THE EVOLUTION OF REGIONAL WAGE DIFFERENTIALS IN A TRANSITION ECONOMY: EVIDENCE FROM POLAND

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ABSTRACT

This paper uses micro data from the Labor Force Surveys to examine regional wage differentials and their dynamics in Poland over 1994-2007. We find that controlling for observed worker characteristics reduces regional wage disparity by 30-50 percent, but remaining wage differentials persist and seem to intensify over time.

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KEYWORDS: Regions, Wage Differentials, Transition Economies

INTRODUCTION

Economic and social cohesion has been one of the major priorities of the European Union since its inception in the 1950s. The mission of the EU cohesion policy was first defined in the preamble of the Rome Treaty (1957) as the need to ensure "harmonious development by reducing the differences existing between the various regions and the backwardness of the less favoured regions." The Single European Act (1986) established a European Community policy of economic and social cohesion, and the Lisbon Treaty (2007) recognized 'territorial cohesion' as a general political objective in addition to economic and social cohesion. The EU regional policy gained in importance after 2004 with the accession of 12 new member countries which all had relatively low levels of economic development (Bulgaria, Cyprus, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Malta, Poland, Romania, Slovakia and Slovenia). Financial resources for cohesion policy increased significantly and now constitute the second largest outlay in the EU budget after the Common Agricultural Policy. For instance, the Structural and Cohesion Funds amounted to €213 billion for EU-15 and €21.7 billion for the 10 new Member States in the 2000-2006 planning period and to €347 billion in the 2007-2013 planning period. This constitutes over one third of the EU budget and about 0.4 percent of the total GDP of the EU. In 2007-2013 Poland was the main beneficiary country (€67.3 billion), followed by Spain (€35.2 billion), Italy (€28.8 billion), Czech Republic (€26.7 billion), Germany (€26.3 billion), Hungary (€25.3 billion), Portugal (€21.5 billion), and Greece (€20.4 billion) (EC, 2008, pp. 21, 25).

Notwithstanding these huge expenditures, the impact of the EU regional policy on regional development and convergence is not clear-cut (see Busillo *et al.*, 2010 for an overview). Interestingly enough, both converging and diverging tendencies are being reported for the EU area: while regional disparities between the EU countries have been narrowing, regional disparities within member countries – particularly the new ones – have widened (EC, 2003, p. 3; Monfort, 2008, pp. 5-6; EC, 2010a, pp. 13-14; EC, 2010b, pp. 57-58). For instance, EC (2010b) reports that the extent of regional dispersion in GDP per capita (as measured by the logarithmic deviation index) across the EU-25 declined from 8.3 in 1995 to 6.3 in 2006. At the same time, the index of regional dispersion increased from 4.9 to 5.5 across the sub-group of the 10 new members. The regional dispersion also widened within the Czech Republic (from 2.5 to 5.3), Hungary (from 4.0 to 8.5), Slovakia (from 5.9 to 8.0) and Poland (from 1.4 to 3.1).

These empirical findings should be treated with caution, though. Many of these analyses employed aggregate regional data, typically GDP per capita or wage per person. However, GDP is a measure of market production and not a good measure of well-being (Stiglitz *et al.*, 2008, p. 8). What is more important is that all aggregate approaches are flawed in their failure to account for regional heterogeneity. They implicitly assume regional homogeneity, meaning that individual differences average out in large populations, and regional macro metrics converge upon some common value. In reality, however, regions differ in their demographic, social and economic structures. For this reason, "aggregate approaches barely say anything about the "how" and even less about the "why" of regional inequalities" (Duranton and Monastiriotis, 2002, p. 223). Duranton and Monastiriotis call for a disaggregated approach (i.e., use of micro data) in the analyses of regional dynamics because measures of regional differences that take into account regional heterogeneity may be quite different to measures that ignore it.

This paper examines the evolution of regional wage disparities within Poland in 1994-2007. We estimate the size of regional wage differentials at a particular date and over time and focus on whether there is any evidence that regional wage disparities are reduced over time. The paper contributes to the literature in five ways. First, it analyzes regional disparities in Poland over a long time span (1994-2007), covering both an early and mature stages of economic transformation as well as Poland's membership in the EU. Second, we use workers' compensation (wages) which is considered to be a better than GDP measure of both economic and social aspects of development. Third, we examine regional wage disparities for men and women separately. Fourth, we employ micro data in order to determine whether regional disparities still exist after controlling for a number of worker and regional characteristics. Fifth, the paper adds to our understanding of regional wage differentials in transition economies, a subject on which studies are scarce. The paper is organized in the following way. The next section provides a brief overview of the theoretical literature on the causes of regional wage differentials. The "Data and Methodology" section describes the data set used for this study as well as the analytical framework. The following section presents and discusses our results; and the final section summarizes and concludes.

LITERATURE REVIEW

The basic neoclassical model predicts that if information is perfect, transportation costs are moderate, and labor and capital can move freely, then wages of workers with similar human capital characteristics will be equalized across regions (Goldfarb and Yezer, 1976). The empirical evidence, however, suggests that regional pay differentials persist even in highly mobile developed economies. In order to explain equilibrium wage disparities, the simple neoclassical model was extended by bringing into the fold a variety of non-wage factors affecting the location decision of workers (suppliers of labor) and firms (demanders of labor). For workers, it is hypothesized that they consider both wage and non-wage factors and maximize their overall utility rather than their wages (Roback, 1982, 1988; Rosen, 1986; Gyourko and Tracy, 1989). These unique features are collectively referred to as 'amenities' and may include topography, climate and environment, cost of living, fiscal conditions, family considerations, availability and quality of public services, *etc*. If workers place a high value on regional amenities, they will tend to move to high-amenity areas, the supply of labor in those areas will increase leading to lower wages. On the other hand, the supply of labor in the areas with severe climate conditions, air pollution, poor public services and other negative regional attributes will decrease leading to higher wages. For firms, the neoclassical approach asserts that they act as profit maximizers and will pay a wage equal to the marginal productivity of labor (to be more specific, a nominal wage equal to the marginal revenue product of labor); hence, wages are assumed to be determined by labor productivity. If the regional characteristics – such as skilled labor, proximity to major markets, good transportation networks, favorable local economic conditions, *etc*. – increase productivity, the demand for labor in those areas will increase leading to higher wages. Conversely, the low productivity-enhancing regional characteristics will decrease the demand for labor and thereby decrease wages in those regions (Beeson and Eberts, 1989). Overall, neoclassical

theory contends that if workers and firms take into account regional non-wage factors when making location decisions, wages will not necessarily be equalized across regions even in the competitive market.

A competing model – the efficiency wage hypothesis – offers a further understanding of persistent regional earnings disparities. Unlike neoclassical theory, the efficiency wage model hypothesizes that workers with identical productive characteristics may receive different wages if firms pay premiums in order to minimize turnover, shirking and adverse selection and increase worker loyalty (Katz, 1986). Farber and Newman (1989) show that efficiency wage models may be appropriate for explaining inter-regional wage differentials if the relationship between wages and productivity differs across regions and if inter-regional conditions necessitate regional efficiency premiums. According to this view, regional efficiency wage premiums may also be a source of persistent gaps in regional wages in addition to the productivity and amenity components.

Most recently, the neoclassical theory of wage determination was augmented with the new economic geography approach pioneered by Krugman (1991a,b). As mentioned above, the standard neoclassical model asserts that each region has a specific set of site characteristics which determine its high or low productivity value to firms. In other words, the region-specific productivity factors are taken as given (*i.e.*, exogenous). In contrast, the new approach posits that productivity differences across regional markets are endogenously determined by the level of economic activity (*i.e.*, agglomeration economies) in that region. Moretti (2010, p. 1286) identifies the three most relevant explanations for the agglomeration of economic activity: "(1) advantages deriving from thick labor markets; (2) advantages deriving from proximity to providers of intermediate non-tradable goods and services; (3) localized knowledge spillovers" and explains how the existence of agglomeration economies can generate multiple regional equilibria, some with low economic activity and low nominal wages, and some with high economic activity and high nominal wages. For instance, a thicker labor market in a particular region may produce higher quality worker-firm matches resulting in higher productivity and higher wages in that region. When many firms locate in a dense region, they share a larger and wider regional supply of inputs, which may cause an increase in productivity as well as wages. The agglomeration of human capital creates regional clusters of high-skilled workers and may generate important knowledge spillovers that increase productivity and efficiency and allow for higher wages. Furthermore, economic agglomeration may create congestion costs, and firms in agglomerated regions must pay workers higher nominal wages.

Finally, institutional factors and regulatory restrictions on labor and firm mobility offer additional explanations for persisting regional pay differentials. Institutional factors typically include such non-competitive forces of wage determination as unionization levels, collective bargaining, contract duration, wage discrimination, market concentration (monopoly or monopsony power), *etc*. For instance, the studies on the effects of unionization and bargaining on wage inequality show that weak unions as well as more decentralized and uncoordinated collective bargaining typically coincide with more pronounced regional wage differences (OECD, 2004; Dell'Aringa and Pagani, 2007; Vamvakidis, 2008). Restrictions on geographic labor mobility also represent a source of persistent inter-regional pay disparities (Topel, 1986; Dickie and Gerking, 1998).

A broad range of empirical studies have analyzed regional wage differentials for a number of developed countries. For transition economies (and particularly Poland), studies on regional wage differentials are scarce. We found only a few papers for Poland: Gora and Sztanderska (1998), Duffy and Walsh (2000, 2002), Sibley and Walsh (2002), Rogut (2007), Adamczyk *et al*. (2009), Bogumil (2009), Czyz and Hauke (2011). While the empirical evidence is far from conclusive (estimates of regional wage differentials vary considerably as a result of variations in methodologies used as well as data sources), the majority of studies find that significant inter-regional pay differentials do exist. However, it has been proven difficult to disentangle their sources and to explain their persistence and stability over time.

DATA AND METHODOLOGY

Labor Force Surveys conducted by the Polish Central Statistical Office in May of 1994-2007 constitute the data source for this paper. We restrict our attention to full-time hired employees because only this category reported their earnings in the survey. We further narrowed our sample of full-time hired workers by deleting those individuals who did not report their earnings, who were full-time students, or handicapped, or younger than 18, or older than 60 (the retirement age for women) or 65 (the retirement age for men). Furthermore, for consistency we controlled if an employee worked 40 and more hours per week on a regular basis. After all these adjustments, we had samples of about 5,000-9,000 full-time hired male employees and 4,000-7,000 full-time hired female employees for each year in 1994-2007.

Since the 14th century, a 'voivodship' ('województwo' in Polish) has been the major territorial division in Poland. At the outset of the transition, in the early 1990s there were 49 voivodships, but in 1999 the Polish local government reform reduced the number of territorial units to 16. The aim of the reform was to create territorial units which would comply with the criteria defined by the Assembly of European Regions: common economic goals and inner economic integration, democratically elected political representation, inner social links built on shared social and territorial identity, and direct submission to central governmental level (Kozak *et al*., 2000, p. 47; Sagan and Lee, 2005, p. 166). Polish voivodships are equivalent to provinces and correspond to the NUTS 2 level according to the EU Nomenclature of Territorial Units for Statistics.

We use two different measures – the weighted average absolute regional wage differential and the standard deviation of regional wage differentials – to assess the overall dispersion of regional wages. To control for observed heterogeneity of workers, we use the Mincerian 'human capital earnings function' (Mincer, 1974) and apply the restricted least squares estimation procedure developed by Haisken-DeNew and Schmidt (1997). The following section provides further explanations and formulae.

RESULTS

We first calculate the overall "raw" regional wage differentials (*deltas*) for men and women separately using current wages in Zlotys:

$$\delta_r = \frac{\sum_{i=1}^{n_r} \frac{w_{ir}}{\overline{w}}}{n_r} - 1, \qquad (1)$$

where $r = 1,...,R$; R is the number of regions (i.e., 16 voivodships); $i = 1,...,n_r$; n_r is the number of workers in region r; w_{ir} is the wage of worker i in region r; $\overline{w}$ is the average wage in the national economy. We use two different measures to measure the overall dispersion of regional wages:

the weighted average absolute regional wage differential

$$AVG|\delta| = \sum_r |\omega_r \delta_r| \quad \text{and} \qquad (2)$$

the standard deviation of regional wage differentials

$$SD(\delta) = \sqrt{\sum_r \omega_r \delta_r^2} \quad , \qquad (3)$$

where $\omega_r = \frac{n_r}{N}$ is the share of each region in the total number of workers (N).

As expected, Mazowieckie voivodship (with the capital city of Warsaw) exhibits the largest positive deviations from the national average: for instance, 9% and 15% for men and 15% and 25% for women in 1994 and 2007, respectively. As expected, the regions in the Eastern part of Poland typically exhibit the largest negative deviations from the national average wage. Our dispersion measures drawn from these average wage data are summarized in Columns (c) and (f) in Table 1. Over all 16 regions, for men the AVG|*delta*| measure was 9.0% in 1994 and 7.9% in 2007. The SD(*delta*) measure shows a similar drop in regional wage dispersion for men from 10.9% to 9.1% over these years. Our measures for women, however, suggest sharply rising regional wage dispersion. The AVG|*delta*| for women rose from 4.9% to 6.9% and the SD(*delta*) from 6.9% to 9.8%. Of course, these statistics do not control for differences across regions in the characteristics of workers.

To control for observed heterogeneity of workers, we used the well-known Mincerian 'human capital earnings function' (Mincer, 1974) in its traditional semi-log form:

$$\ln W_i = \alpha + X_i\beta + \sum_{r=1}^{R} \delta_r D_{ri} + \varepsilon_i \qquad (4)$$

where $\ln W_i$ is the natural logarithm of monthly earnings of a full-time hired employee i ; X_i is a vector of observed characteristics other than the region of residence; D_{ri} is a regional dummy which assumes the value of 1 if worker i resides in region r and 0 otherwise, $r = 1,...,R$, $R = 16$; α, β, δ_r are the coefficients to be estimated; and ε_i is an error term assumed to be $N(0, \sigma_\varepsilon)$. Equation (4) assumes that β 's do not vary by region. While not beyond reproach, this assumption is quite common in empirical regional studies (see, for example, Maier and Weiss, 1986; Azzoni and Servo, 2002; Combes *et al*., 2007; Beenstock and Felsenstein, 2008).

Compared to other papers on the Polish wage structure, the specification of the earnings equation in our study is one of the most comprehensive with 63 individual socio-economic characteristics. In addition to the 16 regional dummies we include: 6 city/town/rural dummies, 5 educational dummies, marital status (married or divorced vs single as a reference group), whether the worker heads a household, private sector (vs public sector as a reference group), 13 industry dummies, potential experience and potential experience squared, tenure at the current workplace and tenure squared, 8 occupational dummies, permanent job (vs temporary job as a reference group), recent (within the past 12 months) graduate, whether the worker holds a second job, whether the worker is looking for another job in accordance with his/her qualifications, and whether the worker has an additional non-wage source of income.

It is worth noting that dummy variables for *each* of the 16 regions were included in the regression (that is, there is no reference group for this category), and the restricted least squares (RLS) procedure was applied to estimate Equation (4). As noted in Freguglia and Menezes-Filho (2012, p. 22), "the advantage of the restricted least squares (RLS) procedure (…) is that all (…) dummy coefficients and standard errors are reported, i.e., the results are independent of the choice of the reference category. This procedure corrects the problems of the traditional methodology of overstating differential standard errors and understating the overall dispersion. The coefficients can be interpreted as percentage-point deviations from the states' weighted average wages."

Table 1: Summary Measures of the Overall Dispersion of Regional Wages: AVG|*delta*| and SD(*delta*)

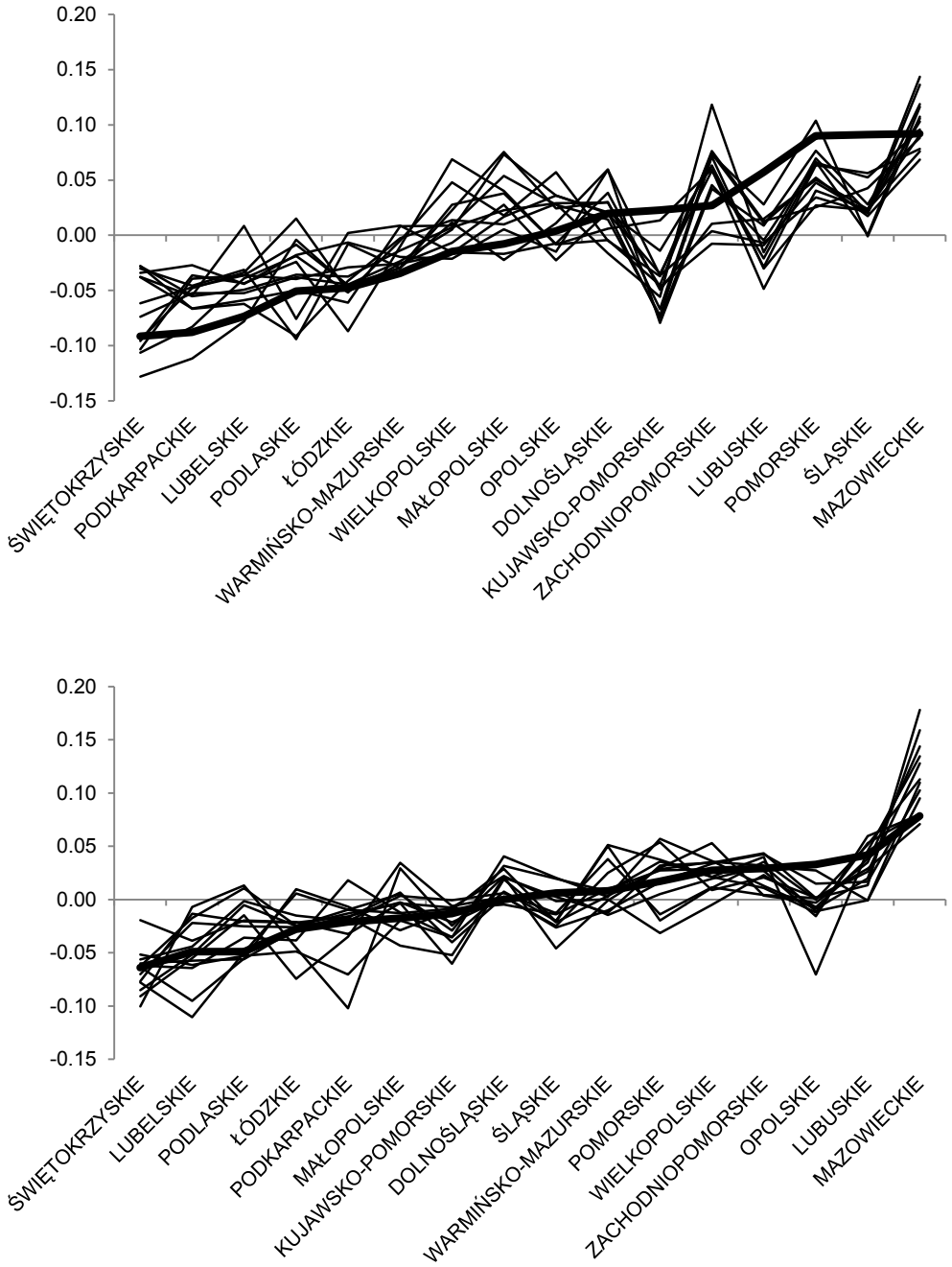
Year	N obs	AVG|*delta*|			SD(*delta*)		
		Using Actual Wages	Using RLS Coefficients	Reduction in Dispersion, % (d/c-1)*100%	Using Actual Wages	Using RLS Coefficients	Reduction in Dispersion, % (g/f-1)*100%
(a)	(b)	(c)	(d)	(e)	(f)	(g)	(h)
MEN							
1994	8501	0.0903	0.0542	-39.9	0.1095	0.0631	-42.3
1995	8555	0.0771	0.0445	-42.3	0.0877	0.0498	-43.3
1996	8220	0.0728	0.0428	-41.2	0.0861	0.0473	-45.1
1997	8246	0.0662	0.0363	-45.1	0.0772	0.0393	-49.1
1998	8236	0.0726	0.0477	-34.3	0.0856	0.0537	-37.3
1999	7383	0.0572	0.0414	-27.7	0.0699	0.0471	-32.7
2000	5356	0.0729	0.0465	-36.3	0.0963	0.0574	-40.4
2001	5266	0.0851	0.0480	-43.5	0.1024	0.0577	-43.7
2002	4757	0.0826	0.0390	-52.9	0.0987	0.0483	-51.1
2003	4440	0.0656	0.0425	-35.3	0.0761	0.0488	-35.8
2004	4623	0.0557	0.0313	-43.8	0.0662	0.0361	-45.5
2005	4483	0.0654	0.0308	-52.9	0.0790	0.0357	-54.8
2006	4642	0.0732	0.0431	-41.1	0.0844	0.0513	-39.2
2007	4722	0.0790	0.0560	-29.2	0.0908	0.0658	-27.5
WOMEN							
1994	6440	0.0490	0.0291	-40.7	0.0686	0.0351	-48.8
1995	6690	0.0480	0.0260	-45.9	0.0718	0.0372	-48.2
1996	6488	0.0421	0.0229	-45.5	0.0621	0.0313	-49.6
1997	6320	0.0384	0.0219	-43.1	0.0587	0.0282	-52.0
1998	6364	0.0412	0.0289	-29.7	0.0641	0.0359	-44.0
1999	5929	0.0465	0.0336	-27.9	0.0683	0.0426	-37.5
2000	4243	0.0593	0.0312	-47.4	0.0873	0.0385	-55.9
2001	4195	0.0732	0.0475	-35.2	0.1144	0.0598	-47.7
2002	3879	0.0653	0.0454	-30.5	0.1105	0.0631	-42.9
2003	3600	0.0442	0.0417	-5.7	0.0626	0.0537	-14.3
2004	3493	0.0458	0.0372	-18.8	0.0651	0.0454	-30.3
2005	3441	0.0524	0.0358	-31.7	0.0649	0.0374	-42.5
2006	3505	0.0637	0.0401	-37.0	0.0952	0.0508	-46.6
2007	3669	0.0691	0.0466	-32.5	0.0978	0.0600	-38.7

The table shows the weighted average absolute regional wage differential (AVG|delta|) and the standard deviation of regional wage differentials (SD(delta)), where deltas are regional wage differentials measured as deviations from the average wage in the national economy.

The wage regression (4) was estimated for each of the 14 years within the 1994-2007 period. The estimated coefficients on the regional dummy variables ($\hat{\delta}_r$) are interpreted as the regional differences in wages that still exist after controlling for the compositional mix of the work force as well as different socio-economic characteristics. The Salter graphs (Figure 1) shows the estimated regional coefficients. To construct these graphs, we first rank all regions according to their wage coefficients in the base year

(1994) and place them in this order along the horizontal axis. Keeping the base year rank positions of regions constant on the horizontal axis, we show the estimated RLS wage coefficients for 1994 and all

Figure 1: RLS Regional Wage Coefficients for Men (upper) and Women (lower): Salter Graph



The graphs show the estimated RLS regional (16 voivodships) wage coefficients for male and female workers. The 0.0 line represents a benchmark (i.e., the average wage in the national economy). The thick line represents the regional wage coefficients in the base year, 1994. The fine lines show the wage coefficients for each voivodship in 1995-2007. The overall pattern emerging in each graph helps us identify low-wage and high-wage regions as well as those regions that widened or narrowed their wage gap with respect to the national average after 1994.

subsequent years on the vertical axis. The Salter graph helps us visualize any significant changes in the regional disparity of wages as well as identify low-wage and high-wage regions. Similar to the findings

reported for the "raw" wage differentials, Mazowieckie voivodship (with the capital city of Warsaw) shows the largest positive deviations of wages from the national average, and the eastern regions show the largest negative deviations of wages from the national average. For both men and women there is a significantly negative *delta* for the four eastern regions of Podlaskie, Lubelskie, Swietokrzystkie and Podkarpacie that appears to be more negative in 2007 than in 1994. Western regions like Pomorskie, Wielkopolskie, Zachodiopomorskie along with Mazowieckie, which contains Warsaw, and Malopolskie, which contains Krakow, have large positive regional wage *deltas* that appear to have risen over time. Our next observation from the Salter graphs is that there seems to be some tendency towards the horizontality of the series for men, which implies that there was a general decrease (or, at least, no increase) in regional wage disparities. For men, we observe some sort of a "catching up" process when low-wage regions (in the low end of the graph) move upward, and high-wage regions (in the high end of the graph) move downward. For women, though, the regional wage disparity seems to worsen, especially due to the fact that Mazowieckie voivodship significantly widened its positive wage gap as compared to the national average.

In order to examine individual movements within the regional wage distribution shown in the Salter graphs, we employ the Markov chain analysis and construct transition probability matrices (Table 2). We choose 5 classes and select the following class limits: less than -0.06, from -0.06 to -0.02, from -0.02 to 0.02, from 0.02 to 0.06, 0.06 and above. Table 2 shows the proportion of regions belonging to each class in 1994 and the proportion of regions that moved from class *i* in 1994 to class *j* in 2007. The stability index (Pellegrini, 2002) is computed as:

$$S = \frac{Tr(P)}{d} \tag{5}$$

where $Tr(P)$ is the trace of the transition matrix P, i.e., the sum of the elements of the main diagonal, and d is the matrix dimension. For both men and women, the stability index is very low (0.53 and 0.58, respectively), indicating that there had been significant movements of regions among the classes. The transition matrix for men is ergodic, i.e., the absolute value of its second eigenvalue (λ_2) is strictly smaller than 1 (for men, 0.836). It means that the transition probability matrix converges to its steady state; and the speed of this movement can be evaluated by the half-life indicator showing the amount of time periods it will take to cover half of the distance between the current and stationary distributions (Shorrocks, 1978):

$$HL = \frac{-\ln 2}{\ln |\lambda_2|}. \tag{6}$$

For men, a half-life is 7.8, indicating that convergence towards the stationary distribution is extremely slow, i.e., 7.8 periods of 14 years. For women, the second eigenvalue of their transition probability matrix is equal to 1, the stationary distribution does not exist, and *HL* is infinity. It is worth noting, however, that our transition matrices summarize an overall change in the regional wage distributions between the first (1994) and the last (2007) years of the period under examination and fail to capture movements within the period. As shown by the Salter graphs, rapid movements did take place within the distribution over 1994-2007. Hence, our results for *S* and *HL* should be treated with caution. To further investigate the dynamics of the regional wage distributions, it would be beneficial to split 1994-2007 into sub-periods and analyze whether the dynamics changed from one sub-period to the other. Also, in the subsequent paragraph, we compute the summary measures of regional wage dispersion, which take into account all annual (14) measures of dispersion and, hence, provide a more comprehensive picture of the dynamics of regional wage differentials.

Table 2: Transition Probability Matrix

RLS Wage Coefficient	Percentage of Regions in 1994	The Proportion of Regions (Percent) That Moved from Class *i* in 1994 to Class *j* in 2007					
		Less Than -0.06	from -0.06 to -0.02	from -0.02 to 0.02	from 0.02 to 0.06	0.06 and above	Total
MEN							
less than -0.06	18.8	100.0					100.0
from -0.06 to -0.02	18.8		66.7	33.3			100.0
from -0.02 to 0.02	25.0				75.0	25.0	100.0
from 0.02 to 0.06	18.8	33.3			33.3	33.3	100.0
0.06 and above	18.8			33.3		66.7	100.0
WOMEN							
less than -0.06	6.3	100.0					100.0
from -0.06 to -0.02	25.0	25.0	25.0	50.0			100.0
from -0.02 to 0.02	37.5		33.3	16.7	50.0		100.0
from 0.02 to 0.06	25.0			50.0	50.0		100.0
0.06 and above	6.3					100.0	100.0

The table shows the proportion of the Polish voivodships belonging to each class in 1994 and the proportion of voivodships that moved from class i in 1994 to class j in 2007. The shaded cells indicate the proportion of voivodships that belonged to class i in 1994 and remained in the same class in 2007.

The summary measures of regional wage dispersion were calculated using Eqs. (2) and (3). The latter, however, needed to be augmented (see Eq. 7). The estimated coefficients on the regional dummy variables from the RLS regressions were used to compute AVG|*delta*| and SD(*delta*):

$$SD(\delta) = \sqrt{\sum_r \omega_r \hat{\delta}_r^2 - \sum_r \omega_r \sigma_r^2} \quad , \tag{7}$$

where σ_r^2 is the variance of $\hat{\delta}_r$. The results are summarized in Columns (d) and (g) in Table 1. Again, the summary measures of dispersion suggest sharply different time series patterns for male and female workers. Looking at the time series of data on AVG|*delta*| we see that for men there was a gradual downward trend in measured regional dispersion from 1994 to 2005 followed by a sharp increase in the last two years in the figure. For women AVG|*delta*| increased significantly in 2001; paralleling the data for men in the years following that year. The dynamics of SD(*delta*) shows a similar pattern, perhaps emphasizing the extent of the rise in regional wage disparity in 2006 and 2007 a bit more. When we compare 1994 and 2007, we see that for men AVG|*delta*| equaled about 5.5% and SD(*delta*) 6.5% for both years. For women, AVG|*delta*| rose from 2.9% to 4.7% and SD(*delta*) from 3.5% to 6.0% from 1994 to 2007. The test for equality of the variances in 1994 and 2007 – using the T2 statistic proposed by Carree and Klomp (1997) – was rejected for women but not for men.

Columns (e) and (h) of Table 1 indicate that controlling for observed worker heterogeneity reduced measured inter-regional wage disparity by 30-50%. For instance, in Mazowieckie voivodship (with the capital city of Warsaw) in 2007 *deltas* reduce from 15% ("raw") to 11% (RLS) for men and from 25% ("raw") to 14% (RLS) for women. Our further comparison of the two approaches to measuring regional wage disparity, i.e., actual wages vs RLS coefficients, produces an interesting result. For men, regional wage dispersion as measured by AVG|*delta*| decreased by 12.4% (from 9.0% in 1994 to 7.9% in 2007) when using actual wages, but increased by 3.3% (from 5.4% to 5.6%) when using RLS coefficients. The pattern is similar for SD(*delta*): a decrease by 17% (from 10.9% to 9.1%) when using actual wages, but an increase by 4.3% (from 6.3% to 6.6%) when using RLS coefficients. For women, both methods show an increase in regional wage disparity in 2007 as compared to 1994, but the increase is much greater if using the RLS coefficients: 60.2% vs 40.9% for AVG|*delta*| and 70.8% vs 42.6% for SD(*delta*). We conclude that controlling for observed worker heterogeneity does reduce regional wage disparity in

Poland, but wage differentials still exist, albeit smaller. Moreover, not only do these remaining wage differentials persist, but they seem to intensify over time.

Our results are consistent with the studies that have reported regional wage differentials for Poland (see the references in the "Literature Review" section). Generally, the studies found important inter-regional wage differentials with a persistent gap between western and eastern Poland and between Mazowiecki voivodship (with the fast-growing capital city of Warsaw) and the rest of the country. Our analysis reveals that significant wage disparities between the Polish regions remain even after controlling for a number of observed socio-demographic characteristics of workers. What forces cause persistent regional wage disparity in Poland is unclear. To our knowledge, so far no study analyzed the relative contribution of different region-specific factors (such as, amenity, productivity, efficiency wage premiums, agglomeration economies, institutional and regulatory restrictions, *etc*.) to the remaining (*i.e.*, unexplained by the worker characteristics) portion of the regional wage gaps. Some researchers believe that these disparities is a sign of the lack of mechanisms for spatial coordination when growth is not regionally balanced. Growth was (and still is) disproportionately concentrated in a few regions, particularly in Mazowieckie voivodship (with the capital city of Warsaw), which is the richest region in Poland, and in the western regions. This east-west divide, often referred to as Poland A and Poland B, is a result of long-term inherited trends in institutional development, sectoral specializations, and educational attainment (Gorzelak, 2006; Piasecki, 2006). Some researchers argue that the usual mechanisms of regional equalization (such as migration) in Poland are ineffective, and labor-market adjustments typically take place through changes in the labor force participation rather than through wage flexibility (Bogumil, 2009). A closer investigation is definitely needed to uncover the impact of different geographical, political, institutional and regulatory factors on inter-regional wage differentials in Poland.

CONCLUDING COMMENTS

The goal of this paper was to provide some preliminary evidence documenting the existence and evolution of regional wage differentials in a transition economy. Using micro-data drawn from the 1994-2007 Polish Labor Force Surveys, we show that regional wage disparities in Poland are present and persistent. The findings indicate that the wages were higher in the western regions when compared to the eastern regions for both male and female workers. Furthermore, for both genders, the results reveal increasing disparities between Mazowiecki voivodship (with the fast-growing capital city of Warsaw) and the rest of the country. To control for observed heterogeneity of workers, we use the standard Mincerian earnings function and apply the restricted least squares estimation procedure. The results show that a large part of regional pay differentials (30-50 percent) can be attributed to individual observed socio-demographic characteristics of workers; however, the remaining earnings differentials are still noticeable and seem to intensify during the period under examination. Further research will attempt to disentangle the relative contribution of different region-specific factors (such as, amenity, productivity, efficiency wage premiums, agglomeration economies, institutional and regulatory restrictions, *etc*.) to this remaining portion of the regional wage gaps in Poland.

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