' (MARD, 2002).

than other localities. In a similar vein, higher population densities have also been associated in the literature with lower job search costs and a quicker matching process between workers and job vacancies (e.g. Badinger and Url, *op*. *cit*.). On a rather different note, it has sometimes been introduced as a variable attempting to capture the amenities/disamenities workers associate with different areas (Partridge and Rickman, 1997). However, there is little agreement about the underlying direction of influence. Thus, some see densely populated areas as a repellent on account of their congestion problems while others view their cultural assets as a potential attraction.

Whatever the system of classification, there are certain additional reasons for expecting that Polish rural areas might have higher levels of unemployment than urban localities. Thus, the rural population is poorly educated (MARD, *op*. *cit*.; Ciechocińska, 1989) and low levels of human capital are inimical to the conduct of modern economic activity. With no measure of the stock, as opposed to flow, of educational attainment available, any measure of rurality will, at least partly, track this influence. Further, many of Poland's rural areas are connected but poorly to the more dynamic centres of the country's economy as a result of inferior physical communications networks (MARD, *op*. *cit*.), which reflects the contextual dimensions of isolation and peripherality. Both low educational attainment and remoteness would be expected to raise observed levels of unemployment. However, the distinctive characteristics of Polish farming lead one to suspect that this relationship may not always prevail.

The country's agriculture is certainly declining, insofar as its share of GDP fell from 12.9 per cent in 1989 to just 2.6 per cent in 2003 (GUS, 1994, 2004). However, its employment total has not adjusted accordingly and the

sector still accounted for almost 29 per cent of all in work in 2003 (GUS, 2004a).[14] In short, the sector's more than four million workers include many who are disguised unemployed. Furthermore, given that prevailing regulations prevent individuals connected to family farms receiving unemployment benefit, there may be little incentive for them to register themselves as out of work. As such, it is natural to hypothesise that *cet*. *par*. the more agricultural is an area the lower would be its unemployment rate.

As the powiats do not necessarily represent self-contained labour market areas, they may experience commuter flows across their boundaries; that is, there may be spatial spillovers. Certainly in the years prior to 1989, numerous workers from the countryside were known to travel daily to industrial complexes in urban localities for their employment. However, it is often remarked that those with agricultural plots were the first to be laid off as enterprises rationalised in the post-communist environment (Góra, 1991). Also, public transport services have been curtailed in rural areas, thereby reducing the ease of commuting and increasing peripherality. Nevertheless, some account needs to be taken of the possibility that labour mobility could contaminate analyses of powiat unemployment, with such flows regarded as more likely the more buoyant or metropolitan are surrounding areas.

Initial Conditions, Structural Change and Industry Mix

As already noted, discussion of labour market performance in the transition economies frequently places emphasis on the importance of the initial conditions

[14] Statistical sophistry subsequently erased some two million peasant farmers from the labour market map (GUS, 2004a; Ingham and Ingham, 2004).

inherited from the era of central planning. In general, this might be captured by the initial degree of industrial diversification of local economies as a measure of their ability to withstand the shocks of transition. However, in the particular case of Poland, studies have tended also to stress the location of the ex-state farms as an important negative structural inheritance from the past (Dzun, 2004). It is certainly the case that this particular segment of agriculture has dwindled almost to nothing, employing just 40,357 workers in 2003 (GUS, 2004a). That said, the obverse of the size of private farming was a state sector of limited proportion and the pure state farms, excluding co-operatives, employed just 470,000 workers in 1990 (GUS, 1991). Furthermore, not only were the state farms relatively diversified enterprises in order to shield them from seasonal fluctuations, early retirement and invalidity pensions were often used to shed labour post-1989. Nevertheless, they were concentrated spatially, as shown in Table 5, and the possibility that their demise generated localised problems should be explored.

Table 5 here

The difficulty with an emphasis on initial conditions, particularly after a reasonable lapse of time, is that economies evolve, as does the identity of those participating in them. This implies a need to control for structural change. Unfortunately, the industrial classification in use in Poland was revised with effect from 1994 and the boundaries of the country's administrative areas changed in 1999. This compounds the problem of only having employment data available at the level of the voivodship and suggests that, in addition to attempting to measure change over time, it might be necessary to explore the power of point modernity measures. Natural candidates in this regard would

seem to be contemporary indicators that attempt to account for the degree of diversification or the importance of the service sector.

Economic Activity: Investment and FDI

Ideally, a measure of local economic activity such as gross regional product would be used as a proxy for labour demand. Unfortunately, no tolerably accurate measure of this is available at the level of the powiat and**,** in an attempt to avoid over-reliance on variables relating to higher levels of spatial aggregation, other indicators are employed.[15] The first is the level of investment per capita, which is itself an important component of GRP. Furthermore, it might also be argued to be one measure of the extent of modernisation being undertaken within a local economy. Other things equal, the former consideration would lead to the expectation of a negative relationship between investment and unemployment, although matters are more ambiguous once the second possibility is noted. Thus, while modernisation could take the form of more progressive and more competitive enterprises that create new work opportunities, it might also take place through the rationalisation of existing operations and, at least initially, the destruction of jobs. The *a priori* net outcome of investment on unemployment is therefore unclear.

Another indicator looks to the significance of companies with foreign capital participation in the powiat business base as recorded in the official REGON register, particularly as the transition literature is replete with speculation regarding the potential role of FDI in transforming economies. The most prevalent attitude is that it can support transition by transferring

technologies, managerial and labour skills, marketing channels and a market-based business culture, while at the same time supplementing domestic savings in the process of catching up with western living standards (Lankes and Venables, 1997). Such developments might be expected to reduce unemployment.

However, some see FDI as a threat to democratic workplace organisation and as a force acting to marginalize local economic strengths through its focus on low wage cost advantages and large scale worker flexibility (Smith and Pavlinek, 2000), although it is not immediately apparent that such negative developments would impact deleteriously on the prevailing level of unemployment. The latter could come about if worker flexibility is reflected in greater employee turnover. Likewise, joblessness might increase if the inward investment crowded out domestic activity or if it was associated with the rationalisation of newly privatised enterprises. Also, it is possible that foreign enterprises employ more capital-intensive technologies and hence *ceteris paribus* less labour than domestic undertakings, thereby leading to higher unemployment rates. Wherever one's predilections lie – direct evidence is scarce – the numerical weight of companies with foreign capital participation provides one test of the role of the latter in local labour markets.[16]

Labour supply and migration

Having considered some important influences on the demand for labour, attention here focuses on supply. Empirically, labour supply can be approximated

[15] The relationship between GRP and unemployment has been shown to be complex (Elhorst, 2003: 732).
[16] The monetary volume of FDI, whether measured as a stock or a flow, is not available at the level of the powiat.

by the population of working age multiplied by the participation rate.[17] However, the participation rate is not available at the level of the powiat, although data for the population of working age are released and can be used as the basis for examining labour supply pressures.

The actual labour supply of working age is the outcome of a number of flows, of which migration often receives emphasis in the literature on local unemployment. Some, such as Marston (*op. cit.*), see it as a powerful and rapid equilibrating mechanism when unemployment rates diverge across space. If his theoretical perspective is the correct one, there arises an endogeneity problem when migration is introduced into an unemployment equation. However, the evidence for countries other than the U.S. does not support the causal link from unemployment through to migration nearly so strongly (Ferragina and Pastore, *op. cit.*; Elhorst, *op. cit.*; Bila, 2002). Also, the housing shortage in Poland has been a notorious constraint on mobility and, even though the situation has improved somewhat in recent years, it still gives rise to concern (OECD, 2002). Nevertheless, movement does occur and the migration rate and its potential endogeneity therefore need to be considered.

Model Specification and Preliminary Screening

In view of the preceding discussion, attention focused on variants of the following general model:

U = f(Rurality, Initial Conditions, Structural Change, Economic Activity, Labour Supply, Controls)

[17] The measure is an approximation because some people participate even though they are outside the accepted working age limits. Commuting across local area boundaries represents a further distortion. However, other possible measures of labour supply, such as total population multiplied by the overall participation rate, lead to even more serious problems.

wherein

U = registered unemployment rate.[18]

The precise regressors were then defined as follows.

Rurality

RUROECD = percentage of the population resident in whole or part gminas with population densities below 150 persons per square kilometre (SADB).[19]

RURPOL = percentage of the population resident in wholly rural gminas or in the rural part of mixed gminas (SADB).

DENS = population density (SADB).

AG = agricultural employment as percentage of population of working age (GUS, 2001a; 2002a).

PERIPH = dummy variable = 1 if powiat contiguous to a city powiat, = 0 otherwise.[20]

SPOVER = simple average unemployment rate across all contiguous powiats.

Initial Conditions

$HERF_0$ = Herfindahl index of industrial concentration across 17 sectors measured at the voivodship level in 1989.[21]

STFARM = Percentage employment in state farms (excluding co-operatives) in 1990 measured at the voivodship level (GUS, 1991).

[18] Data for all unemployment measures are taken from *Registered Unemployment* (GUS), various issues.
[19] SADB is the Small Area Data Base maintained by GUS.
[20] City powiats are treated as contiguous to themselves. Also, Warsaw Central was not designated officially as a city powiat until 2002, but has been treated as one in the current analysis.
[21] When a powiat does not map completely into one old voivodship, a weighted average of the *H* measures for the voivodships involved is used, with weights equal to the powiat's resident population that would have been located in each. Data for all employment measures are taken from *Employment in National Economy* (GUS), various issues.

Structural Change

$STCH_0$ = Index of structural change 1989-1993 across 17 sectors measured at the level of 49 voivodships (GUS, 1997).[22]

$STCH_1$ = Index of structural change 1994-1998 across 14 sectors measured at the level of 49 voivodships (GUS, 1999; 1995).

SERV = percentage employment in the service sector measured at the voivodship level (GUS, 2002c, 2001b).[23]

TOURISM = number of tourists accommodated per head of powiat population (SADB).

Economic Activity

INV = investment (real złoty) per capita (SADB).

PRCCFOR = the proportion of REGON commercial law enterprises with foreign capital participation (SADB).

Labour Supply

LS = percentage of powiat population of working age (GUS, 2001c; 2002d).

MIG = net internal and international migration (inflows minus outflows) for permanent stay per 1000 population (GUS; 2001c; 2002d).

Controls

S1 = Quarter 1 seasonal dummy.

S2 = Quarter 2 seasonal dummy.

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[22] $STCH_0 = \sum_i 0.5\left|S_{i_{t1}} - S_{i_{t0}}\right|$ where $S_{i_{t1}}$ is the employment share of industry *i* in time period t_1 and $S_{i t0}$ is the corresponding share for time period t_0. $STCH_1$ is defined analogously.

[23] Services comprise trade and repair, hotels and restaurants, transport, storage and communication, financial intermediation, real estate, renting and business activity, public administration and defence, compulsory social security, education, health and social work and other community, social and personal social services.

S3 = Quarter 3 seasonal dummy.

All variables measured at powiat level for the years 2000 and 2001 unless stated otherwise.

Initial estimation revealed that *LS* was highly negatively correlated with *AG* and had to be excluded. The measure of agriculture's importance is therefore capturing both industry mix and age of workforce effects. As expected, *RUROECD*, *RURPOL* and *DENS* were collinear, critically so in the case of the former two, and they were therefore retained for alternative specifications. However, notwithstanding evident stability, collinearity between these rurality measures and agricultural intensity remained a concern. As the problem was much less severe when population density was employed, its inclusion defines the *a priori* preferred version of the model.

7. ECONOMETRIC SPECIFICATION

Data on a group of observational units over time raise questions about the choice of modelling strategy. The straightforward option would be to ignore heterogeneity within the sample and to pool the data. However, if heterogeneity across powiats is present, it results in biased and inconsistent estimators. This work therefore adopts a panel data approach and utilises the one-way error correction model proposed by Baltagi (1981, 2001). Initial estimation testing rejected the null of no endogeneity for two of the model's explanatory variables, *INVPC* and *MIG*, and Baltagi's (*op. cit.*) random effects error component two-

stage estimator (EC2SLS) was used to generate consistent, asymptotically efficient estimates.[24]

The first structural equation of the model is given by:

$$y_1 = Z_1\delta_1 + u_1 \tag{1}$$

where $Z_1 = [Y_1, X_1]$ and $\delta_1' = (\gamma_1', \beta_1')$. Y_1 is a set of g_1 right-hand endogenous variables and X_1 the set of k_1 included exogenous variables. This equation has k_2 excluded exogenous variables (X_2) with identification requiring k_2 to be greater than or equal to g_1. The error term is equal to $u_1 = Z_\mu\mu_1 + v_1$ with $Z_\mu = (I_N \otimes i_T)$. $\mu_1' = (\mu_{11},...,\mu_{N1})$ and $v_1 = (v_{111},...,v_{NT1})$ are random vectors with zero means and covariance matrix:

$$E\begin{pmatrix}\mu_1\\ v_1\end{pmatrix}(\mu_1' \quad v_1') = \begin{bmatrix}\sigma_{\mu 11}^2 I_N & 0\\ 0 & \sigma_{v11}^2 I_{NT}\end{bmatrix}$$

where $E(\mu_1\mu_1') = \Omega_{11} = \sigma_{v11}^2 I_{NT} + \sigma_{\mu 11}^2 (I_N \otimes J_T)$, with J_T being a unit matrix of dimension T.

Transforming the first structural equation by $Q = I_{NT} - P$ where $P = I_N \otimes \bar{J}_T$, gives:

$$Qy_1 = QZ_1\delta_1 + Qu_1. \tag{2}$$

Defining $\tilde{y}_1 = Qy_1$, $\tilde{Z}_1 = QZ_1$, $\tilde{X} = QX$ and $\tilde{u}_1 = Qu_1$ and applying generalised least squares (GLS) to $\tilde{X}\tilde{y}_1 = \tilde{X}\tilde{Z}_1\delta_1 + \tilde{X}\tilde{u}_1$ produces the 'within' two-stage least squares (2SLS) estimator:

[24] There has been much discussion in the literature on the relative merits of the fixed and random effects approaches to panel data (e.g. Mundlak, 1978 and Nerlove, 2002). However, with time-invariant regressors (*PERIPH*, *STATEAG*, *HERF*, $STCH_0$ and $STCH_1$), the individual-specific variables in the fixed effects model are collinear with the constant term (Greene, 2002), hence this specification cannot be employed.

$$\hat{\delta}_{1,W2SLS} = \left(\tilde{Z}_1' P_{\tilde{X}} \tilde{Z}_1\right)^{-1} \tilde{Z}_1' P_{\tilde{X}} \tilde{y}_1 \quad (3)$$

where $P_{\tilde{X}} = \tilde{X}\left(\tilde{X}'\tilde{X}\right)^{-1} \tilde{X}'$.

Similarly, transforming the first structural equation by P and defining $\bar{y}_1 = Py_1$, $\bar{Z}_1 = PZ_1$, $\bar{X} = PX$ and $\bar{u}_1 = Pu_1$, the GLS estimates from $\bar{X}\bar{y}_1 = \bar{X}\bar{Z}_1\delta_1 + \bar{X}'u_1'$ produce the 'between' 2SLS squares estimator:

$$\hat{\delta}_{1,B2SLS} = \left(\bar{Z}_1' P_{\bar{X}} \bar{Z}_1\right)^{-1} \bar{Z}_1' P_{\bar{X}} \bar{y}_1 \quad (4)$$

where $P_{\bar{X}} = \bar{X}\left(\bar{X}'\bar{X}\right)^{-1} \bar{X}'$.

Stacking the two transformed equations:

$$\begin{pmatrix} \tilde{X}_1'\tilde{y}_1 \\ \bar{X}\bar{y}_1 \end{pmatrix} = \begin{pmatrix} \tilde{X}_1'\tilde{Z} \\ \bar{X}_1'\bar{Z} \end{pmatrix}\delta_1 + \begin{pmatrix} \tilde{X}_1'\tilde{u}_1 \\ \bar{X}_1'\bar{u}_1 \end{pmatrix} \quad (5)$$

where $E\begin{pmatrix} \tilde{X}_1'\tilde{u}_1 \\ \bar{X}_1'\bar{u}_1 \end{pmatrix} = 0$ and $\text{var}\begin{pmatrix} \tilde{X}_1'\tilde{u}_1 \\ \bar{X}_1'\bar{u}_1 \end{pmatrix} = \begin{bmatrix} \sigma_{v11}^2 \tilde{X}'\tilde{X} & 0 \\ 0 & \sigma_{1_{11}}^2 \bar{X}'\bar{X} \end{bmatrix}$

then GLS on equation (5) gives BALTAGI'S (*op. cit.*) EC2SLS estimator:

$$\hat{\delta}_{1,EC2SLS} = \left[\frac{\tilde{Z}' P_{\tilde{X}} \tilde{Z}}{\sigma_{v11}^2} + \frac{\bar{Z}' P_{\bar{X}} \bar{Z}}{\sigma_{1_{11}}^2}\right]^{-1} \left[\frac{\tilde{Z}' P_{\tilde{X}} \tilde{y}_1}{\sigma_{v11}^2} + \frac{\bar{Z}' P_{\bar{X}} \bar{y}_1}{\sigma_{1_{11}}^2}\right] \quad (6)$$

Although the variance components in (6) are unknown, consistent estimates of them can be derived from the W2SLS and B2SLS residuals:

$$\hat{\sigma}_{v11}^2 = \left(y_1 - Z\hat{\delta}_{1,W2SLS}\right)' Q \left(y_1 - Z_1\hat{\delta}_{1,W2SLS}\right) / N(T-1) \quad (7)$$

$$\hat{\sigma}_{1_{11}}^2 = \left(y_1 - Z\hat{\delta}_{1,B2SLS}\right)' P \left(y_1 - Z_1\hat{\delta}_{1,B2SLS}\right) / N \quad (8)$$

and when these estimates are substituted into (6) feasible EC2SLS are generated.

8. RESULTS

Results from estimating four variants of the model by means of EC2SLS on the available 2,984 observations are presented in Table 6. Equation (1) represents the preferred specification and explains over 57 per cent of the variance in powiat unemployment rates, which is respectable in a panel data context, and most of the regressors are significant at the five per cent level or better and attract the expected signs. The findings indicate that higher population densities – less rural areas – are associated with lower unemployment rates, having controlled for the importance of agriculture, with the result being highly significant. However, the results are in general not sensitive to the precise definition of rurality that is adopted, with only the peripherality measure losing the significance it attains elsewhere when *DENS* is included in the first specification. It is notable though that the exclusion of any rurality measure (column (4)) renders the size of agriculture wholly insignificant. The evident negative impact of agriculture on the registered unemployment rate undoubtedly reflects the hidden unemployment in Polish farming, which is obscured when agriculture also has to identify rural areas in general. It is, however, noteworthy that this result is the opposite of that found by Fagerberg *et al.* (*op. cit.*) for regions within the old EU-15, where the social role of farming is much less significant.

Table 6 here

On the other hand, powiats that historically formed centres of state farming (*STFARM*) are still confronted with a statistically significant legacy working in the opposite direction. Given the erstwhile concentration of such activity, as highlighted above, the impact is also rather large. This finding contrasts somewhat with that for the other initial condition included in the model;

the general industrial concentration measure, $HERF_0$. Thus, while this is both large and of the expected sign, it only attains statistical significance at the 10% level in the preferred specification and is weaker still in the other variants reported. There is, therefore, at least some suggestion that the footprint of early handicaps on local labour markets in Poland eventually fades.

Both of the restructuring indices employed, $STCH_0$ and $STCH_1$ are statistically significant, although they exert opposing influences on the unemployment rate. Powiats located in voivodships which experienced the most restructuring during the period 1989-1993, were suffering from high unemployment a decade later. Closer inspection revealed that the most significant component of the index was the collapse of manufacturing employment, which was not offset by the increase of jobs in the commerce and service sectors. The natural suggestion is that the employment lost was in the most worthless of state enterprises, possibly situated in inappropriate locations and with an eye to markets that have been largely lost. Restructuring between 1994 and 1998, however, was found to exert a negative influence on unemployment. For this period, the largest components of the index were the increased employment shares for the commerce, business service and financial intermediation sectors. This represents the first piece of current evidence to confirm that modern local economies generate jobs.

The last finding is reinforced by the downward pressure exerted on the unemployment rate as the importance of *TOURISM* increases. Somewhat perversely, however, the coefficient on the size of the overall service sector, *SERV*, attracts a positive coefficient. One possible explanation for this result is that small service sectors reflect concentrations of still to be privatised industrial

enterprises that continue to house hidden unemployment.[25] Alternatively, the variable used may have been measured inappropriately insofar as the available service sector employment contains not only those in the supposed growth sectors, such as business services and financial intermediation, but also those in publicly provided services, such as health and education.

Both investment and the presence of foreign capital are likely to be associated with economic modernisation and the negative and significant parameter estimates for *INV* and *PRCCFOR* indicate that both serve to lower unemployment, notwithstanding possible theoretical suggestions to the contrary. Although the FDI test applied is admittedly not very strong, the result does at least provide some concrete evidence in a field that has been noted more for introspection and circumstantial conclusions (Ferragina and Pastore, *op*. *cit*.).

The coefficient on net migration is negative, indicating that population inflows are not associated with higher unemployment. This finding for the labour supply proxy is in line with the contention that 'people cause jobs' (Layard, 1997) and is consistent with the results for other countries reported in OECD (2000). On the other hand, the weighted average of contiguous powiat unemployment rates, *SPOVER*, is both positive and highly significant, which reflects the restricted commuting, as opposed to migration, flows in depressed areas of the country. However, *PERIPH*, which indicates whether or not a powiat is either a city, or is adjacent to one, fails to achieve statistical significance in the preferred specification, even though it does attract the anticipated negative sign.

[25] In this regard, it might be worth noting that OECD (2006a) continues to criticise Poland for its tardiness in completing its privatisation programme.

Finally, the three seasonal dummy variables are all negative and significant, reflecting a relatively slight tendency for unemployment rates to be highest in the winter months and lowest in the summer.

9. SUMMARY AND CONCLUSION

Poland has been plagued with stubbornly high unemployment in the years since 1990, although the severity of the problem has long been recognised to be spatially uneven. Numerous attempts have previously been made to analyse the factors driving the variation in experience across the macro regions of the country, but the Local Government reform effective from 1999 rendered subsequent such exercises much less incisive. The work described above adopted a more disaggregated perspective and analysed the issue at the level of the 373 NUTS 4 powiats that existed in the years 2000 and 2001, across which there was and remains a tremendous variation in unemployment rates.

In addition to its high unemployment, the country continues to exhibit a marked rural development deficit. The findings of this paper, generated by applying a random effects error component two-stage estimator to a panel data set of registered jobless rates, indicate that the two, to some extent at least, go hand in hand. However, the relationship is tempered by the role that agriculture evidently plays in containing unemployment totals, although, for the most part, this is but another facet of the failure of rural reform efforts to date. The recent decision to reclassify many erstwhile farmers as economically inactive will not effect any improvement in this regard. At the same time, while consistent with a good deal of popular speculation, the finding that the legacy of the dissolution of the ex-state farms remains was a somewhat surprising finding and a further

indication of the depth of the country's rural malaise and of the need for renewed policy initiatives in the area.

Other strong findings from the estimation of the chosen model, which was well determined and evidently robust, were that the rate of investment and, as has often been hypothesised, the presence of foreign capital, help to reduce local unemployment rates. In-migration and contiguity with localities possessing relatively healthy labour markets, presumably reflecting commuting opportunities, were also found to be benign forces. Beyond the localised finding for the presence of state farming, there was not strong evidence that conditions at the onset of the transition retained a lasting influence. Furthermore, while past structural change seemingly has a role to play in explaining later unemployment rates, the process appears to be complex and would merit further study. Likewise, the presence of service sector activity appears to exert an ambiguous influence, with reductions in unemployment only seemingly associated with the growth of labour intensive tourism.

Greater understanding of the factors determining local unemployment in Poland is overdue as it grapples with the challenges posed by membership of the EU in what is surely now to be regarded as its post-transition era. This paper has reported the results of work that represented an initial attempt to proceed towards the former goal. The analysis clearly has its limitations, perhaps particularly in the data constraints with which it was confronted. Hopefully, future research efforts will overcome these.

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Table 1
Dimensions of Powiat Unemployment: Descriptive Statistics (June)

Year	National	Minimum	Maximum	Mean	Standard Deviation	n
2000	13.6	2.8	31.3	15.6	5.9	373
2001	15.9	4.1	35.7	18.5	6.5	373

Source: GUS (2002a, 2001a)

Table 2
GDP per Worker: 1990 Prices (1990 = 100)

1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
97.2	102.6	108.3	112.7	120.2	123.1	127.7	134.1	141.6	152.4	159.0	170.7

Source: *Statistical Yearbook of Poland* and *Employment in National Economy* (GUS), various issues.

Table 3
Employment and Unemployment: Poland

	Employment (000)	Unemployment	
	Public Sector	Previously employed	
		% of total	From public sector (%)
1989	9277.8	n.a.	n.a.
1990	8243.4	n.a.	n.a.
1991	7052.1	n.a.	n.a.
1992	6606.4	78.3	63.9
1993	6060.3	77.0	58.2
1994	5878.4	77.0	n.a.
1995	5623.1	78.9	n.a.
1996	5412.5	83.4	36.8
1997	5072.8	80.9	34.6
1998	4671.3	77.4	33.8
1999	4338.9	76.3	30.0
2000	3988.6	76.2	24.3
2001	3702.7	76.3	21.3
2002	3905.2	76.1	20.6
2003	3780.2	75.9	20.4
2004	3695.6	75.8	20.1

Source: *Employment in National Economy* and *Registered Unemployment*, various issues, GUS.

Table 4
Powiat Unemployment Rates 2001

Voivodship	Total (%)	Minimum (%)	Maximum (%)
Dolnoślaskie	19.3	8.5	33.3
Kujawsko-pomorskie	20.1	10.7	29.3
Lubelskie	14.3	10.9	19.4
Lubuskie	22.4	11.5	32.1
Łódzkie	16.8	7.6	23.0
Malopolskie	12.9	7.4	20.3
Mazowieckie	11.7	4.1	28.5
Opolskie	16.3	8.9	25.0
Podkarpackie	16.3	9.1	22.0
Podlaskie	13.8	7.3	21.3
Pomorskie	17.6	6.8	34.0
Śląskie	14.3	6.2	26.2
Świętokrzyskie	17.2	8.4	25.1
Warmińsko-mazurskie	26.8	11.8	33.5
Wielkopolskie	13.5	4.3	26.3
Zachodniopomorskie	21.7	9.9	35.7

Source: GUS (2002a).

Table 5
Employment in State Agriculture in 1990 (% of total employment)

VOIVODSHIP	%
Kozalińskie	11.1
Elbląskie	10.9
Olsztyńskie	9.0
Pilskie	9.0
Gorzowskie	8.4
Leszczyńskie	7.5
Suwalskie	7.4
Szczecińskie	7.4
Zielonogórskie	5.7

Notes: Of the old 49 voivodships only those where state agriculture accounted for 5% or more of total employment are included in the Table.
Source: GUS (1991).

Table 6
Error Component Two-Stage Least Squares Estimates

	(1)	(2)	(3)	(4)
Constant	-1.7563 (0.91)	-4.6920 (2.32)	-3.9371 (1.95)	-2.2991 (1.15)
DENS	-0.0022 (5.96)			
RURPOL		0.03728 (4.15)		
RUROECD			0.02710 (3.03)	
AG	-0.0247 (2.64)	-0.0258 (2.59)	-0.0204 (2.06)	-0.0070 (0.78)
INV	-12.3802 (4.63)	-12.2650 (4.56)	-12.4828 (4.63)	-12.6263 (4.72)
PRCCFOR	-15.0676 (13.81)	-14.8142 (13.55)	-14.6222 (13.38)	-14.7292 (13.44)
MIG	-0.1342 (6.22)	-0.1320 (6.09)	-0.1292 (5.96)	-0.1287 (5.95)
TOURISM	-0.6479 (2.91)	-0.6269 (2.82)	-0.6339 (2.85)	-0.6412 (2.84)
SERV	0.1887 (7.00)	0.1908 (7.12)	0.1884 (7.01)	0.1927 (7.00)
SPOVER	0.7102 (52.68)	0.7139 (52.83)	0.7147 (52.82)	0.7155 (52.99)
PERIPH	-0.7053 (1.34)	-1.7105 (3.61)	-1.7894 (3.74)	-2.1094 (4.33)
$HERF_0$	7.0343 (1.72)	6.8720 (1.70)	6.3482 (1.57)	5.4569 (1.29)
STFARM	0.3175 (3.64)	0.3760 (4.39)	0.3511 (4.07)	0.3754 (4.19)
$STCH_0$	36.6977 (3.24)	39.3462 (3.51)	38.8727 (3.44)	35.5399 (3.03)
$STCH_1$	-42.6423 (2.19)	-42.1989 (2.19)	-41.9755 (2.16)	-50.0674 (2.48)
S1	-0.5734 (13.03)	-0.5700 (12.88)	-0.5690 (12.85)	-0.5682 (12.90)
S2	-0.7270 (15.94)	-0.7221 (15.75)	-0.7210 (15.71)	-0.7200 (15.76)
S3	-0.5697 (13.03)	-0.5664 (12.88)	-0.5656 (12.85)	-0.5649 (12.90)
NT	2,984			
R^2 - *within* R^2 - *between* R^2 - *overall*	0.7500 0.5629 0.5725	0.7490 0.5517 0.5619	0.7487 0.5464 0.5569	0.7497 0.5259 0.5374
σ_u σ_e ρ	4.1168 0.8000 0.9636	4.0610 0.8049 0.9622	4.0728 0.8042 0.9624	4.2319 0.804 0.9660
Wald χ^2	8063.31	7969.16	7863.42	7980.25