



# The wage curve in Slovakia – panel data view of labour market segments

Pavel Gertler  
National Bank of Slovakia

*V článku skúmame vzťah medzi lokálnou mierou nezamestnanosti a úrovňou miezd – vzťah, ktorý sa v odbornej literatúre tiež nazýva mzdová krivka. Použitím panelových odhadov na rozsiahlej databáze mikroúdajov na úrovni podnikov (a závodov) môžeme potvrdiť predchádzajúce zistenia, že v priemere sú mzdy na Slovensku relatívne pružné. Presnejšie, že rast lokálnej miery nezamestnanosti o 1 percentuálny bod je spojený s 0,85 % poklesom v úrovni miezd. Zistené elasticity sa však výrazne líšia medzi sektormi, regiónmi a hlavne medzi kvalifikačnými skupinami zamestnancov. Výsledky odhadov naznačujú, že celkovú pružnosť miezd na slovenskom trhu práce ťahá najmä vysoká pružnosť miezd zamestnancov so zväčša vyššou kvalifikáciou a širšími možnosťami uplatnenia ako inštitucionálne nastavenie trhu práce.*

<sup>1</sup> Blanchflower and Oswald argue for the use of microeconomic data and document the existence of a logarithmic curve linking the level of pay to the unemployment rate in the local area. In their 1994 book, they draw this conclusion from an analysis of 16 nations including the US; in their 2005 publication, they expand their sample to 40 countries from around the world.

## INTRODUCTION

In the contemporary environment of negative demand shocks flexible wage formation it is becoming ever more important component of the real economy. The concept of estimating unemployment elasticity of wages directly responds to the question of the wage formation process. In a world of flexible wages, adverse changes in demand and the consequential rise of the unemployment rate are accommodated by contraction in employee wage bills. Wage flexibility is therefore increasingly important in the absence of an exchange rate channel to support the competitiveness of enterprises.

Wage flexibility is a concept that has usually been researched on nation-wide data, yielding a message about how flexible are wages overall. The aim of this analysis is to construct a micro-database that allows us to identify specific segments of the labour market where wages are rigid to changes in the local rate of unemployment. Identifying these segments and assessing their degree of rigidity allows us to see potential risks and hence facilitates targeted labour market policy-making.

## 1. THEORETICAL BACKGROUND

From the extensive literature, we may distinguish two main approaches to measuring wage flexibility. The first is based on the long-run relationship between the level of wages and the level of local unemployment<sup>1</sup> (this concept, known also as “the wage curve”, was introduced by Blanchflower and Oswald (1990) and has since been challenged by many other authors). The other approach is based on aversion to wage cuts (also called “downward wage rigidity”).

The wage curve approach is the one that we will apply in this study. There is an important di-

vide in the concept of the unemployment/wage relationship. Traditionally, economic theory uses the Phillips curve, which models the trade-off relationship between the variation of wages and the level of unemployment. This is well established in a great number of specifications as a tool for economic policy or for assessing the functioning of the labour market. However, the wage curve departs from the Phillips curve approach by assuming a long-run relationship between the level of wages and the level of local unemployment. Several methods to validate this relationship have been developed (more details in part 3). From the point of view of economic theory, three main approaches to wage formation are usually referred to when rationalising the long-term relationship.

The first is a demand-supply framework where both parties – labour demand and labour supply – have a certain position in the collective bargaining market (Diamond, 1982, Pissarides, 1990). In this stream of theory, an employee's position in the bargaining process is measured by the reservation wage, i.e. the wage level that makes an employee neutral between accepting a wage offer and being unemployed. The level of the reservation wage depends mainly on factors such as utility of leisure, unemployment benefits, and opportunities to obtain another form of income (or access to loans), the scale of accessible illegal employment, and others. The reservation wage will therefore rise during economic upswings and decrease when the rate of unemployment is rising. Since the reservation wage cannot be measured directly, it is in practice derived from flows of labour.

The second approach builds upon the reservation wage. Assuming that the wage level and wage growth affects productivity growth, employers rather pay in excess of the reservation



wage in order to ensure the retention and motivation of key employees (Katz, 1986). This higher pay is often called the aspiration wage, i.e. what an employee assumes to be a fair pay, usually on the basis of his previous wage level. In the so-called "shirking model" of Shapiro and Stiglitz (1984), the aspiration wage serves as a reference value below which the employee will tend to underperform his employment duties.

The third approach is mainly applied to specific groups of employees (usually low-skilled and paid close to the reservation wage) where the standard demand-supply relationship does not apply. Since their chances of getting a well-paid job are worse in comparison with the rest of the workforce, they are also in a weaker bargaining position. (Card and Riddell, 1993).

No matter which approach prevails in a given labour market, the long-run relationship between the level of wages and the rate of unemployment is easily subjected to empirical observation. Based on a number of estimates, Blanchflower and Oswald (1994) claimed to have found an empirical law that the regional rate of unemployment elasticity of wages is around -0.1. The approach has been compromised in the later discussions, result of what has been a clearly drawn line between short-term features of the Phillips curve and long-term interpretation of the wage curve relationship.

However, consensus views appeared, too, suggesting complementary rather than substituting features of the two specifications. Whelan (1997), e.g. argues that taking into account the mark-up price setting mechanism and the way in which expectations are formed, an aggregate Phillips curve may be obtained from a microeconomic specification of the wage curve without making any assumptions about the autoregressive nature of the wage level.

That wage dynamics may play an important role is proven by the different evidence of autoregression in wages in the US and other countries and by some of the limitations in testing for it.

Bearing these issues in mind, we will first test for the nature of autoregression in wages according to the approaches suggested earlier. Since we find this to be far from unity, we then examine the static wage curve according to Baltagi, Blien and Wolf (2008), using the two-step method of Bell et al. (2002).

So far, to our knowledge, there have been three studies that used Slovak data to estimate some form of wage rigidity. The B and O paper (2001) uses microdata for one year (1995) and finds an elasticity of wages of -0,049. Huitfeldt (2001), examining regional data for effects of unemployment and labour market policies on real wages in the Czech Republic and Slovakia in 1992-1998, finds significantly less wage rigidity in Slovakia (elasticity under -0.1) compared to both the previous study and to the Czech Republic. Finally, Babetskii (2006) confirms the elevated level of wage flexibility before 2000 on a basic Phillips curve specification (referring mainly, however, to the fi-

xed exchange rate regime period), while showing evidence of its deterioration thereafter.

The first two of these studies, as well as the vast majority of other papers estimating wage curves for individual economies, present overall estimates of unemployment elasticities of wages as evidence for the wage curve. The variable structure of emerging economies may however reveal many new findings that could put economy-wide estimates into a different perspective. This is because the structure of an emerging economy is often a subject of more frequent and intense changes, usually driven by investments in certain sectors and certain regions. Therefore, any averaging across the economy may lead to distortions. The aim of this paper is therefore to exploit the wage curve approach at a disaggregated level in the estimates in order to examine more closely the relationship between wages and unemployment as it appears in different sectors, regions or types of occupations.

## 2. DATA

We use enterprise-level microdata collected by the Statistical Office of Slovak Republic in three different enterprise surveys<sup>2</sup> and merge them into one concise database with annual data. The database is filtered in three levels: (1) keeping only those observations where the identifier matches the relevant wage observations in two consecutive years, (2) dropping missing entries, illogical entries (e.g. negative value added) etc. and (3) keeping only those firms for which there are at least five consecutive annual observations. This leaves us with the sample of 3498 firms, 70% of which are represented in all observations from 2001 to 2007; in aggregate 22814 annual observations.

We use the concept of a wage bill per hour of work in a company, which is calculated as compensation paid to the employees of a company divided by the number of hours worked. Our extensive database allows us to measure wages as wages paid per physical employee or normative employee (working 40 hours per week). While the results are similar, we stick to the former definition so that we can capture the potential shift towards more flexible employment contracts, especially at the end of the period under review.

The rate of unemployment data are drawn from Labour Office Statistics. We use monthly rates of unemployment per district (NUTS 4 geographical unit) averaged to annual frequency. Since the methodology for reporting the rate of unemployment in Slovakia was changed in 2004, we calculate monthly rates of unemployment before this date based on its current definition (unemployed available for work<sup>3</sup> in a given month as a share of the average labour force for the previous year).

To sum up, analysis is being undertaken on an unbalanced panel of cross-section company-level data over seven annual observations. The database also includes variables and attributes assigned to each company, which are used as a set of individual firm characteristics.

<sup>2</sup> The Annual Questionnaire on Labour (Praca 3-01), the Annual Questionnaire on Business Statistics by Establishments (ROC Zav 1-01) and by Enterprises (ROC 1-01).

<sup>3</sup> The Statistical Office of the Slovak Republic refers to this group as "disposable unemployed" on the English-language version of its website.



- 4 Financial services are usually being reported as the sixth sector in the NACE 6 breakdown, however SOSR reports that we draw our data from do not include financial institutions.
- 5 Regional breakdown *r* corresponds to the NUTS 4 classification, while regional breakdown *R* corresponds to NUTS 3.
- 6 The numbers of companies in a specific year in our sample range from 4535 to 4885. Some estimations were also made with a balanced panel, achieved by retaining in the sample those establishments that reported to the Statistical Office for each year of observation (2439 establishments x 7 years). Since, however, these estimates yield very similar coefficients as the unbalanced dataset, we do not report them.

The segments we are studying are the following:

- Occupational structure based on predominance of certain ISCO classes of employees (white-collar high skilled, white-collar low-skilled and blue collar)
- Economic sectors according to NACE, broken down to 5 main classes (agriculture, industry, business services, construction and government)<sup>4</sup>
- Geographical breakdown according to NUTS 3 (8 regions: Bratislava, Trnava, Trenčín, Nitra, Žilina, Banská Bystrica, Prešov and Košice)
- Time dimension – checking consistency of results in individual years of observation

### 3. TESTING THE VALIDITY OF THE WAGE CURVE HYPOTHESIS AND THE MODEL

We depart from B and O's (1994) standard formulation of the wage curve, which lets the individual wage level be a function of individual characteristics and the regional rate of unemployment. In accordance with the discussion three tests are performed to validate the wage curve approach and to rule out dynamics in wages.

- a) Including lagged nominal wages in Blanchflower and Oswald wage curve formulation yields coefficient with lagged wages at 0.09, which is distant enough from one to rule out a Phillips curve relationship.
- b) Worries about possibly distorted outcomes of the latter test due to presence of both the regional fixed effect and lagged dependent variable or due to eventual serial correlation in the regional market error term we avoid dynamics component by using the Card (1995) test. Wage curve hypothesis however cannot be confirmed by this test as it is impossible to reject neither of the two concepts.
- c) Finally, two-stage testing proposed by Solon et al. (1994) and used e.g. Blanchard and Katz (1997) confirms the validity of the wage curve, lagged wages at 0.27 being distant enough from unity.

Summing up the testing, we were not able to reject the wage curve hypothesis in single case and therefore it was further assumed that the wage curve relationship may be applied for the existing dataset.

### 4. THE MODEL

The rationale behind the model is to estimate the slope coefficients of regional unemployment on the hourly average wage paid in the companies.

We depart from the basic model of one-way error component regression:

$$w_{it} = \alpha + \beta u_{it} + \chi q_{it} + \lambda X_{it} + \mu_R + \varepsilon_{it}$$

where  $w_{it}$  is log of wage level,  $q_{it}$  is log of firms' value added per hour of employees' work,  $u_{it}$  is log of local rate of unemployment,  $\mu_R$  is a regional fixed effect,<sup>5</sup>  $\varepsilon_{it}$  is an idiosyncratic component, and  $X_{it}$  is composed of the following characteristics:

- hrse* number of hours worked by one employee (in logs)
- cafa* share of foreign capital in fixed assets
- flex* ratio of the use of flexible hours (employees count per normalised hours count)
- size* number of employees (in logs)
- blue/whil/whih* dummy for firms with a high proportion of blue-collar / white collar low-skilled / white collar high skilled employees, respectively.

The structure of the panel we work with is unbalanced and largely in favour of a cross-section dimension ( $N \sim 4700$  and  $5 \leq T \leq 7$ ).<sup>6</sup>

Preferred specification is formulated as below

$$(w_{it} - \bar{w}_t) = \alpha + \beta (u_{it} - \bar{u}_t) + \chi (q_{it} - \bar{q}_t) + \lambda X_{it} + \mu_R + \varepsilon_{it}$$

and based on the following arguments:

- Fixed effects model is used after testing by F-test, Hausman test and Breusch-Pagan test to rule out OLS or random effects model,
- Since time trend can not be necessarily perfectly removed by dummies, variables are mean differenced on the both sides of the equation in each observed year,
- All level variables are in logs. The rate of unemployment is also in logs due to high variance across the regions. Thus,  $\beta = 0.1$  (i.e. 10% increase in rate of local unemployment) is associated with an increase from e.g. 5 to 5.5% as well as from 15 to 16.5%.

### RESULTS

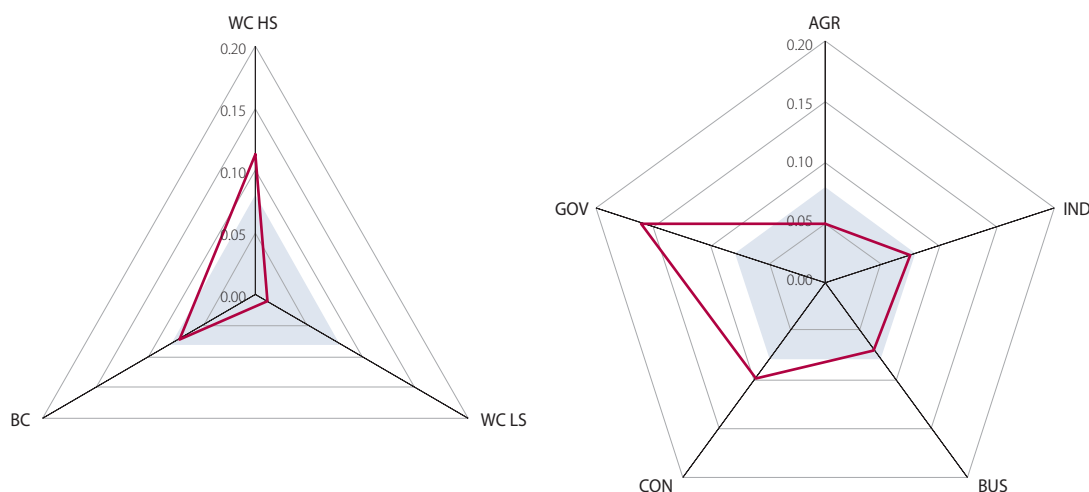
In general, overall estimates of the wage curve confirm the existence of a wage curve in Slovakia. The resulting overall elasticities are close to the golden rule promoted by B and O. The model is quite robust, reflecting also the size of the sample we use.

The wage curve is, however, quite heterogeneous across different market segments. To assess the variability of unemployment elasticity of wages across market segments, we estimate the subsample for each one of them. There is a somewhat higher slope (-0.113) where the only companies accounted for are those employing a high proportion of "white-collar professionals", while the wage curve ceases to exist (at -0.012 and non-significant) where the only companies are those employing a high proportion of "white-collar clerical" employees. The large variation between these subgroups provides prima facie evidence that wages of specific high profile professions are extensively more flexible than wages of the clerical and medium-skilled labour supply. This pattern is also clearly present in nearly all sample subgroups.

Low-skilled clerical, sales and service employees, and to some extent blue-collar workers, are very likely to be destined to work only in the domestic market and are also quite unlikely to migrate to other occupational segments within the



Figure 1 Elasticities in occupational breakdown (left) and sectoral breakdown (right)



Source: Own calculations.

Note: Blue field represents country wide wage flexibility, red line represents actual estimates.

labour market. This could suggest that these groups of employees are more vulnerable and weaker in wage bargaining. As is clear from the results in Figure 1, they do not enjoy the wage increases that unemployment elasticity of wages endows employees in high-skilled occupational segments (since our focus is mainly on the period of economic upturn).

We check the vulnerability assumption by using dummy variables<sup>7</sup> to control for wage cuts and decreases in the local unemployment rate. The results suggest that estimated elasticities remain almost intact, except in the case of clerical, sales and service employees, for which a moderately sloped wage curve is found only in a pseudo-bust environment (i.e. dummies for observed wage cuts).

This finding suggests two things: (1) that the measured wage flexibility is relatively symmetric upwards and downwards and, (2) that high-skilled workers enjoy wage increases in a tightened labour market, but also considerable wage decreases when the labour market conditions loosen. However, this finding must be considered only in respect of the wage measure used in our model, i.e. *de facto* compensation per hour worked.<sup>8</sup>

We also found some differences across the main sectors analysed (agriculture, industry, construction, business services and governmental services). The least flexible wages are reported in agriculture (-0.0495), although with considerable variability between urban and rural regions. In the largest segment of the economy (represented by industry and business services – 69% of the sample) unemployment elasticity of wages is close to the country-wide elasticity.

As regards separate estimates in NUTS 3 regions, the resulting elasticities were by far the most surprising. No wage curve was observed in two regions of central Slovakia (Žilina and Trenčín), and very low elasticities were observed in the other

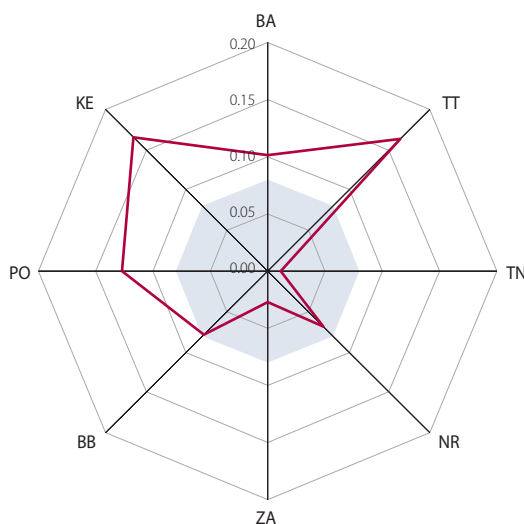
two. By contrast, the far western and far eastern regions in Slovakia are reported with elasticities of over -0.1. This suggests some of the following effects are likely to be in place:

1. Labour mobility (from the southwest to abroad and from east to west and to abroad) exploits regional and cross-border wage differentials, and this in turn affects employers' wage setting (with factors including infrastructure, tradition, educational community formation, or the proximity of wealthier regions across the border).
2. A return to education is starting to appear. Higher elasticities align closely with the presence of major universities in respective regions.
3. A discrepancy between lower-skilled industry job offers in central Slovakia and more services-oriented job offers in the west and east of Slovakia.

7 A new set of variables was defined for cases of negative annual wage change and the corresponding local rate of unemployment increase over the year.

8 Since bonuses constitute a larger share of the compensation of high-skilled employees, the freezing of them is reflected in a more pronounced drop in the company wage bill.

Figure 2 Elasticities in regional breakdown (left)



Source: Own calculations.

Note: Blue field represents country wide wage flexibility, red line represents actual estimates.





Table 1 Preferred specification wage curve coefficients across occupations and regions

	White collar - high	White collar – low	Blue collar
Regions BA,TT,PO and KE	- 0.183 ***	-0.090 ***	-0.086 ***
Regions NR,TN,ZA and BB	- 0.036 *	-0.073 ***	-0.040 **

Source: NBS.

The validity of the above three points is also emphasised when the strong regional patterns are cross-checked with the occupational structure. The regional unemployment flexibility of wages is even higher in firms with a high proportion of high-skilled employees than in the overall sample documented in Table 8. At the same time, there is almost no difference in the wage curve in firms with a high proportion of lower-skilled white-collar (clerical) employees, and only some difference in firms with a high blue-collar workforce.

These results reveal that higher-skilled jobs and higher-productivity activities tend to concentrate in the westernmost and easternmost regions of the country. Opportunities for labour mobility are generally greater for the higher-skilled workforce and therefore the wage curve coefficients found here are more negative. The opposite applies to the mostly rural and mountainous central regions of the country.

## 5. CONCLUSION

We have found clear evidence of the wage curve in the economy-wide enterprise-level microdata. The local rate of unemployment elasticity of wages in the full sample is revealed to be at -0.08 and is relatively stable over time. In other words, an increase in the rate of unemployment by 10% is found to be associated with an average decline in wages by 0.8%. We found this elasticity to be rather symmetric in upturns and in cost-cutting business environments. Based on the extensive empirical literature, we conclude that wages possess a considerable degree of flexibility.

The wage curve is also present in most of the estimated segments of the labour market structure. It showed considerable stability over the history of our sample and also across major sectors, the only exception being agriculture, where the elasticity was revealed to be somewhat lower. We did, however, find more flexible wages associated with firms that have a more high-skilled workforce, which tend to be concentrated in the westernmost and easternmost regions of the country.

At the same time, estimates in multiple segments of the market provide evidence of higher wage flexibility in companies that employ more people on a part-time basis or on fewer hours. However, the effect of company size is not so clear and is often found to be insignificant.

The overall message about relatively flexible wages in Slovakia is broadly in line with previous findings in Gertler and Senaj (2008). However, a closer look at the individual segments based on labour market participants reveals that wage elasticity is quite substantially driven by the high-skilled segment of the labour market. On the other hand some segments have no wage curve or very low unemployment elasticity of wages (e.g. regions where firms with a high proportion of clerical, sales and service employees are more numerous, rural regions with a higher share of agriculture, etc.). Since these are usually also the most vulnerable groups/segments in economic distress, measures taken to make the labour market more flexible should keep this diversity in mind.

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