Center for Social and Economic Research

CASE Reports

Tax Wedge and Skills: Case of Poland in International Perspective

Marek Góra
Artur Radziwiłł
Agnieszka Sowa
Mateusz Walewski

No. 64/2006

Warsaw 2006

Publication financed by the Polish Ministry of Science and Information Technology within the framework of the research project: "Employment of Unskilled Labor Force and Tax Wedge in Poland and in Other OECD and Central and Eastern European Countries." The project was carried out by CASE – Center for Social and Economic Research from November 2004 to February 2006.

Keywords: **tax wedge, labour market, employment, skills, New Member States, Poland**

Graphic Design: Agnieszka Natalia Bury

DTP: CeDeWu Sp. z o.o.

ISBN 978-83-7178-399-9
EAN 9788371783999

Publisher:
CASE – Center for Social and Economic Research
12 Sienkiewicza, 00-010 Warsaw, Poland
tel.: (48 22) 622 66 27, 828 61 33, fax: (48 22) 828 60 69
e-mail: case@case.com.pl
http://www.case.com.pl/

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Marek Góra

Marek Góra is a professor of economics at the Warsaw School of Economics (SGH), where he got his Ph.D. and habilitation. He has been lecturing and conducting research at SGH since 1984. Currently, Marek Góra teaches macroeconomics, pension economics, labour economics, and economic policy for graduate and Ph.D. students. Previously, he also taught econometrics and economic forecasting. During his academic carrier, Marek Góra completed research at the London School of Economics, Erasmus University Rotterdam and Ifo Institute for Economic Research in Munich. Marek Góra is a Research Fellow at the William Davidson Institute, University of Michigan and a Research Fellow at Institute for the Study of Labor (IZA), Bonn. Marek Góra is an author of various articles in the fields of pension economics, labour economics, unemployment, labour market policies. Marek Góra is the co-author of the design of the pension reform called Security through Diversity and the leader of a team of experts who worked on the reform.

Artur Radziwiłł

Artur Radziwill is a Vice President of the CASE – Center for Social and Economic Research. He is professionally interested in monetary integration, public finance and labour markets. He obtained his MA degree in Economics from University of Sussex and Warsaw University (Summa Cum Laude). He also studied at Columbia University and Joint Vienna Institute. He continues his Ph.D. research at University of London. He worked as an adviser to the Prime Minister of Moldova and as an expert for the World Bank, the United Nations Development Programme, International Labour Organisation, German Technical Cooperation (GTZ) and Global Development Network. He participated in many CASE research projects.

Agnieszka Sowa

Agnieszka Sowa is a junior researcher at CASE, holds M.A. in the field of public policy from Warsaw University, Department of Sociology. She continued her education during the scholarship at the Pittsburgh University, Department of Russian and Eastern European Studies, Public Policy course (1998). In 2003 she completed ILO course in social protection financing and health care modeling at the Maastricht University. In 2000 she was a Junior Researcher at evaluation of World Bank EPSP program; since 2001 – a Junior Researcher at CASE. Her experience includes involvement in the analysis of the health care system in Poland after the reform in 1999 and the analysis of the intergenerational poverty dynamics in Poland.

Mateusz Walewski

Mateusz Walewski graduated from the Department of Economics at the University of Sussex in the UK (1997) and at the Warsaw University (MA in 1998), where he participated in an MA programme organised in cooperation wit Columbia University in New York. He works as a researcher at the CASE Foundation since 1997. He is an author of numerous publications and unpublished reports concerning labour market, poverty, inflation, restructuring of the economy and taxation policy but labour market is his main area of interest. He is among authors of the Polish Economic Outlook Quarterly (PEO) responsible for labour market issues. He has participated in several advisory projects for central and local auothorities of Poland. He has worked also as an advisor or a researcher in Georgia, Kosovo, Armenia and Belarus.

1. Introduction

Demographic change (driven by the second demographic transition) led to an uncontrolled increase in scale of various social expenditure in the OECD area, especially in continental Europe. Costs of social transfers created fiscal pressure leading to the necessity of tax increases all over Europe, including the New Member States. Employment consequences of emerging higher tax wedge has become the topic of large body of research. However, surprisingly little evidence is known on distribution of that problem across workers. Is the effect of high tax wedge equally spread or certain groups of workers suffer more than others? More specifically, are low productivity workers exposed more to the problems caused by high tax wedge?

The goal of our research is to investigate empirically the latter question. The empirical hypothesis based on theoretical considerations was that high tax wedge creates especially undesirable effects for the unskilled. In other words, what is bad for the high productivity workers, is very bad for low productivity workers. If it is the case, the commonly used arguments for high public redistribution holds too much smaller extent. On the other hand, the case for progressivity in labour taxation gets stronger. Most importantly, the tax wedge is becoming the issue of urgency in countries abundant in low skilled labour.

The research providing background for this paper was ambitious and modest at the same time. It was ambitious since the problem is complex and important, modest since available data is scant and therefore, the authors could not expect very robust results. Given these limitations, the eventual outcome of the research is probably better than initially anticipated. The remainder of this paper is divided into four sections. The following section presents the basic theory and existing literature. Section three discusses implications for the EU new member states. Section four investigates the problem econometrically in the cross-country perspective. Section five and six provide microeconomic evidence on wage rigidities and incentives for job search, respectively. Section seven concludes.

2. Theory and literature review

Classical economic theory suggests that labour market should have natural tendency to be in equilibrium and high unemployment arises when wages are not flexible enough. Hence, reduced labour demand due to economic slowdown or increased tax wedge can cause sustained unemployment increase only if wage cuts are not large enough. In the subsections below we present the basic theoretical framework as well as existing literature that elaborates on this fundamental principle.

2.1. Theoretical framework

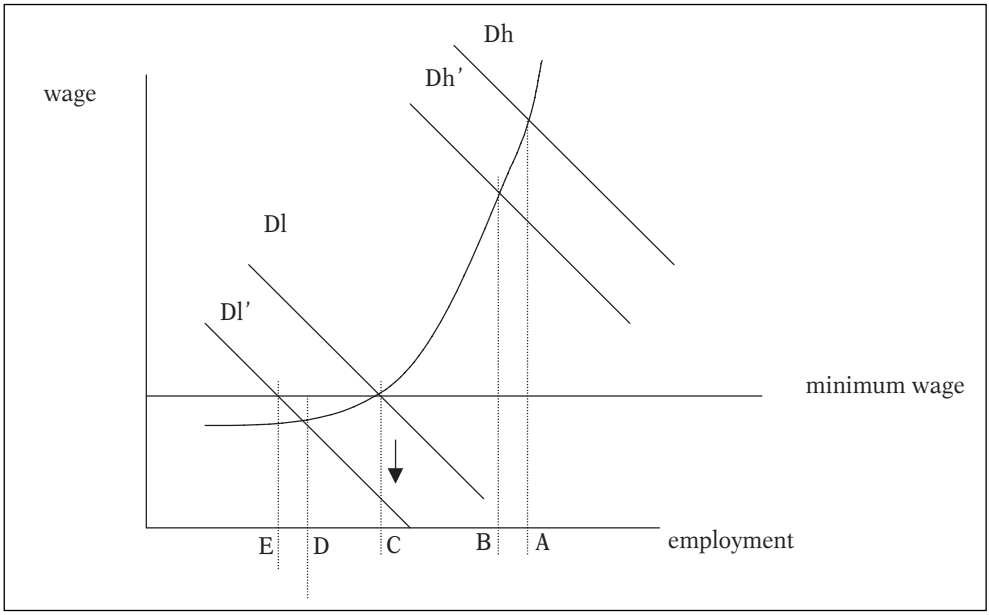
In this section we present a simple theoretical framework that underpins subsequent research. Figure 2.1 illustrates supply and skill-specific demand in the labour market, while the introduction (increase) of the tax wedge is represented by a downward shift in labour demand curve[1].

This very simple graph gives us one basic message about the relationship between tax wedge and employment: the more elastic is the labour supply curve (and/or demand curve) the more harmful is tax wedge for the labour market outcome. In case of vertical labour supply curve (labour demand curve) increase of tax wedge is fully accommodated by decrease in net wage (increase in total labour cost) without any employment consequences meaning that workers (or employers) accept to take the entire financial burden. In case of horizontal labour supply workers are not in position or are unable to accept any net wage decrease – tax incidence is fully on employers and they reduce employment accordingly unless their respective demand curve is vertical and they accept the rise of labour costs without reducing employment.

Most theoretical and empirical analyses concerning the influence of the tax wedge on employment can be summarised as an attempt to discover various microeconomic

[1] In general only payroll tax changes should be represented by shifts in labour demand curve. Income tax changes should be represented by shift of labour supply. In this simple framework however (with the exception of perfectly elastic labour supply curve) results of these two shifts are equivalent. Similar analyses can be found in OECD (2003b), Bell et. al. (2002) and in other sources.

Figure 2.1. The labour market and a tax wedge



- Dh – demand for skilled labour
- Dh' – demand for skilled labour after tax wedge
- Dl – demand for unskilled labour
- Dl' – demand for unskilled labour after tax wedge
- AB – employment reduction among skilled workers due to tax wedge
- CD – employment reduction among unskilled workers due to tax wedge without minimum wage
- CE – employment reduction among unskilled workers due to tax wedge with minimum wage

and macroeconomic factors influencing relative and absolute shapes of labour demand and supply curves and search for their effective shape in various countries and situations.

2.2. Microeconomic evidence

Simple analysis on Figure 2.1 seems to suggest that in case of standard convex aggregate labour supply (and demand) curves high tax wedge can have large impact on the unemployment rate mainly in those labour market segments where wages are relatively lower. Therefore since one of the main factors explaining real wage differentials between individuals is the skill level, one can argue that disemployment effect of the tax wedge should be especially severe for low-skilled workers. The latest research (OECD 2003a, b, European Commission 2003a) confirm such insight.

According to numerous empirical results cited in OECD (2003a) countries introducing special payroll tax reductions for low-wage earners such as Belgium,

Netherlands and France have managed to increase their respective employment considerably. These empirical results do also have their theoretical underpinning. As argued by Koskela (2001) in a bargaining framework *"...the tax-revenue neutral rise in labour tax progression – either in terms of Income Tax rate or in terms of payroll tax rate – will moderate negotiated wages, decrease the outside option for workers and thereby lead to lower equilibrium unemployment"*. Although it is not mentioned by author tax progression may also be treated as an implicit tax subsidy for low wage (ie. low-skilled) workers.

Also Kugler&Kugler (2003) in their study devoted to Columbia explained high employment effect of payroll tax increase over 1980-1990 period by relatively high number of low-skilled workers in this country. Their empirical result of higher employment effect among blue-collar workers than among white-collar workers additionally strengthened their reasoning.

Elasticity of labour supply may be increased by existence of any kind of wage-floor, be it statutory minimum wage or any kind of reservation wage driven either by existence of alternative work income sources (shadow economy) or non-employment benefits. If such a wage floor is commonly recognised and binding labour supply curve becomes horizontal. In the simple framework from Figure 2.1 it leads to maximum negative employment effect of a tax wedge.

Existence of binding minimum wage seems to be the strongest case in this respect and it has been widely acknowledged by researchers. As Kugler&Kugler (2003) admit *"in this case there is excess supply of labour and involuntary unemployment (....) the payroll tax always reduces unemployment since payroll taxes can not be fully shifted to workers as lower wages"*. It is also worth noting that minimum wage case corresponds to the skills-elasticity relationship since minimum wage regulations apply mainly to low-skilled workers. Influence of minimum wage regulation on tax-employment relationship has also been underlined by Nickell (2003), OECD (2003) and also Gruber (1997).

It seems also that in the minimum wage case one should differ between Payroll Tax and Income Tax. Payroll Tax is normally paid by employers, hence, assuming that statutory tax payer also bears the economic costs of rise in payroll tax always results in downward shift in labour demand curve leading to negative employment consequences. On the other hand an increase in Income Tax (in the framework from Figure 2.1) can be represented as the move of the wage floor downwards and extending the part of labour supply curve with positive slope. In this case we have both net wage and employment effect but there is no involuntary unemployment.

Existence of any kind of non-employment financial assistance (for example unemployment benefits) is the next factor that can decide about higher effective elasticity of labour supply and hence higher tax-employment elasticity.

It does not matter whether one assumes like Goerke (1999) that labour supply is an increasing function of the net wage and decreasing function of alternative income or like Koskela (2001) and Nickell (2003) that labour supply is simply a function of a difference between wage and alternative income. In both cases the increase in payroll tax leads to employment reduction and the higher is the replacement rate the bigger is the negative employment effect.

The situation differs as pointed by Gruber (1997) if payroll taxes are solely financing pensions and workers fully recognise that and in effect treat payroll taxes as their own savings. In this (rather theoretical) case payroll tax increase is "fully valued", (Gruber 1997) by workers and can be entirely "shifted backwards" (Muysken et.al 1999) on them in the form of lower wages. In this case effective labour supply curve is vertical and there is not any negative employment effect. As suggested by Kugler&Kugler (2003) the positive linkage between payroll taxes and other non-employment benefits can have similar results.

The employment effect of Income Tax depends on the relative taxation of work income and alternative income. In case where labour supply is only the function of difference between work and alternative income Koskela (2001) points out that: *"if their tax rates are the same then the marginal Income Tax rate will have no effect on wage formation because the Income Tax does not affect the difference between the after-tax wage and the after-tax unemployment income"*. In the simple framework from Figure 2.1 it means that on vertical axis one replaces wage with a difference between wage and alternative income and both are taxed with the same rates. The increase of Income Tax does not move either of curves – there is no change at all. On the other hand however, if non-employment benefits are tax free or taxed according to lower rates the increase in tax rates on wages leads to downward shift of labour demand curve (as perceived by employees) and lowers employment accordingly.

Even from the discussion above it seems clear that negative employment effect of the tax wedge differs depending on which side of the market is being taxed. Even in a simple competitive framework from Figure 2.1 introduction of non-taxed alternative income and/or wage floor results in a break of the Dalton's law[2]. This observation has been also made by Nickell (2003): *"In these [competitive] models...[...]. Since not-labour*

[2] Dalton's law states that the economic effect of the tax does not depend on which side of the market is being taxed.

income is typically not taxed with payroll taxes, then the impact of the payroll tax on work may differ from that of the Income Tax or consumption tax rate. [...]. Second , suppose there is a wage floor, because of minimum wage laws, for example. Then, for those at or near the wage floor, a switch from Income Taxes to payroll taxes will reduce employment."

It means that employment can be boosted not only by lowering the total tax wedge but also by simply changing the tax wedge structure. There exists a bunch of theoretical economic literature proving this proposition for various theoretical structures of the labour market, including these talking into account minimum wages and/or alternative incomes.

For example Muysken et.al (1999) constructed a simple bargaining model in which employers set employment level after the wage bargain has taken place and there exist a threat point represented by a minimum share of net wages in national income trade unions are willing to accept. In this simple (and reasonable) framework even without statutory minimum wages and alternative incomes the employment effect for Income Tax is lower than for payroll tax. Therefore simply shifting of tax wedge from employers to employees may result in employment creation. They back their theoretical result by an empirical exercise. They estimated the wage equation for Netherlands for period 1962-1993 and they concluded that only 44% of Income Tax is shifted forward by employees to employers in a form of higher gross wages. On the other hand employers are not able to shift their tax burden backwards to employees in a form of lower wages. It means that shift of tax burden from employers to employees may result in lower total wage costs and may result in employment increase – as in their theoretical case.

On the other hand Goerke (1999) analyses two labour market models: competitive one and efficiency wage one and introduces an alternative non-labour income. He proves that in both cases if labour supply is an increasing function of net wage and decreasing function of net alternative income and work effort (in case of efficiency wage model) is a decreasing function of net alternative income rise in Income Tax and reduction of payroll tax holding tax wedge constant will boost employment and/or reduce unemployment rate.

The empirical microeconomic literature on payroll tax and employment relationship has been summarised in Nickell&Layard (1999) According to them there exist a small and rather fragile evidence about long-run effects of payroll tax changes on employment. The main empirical problem is that it is very difficult to isolate long run effect of (rather seldom and small) changes in payroll taxes on wages and employment since there are numerous other factors influencing the labour market situation in the long run, (Bell et.al. 2002).

This problem can be avoided in case of deep and rapid reforms of payroll tax systems creating the "natural experiment" environment for empirical research. Such reforms have taken place among others in Chile in the beginning of 80-ties when payroll tax burden on firms fell by 25% over a relatively short period of 6 years. National Income Contributions reform in Great Britain that took place in 1999 is the next example. The interesting feature of this reform was that it has not resulted in unilateral decrease or increase of burden for all employees. The burden decreased for low-income earners and increased for those with high wages. The next example is a reform in Columbia. It was much more spread in time than two previous ones but as the only one resulted in unilateral increase of payroll tax burden for all employees. It grew from about average of 40% in 1980 to about 55% in 1996 as a result of series of smaller consecutive increases. These reforms and their results have been analysed by Gruber (1997) – Chilean one, Bell et. al (2002) – British and Kugler&Kugler (2003) – Columbian one.

All studies used similar methodology estimating the results of reforms on panel of enterprises and exploiting the fact that depending on characteristics of wage distribution the changes of effective tax rates differed across branches and/or companies. Taking into account the general similarity of methodologies adopted large differences in resulting conclusions are quite striking. Gruber (1997) estimated that decrease of payroll taxation has been fully shifted to higher wages with no effect on employment. Bell et.al. (2002) also concluded that payroll tax reform has not had any significant impact on employment and only real wages changed accordingly. However, average working hours in industries where effective rates increased have declined. Kugler&Kugler (2003) estimated that 10% increase of payroll taxes in Columbia resulted in 1.4%-2.3% decrease in wages and 4% to 5% reduction in employment, so opposite to two previous cases there was some employment effect and it was rather considerable one.

Gruber (1997) suggested that his result could be related to highly inflationary environment in Chile during the analysed period. He also pointed out that wages could be much more elastic upwards than downwards. But in general he treaded the results as robust and convincing.

Bell et.al (2002) underlined that their result could have been different if the impact of the reform had not been neutral for the aggregate wage bill. Possible, not mentioned by the authors, explanation for their result could also be related to the distributional features of analysed tax change. Taking into account the simple framework from Figure 2.1 any payroll tax change would have much larger employment effects for low wage earners. In case of British reform analysed the tax wedge for this specific group

decreased and it may have lead to wage increase instead of employment creation as wages are suspected to be more rigid downwards than upwards. On the other hand high wage earners could easily react to the payroll tax increases both accepting lower wages and also reducing their individual work effort.

Kugler&Kugler (2003) explain their result by relatively high and binding minimum wage in Columbia which could result in rather elastic effective labour supply. Their result was additionally reinforced by the fact that employment reaction for payroll tax increases was much higher among low-wage production workers than among high-wage non-production workers.

Results of these natural experiments suggest that overall tax-employment elasticity may depend on local circumstances and on the direction of the tax wedge change. It does seem to be related with characteristics of wage rigidity. Wages are supposed do be much more rigid downwards than upwards. They are also supposed to be much more rigid for blue-collar (low-income) than for white collar (high-income) workers and is does seem consistent with simple framework from Figure 2.1.

2.3. Macroeconomic evidence

Most of considerable number of macroeconomic empirical studies on tax wedge – employment relationship make use of some kind international panel dataset from (mainly) OECD countries. They estimate a reduced form model with employment /unemployment measure as dependent variable and with various measures of tax wedge and set of control variables such as macroeconomic performance and institutional features of labour markets on the right hand side of the equation. Results of these studies are comprehensively summarised in De Haan (2003) and Nickell (2003). In general one can classify these studies depending on definition and measure of the tax wedge used, set of control variable used and geographical range and time horizon. Most of studies produce however quite similar results indicating negative relationship between tax wedge and employment. According to the Nickell's summary paper the increase of the tax wedge between 60-ties and 90-ties explains considerable (1/4) part of the total employment rate difference between Germany, Italy and France on the one side and USA on the other.

The exact magnitude of this relationship seems to depend mainly on institutional features of the individual labour markets: regulations concerning minimum wages and unemployment (non-employment) benefits, tax incidence share between employer and

employee, average skill level of the labour force, downwards real wage rigidity and prevailing structure of wage bargaining.

Taking into account the studies reviewed one can see that this is mainly the last of these factors, ie. concentration of wage bargaining and wage rigidity that proved to decide about tax-employment relationship. This factor plays decisive role for tax-employment relationship in recently most frequently cited studies of that kind Alesina&Perotti (1997) and Daveri&Tabellini(2001). On the other hand in the cross-regional Italian study by Brunello et.al (2003) found some form of real wage rigidity as factor deciding about much higher tax-unemployment relationship in northern regions of Italy than in southern ones.

Alesina&Perotti (1997) in their study first theoretically prove and then empirically test on the sample of 14 OECD countries their two main propositions: *"an increase in redistribution (...) financed by an increase in the labour tax rate leads to an increase in the unit labour costs (ie. deterioration in competitiveness)"* and *"in highly centralised labour markets with economy wide negotiations, the degree of shifting of labour taxation [to unit labour costs] is smaller than in countries with industry level negotiations",* the relationship is hump-shaped. For their theoretical proof they use a model of monopolistically competitive economy with unionised labour markets where bargaining centralisation is defined as an inverse of number of trade unions. Competitiveness is defined as unit labour costs in home country relative to competitors and total taxes are divided to employees part (Income Tax) and employers part (payroll tax). In their empirical part they estimate the model with unit labour costs in manufacturing as dependent variable and with shares of labour taxes in GDP combined with level of bargaining centralisation plus set of control variables on the right hand side of the equation. The classification of bargaining centralisation has been taken from Calmfors and Driffil (1988).

On the other hand Daveri&Tabellini (2001) adopted the general equilibrium framework in order to analyse the relationship between taxes, employment and growth in OECD countries. They estimate their equations on the panel data-set of 14 OECD and countries are divided according to the level of centralisation of wage-bargaining. They use tax ratios (ie. effective tax rates) as measures of labour tax burden. Their results are qualitatively similar to those of Alesina&Perrotti (1997) but additionally they discovered negative relationship between labour taxes and growth. They also suggest that tax reform aiming at revenue neutral shift of taxation from labour to consumption could lead to serious employment creation, especially in countries of continental Europe.

In their interesting study Brunello et.al (2003) instead of using cross-country data adopted regional data from Italy in order to analyse the factors deciding about tax-employment relationship. Their choice gave them the opportunity to automatically exclude the institutional factor, since labour market institutions are the same within a country. They concluded that in Northern regions of Italy wages reacted much more rapidly to changes in taxation than in Southern ones, resulting in higher labour cost increase and employment decrease in the north. It results from much stronger position of local bargaining there leading to "wage drift" – and one could describe it also as higher real net wage rigidity.

In general it seems that high tax-employment elasticity is a result of high monopolistic power of trade unions which in case of average level of bargaining centralisation do not internalise the social costs of high wages negotiated by them. This is exactly the same mechanism that decides about real wage rigidity according to Calmfors&Driffil (1988). And high real wage rigidity can be simplified to a highly elastic aggregate labour supply curve (or labour demand curve) in a simple framework from Figure 2.1.

2.4. Conclusions: factors affecting tax wedge impact on employment

The literature reviewed in this section lets one to identify several factors (besides the size of the wedge as such) that can influence the size of tax – employment elasticity:

- skills of the labour force – the lower are the skills the higher is the probability that high tax wedge will result in unemployment or inactivity,
- reservation wage – the higher is the reservation wage driven by minimum wages and/or other income opportunities the bigger share of potential low-wage earners will not be employed,
- relations between taxes and benefits and taxing of non-employment benefits – if benefits are not taxed the influence of income tax on employment is strong,
- effective tax incidence partition between employer and employee – payroll taxes (paid by employers) are suspected to have much stronger negative effect on employment,
- wage formation structure and especially competitiveness level, relative strength of parties and level of bargain centralisation – the relationship here is hump-shaped, when trade unions are strong and wage bargain is not centralised the negative effect of tax wedge in employment is high, if negotiations are strongly decentralised of strongly centralised the effect tends to be smaller,

- tax progression – tax progressivity tends to limit negative employment effect of high average income tax,
- direction of change – the negative employment effect of tax wedge increase can be much stronger than positive employment effect of a decrease since wages tend to be much more flexible upwards than downwards.

3. Determinants of tax wedge impact in EU new member states

The previous section identified main factors deciding about the existence and magnitude of the negative tax wedge impact on employment. In this section we will discuss to what extent tax wedges can become a problem in EU new member states.

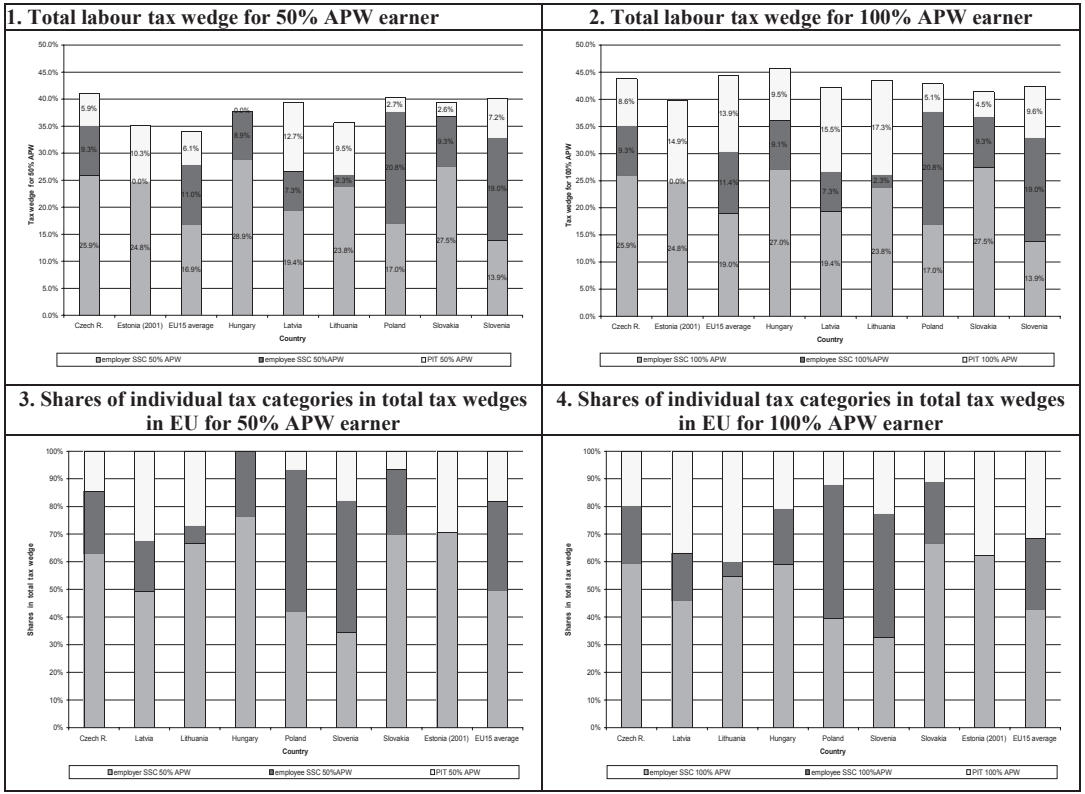
3.1. Size of tax wedge

We start with the size and the structure of the tax wedge as such. Chart 3.1 in upper panels presents the total implicit effective tax wedges (total taxes to labour costs) in NMS countries (excluding Estonia) portioned to individual rates of Social Security Contributions (SSC) paid employees and employers and Income Tax rates. In lower panels the shares of individual tax categories in the total tax wedge are presented.

The share of Income Tax in total tax wedge increases with incomes in all countries but in all cases it is significantly lower than ½ up to average income level. For 50% of APW (close to minimum wage in most of countries) it is significantly lower than 20% in most of countries. For APW earners Income Tax share in total tax wedge reaches 40% in Estonia, Latvia and Lithuania, but it is still close to 10% in Poland and Slovakia.

The progressive nature of effective Income Tax rates in all countries decides about the total tax rate progessivity. On the other hand however the total effective tax wedge in all NMS countries is much (with exception of Lithuania) less progressive than EU15 average (see upper panel of Chart 3.1), at least up to the average income level. The average tax rate for 50% APW earner in NMS countries is 50,1% , whereas in EU15 it is on average almost 10 percentage points lower – 40,1%. On the other hand total average effective tax rate for APW earners in EU15 is only slightly lower than in NMS – 54,7% to 55,2%. It means that relative tax burden for low wage earners is much higher in NMS than in EU15. It is the potentially harmful feature of NMS tax systems since the negative employment

Chart 3.1. Total labour tax rates and shares of individual tax categories in the total tax wedge for 50% APW3 earners and 100% APW earners in NMS countries in 2003 (in 2001 for Estonia)



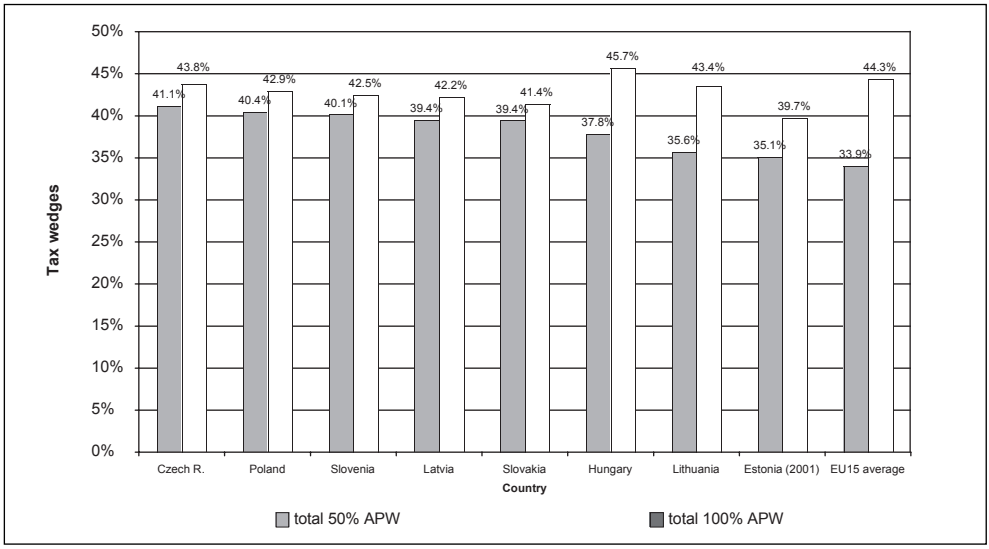
Source: Authors calculations based in EUROSTAT data. APW - Average Production Wage is the average wage in themanufacturing sector . The category is used by OECD and EUROSTAT to measure the central wage tendency and all the data concerning the labour taxes relate to this category. Normally it is slightly above the average wage for total economy.

consequences of tax wedge are theoretically much higher for low-wage than for high-wage earners.

The employers part of Social Security Contribution (SSC) (payroll tax) is the biggest part of the total tax wedge. For 50% APW earners the employer part of SSC constitutes more than 60% of the total tax wedge and it is close to 50% in Latvia. Only in two countries: Poland and Slovenia the employee's share of SSC is higher than employer's part. Since in most of countries the effective rates of Income Tax are progressive and effective rates of SSC are flat the role of the latter in total tax wedge naturally decreases with incomes. Large share of employer's SSC (payroll tax) in total tax wedge in most of NMS countries is the next possibly harmful feature of their labour tax systems taking into account the theoretical results indicating for much higher disemployment effect of payroll tax in comparison to Income Tax.

Tax wedge for 50% APW earners in all NMS countries in higher than in EU15 and ranges from 35,1% to almost 43,8% (see Chart 3.2). The highest tax wedge for low-wage earners is observed in Czech Republic and Poland, the lowest in Estonia and Lithuania. Tax wedge for average-wage (100% APW) earners rises in all NMS countries, the increase rate differs however significantly among individual countries. Here the highest tax wedge is observed in Hungary (on of the countries with the lowest tax wedge for low-income workers). Tax wedge increases also significantly with incomes in Lithuania. In all NMS countries however tax wedge progressivity is lower than EU15

Chart 3.2. Tax wedges for a 50% APW earner and for 100% APW earner in NMS in 2003



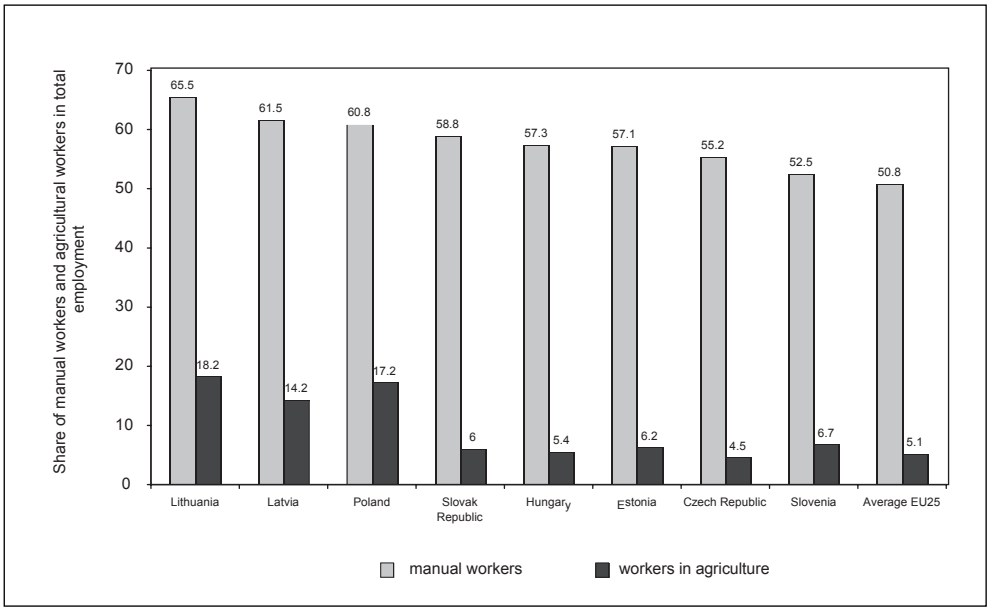
Source: Authors calculations based on EUROSTAT earnings structure data.

and consequently Hungary is the only of NMS countries where tax wedge for average-wage earners is higher than EU15 average.

3.2. Skill composition

On average the skill composition in NMS countries does not differ significantly from the rest of Europe, it may however constitute additional factor strengthening possible labour tax – employment relationship in these countries. Average share of manual workers (ie. those with presumably lower wages and higher tax-employment elasticity) in total employment in NMS is higher than EU25 average, similarly as share of agricultural employment, (for details se European Commission 2004). We consider agricultural employment as an important indicators of poor skills of labour force since agricultural workers tend to be much less skilled than manual industry workers (also as far as the years of schooling is concerned) and their skills are specific and of limited applicability for other jobs. Three of NMS countries seem to have especially disadvantageous employment structure from this point of view (see Chart 3.3). These are Lithuania, Latvia and Poland. In all of that countries the share of manual workers

Chart 3.3. The share of manual workers and agricultural employment in total employment in NMS countries and EU25 average



Source: Authors calculation based on data from Employment in Europe 2004 (European Commission 2004b).

in total exceeds 60% and average for EU25 is less than 51%. The share of agricultural employment in these three countries (respectively 18,2% in Lithuania, 14,2% in Latvia and 17,2% in Poland) is also much higher than in other European countries, including the rest of NMS group (EU25 average is 5,1%).

3.3. Minimum wage and unemployment benefits

In all NMS countries minimum wage is set by national legal regulation and it constitutes about 35% of APW in Czech Republic and Poland and it is close to 50% of APW in the rest of NMS countries (according to EUROSTAT data from 2003). It is not high taking into account European standards where minimum wages vary from 32% in Spain to 60% in France, (European Commission 2003a). However minimum wage applies mainly to low-skilled workers, the larger share of those in total labour force the higher is the possibility that minimum wage is really binding. According to European Commission (2003a) minimum wage affects about 13% of workers in France – and it is the country with highest relative minimum wage in Europe close to 60% of the median – in Poland this share is estimated to 12-15% (CASE 2004), although the relation of minimum to average wage in Poland is much lower than in France. It seems that the restraining role of minimum wage in NMS countries may be much stronger than in EU15 due to worse skill composition.

According to Vodopivec et.al (2003) unemployment benefits systems in countries of Central and Eastern Europe in general including NMS are not very generous. At the end of 90-ties the average generosity index measuring combination of benefits replacement rates and benefits duration in a group of CEEC countries was 11.3 comparing to 26.3 for the group of OCED countries.[3] Replacement rates varied from very low 9% to high 37% in Slovenia with the rest of around 20%-25%. The ratio of unemployed eligible was the lowest in Poland (24%)[4] and the highest in Hungary 100%, (43% in Czech Republic, 31% in Estonia, 33% in Slovakia and 61% in Slovenia). It seems that generosity of unemployment benefit systems in NMS countries should not constitute an important factor of tax – employment relationship.

[3] The group of CEEC countries comprised of: Czech Republic, Hungary, Poland, Slovakia, Slovenia, Estonia and Bulgaria, the OECD groups comprised of Belgium, Denmark, France, Germany, Greece, Ireland, Netherlands, Portugal, Spain, UK and US.

[4] Currently (2005) in Poland it is even lower – around 15%.

3.4. Wage bargaining

Centralised forms of wage negotiations are dominating in most of NMS countries (European Commission 2002), European Commission 2003b). This stems mainly from relative underdevelopment of social dialog partner's organisations. Employers' organisations are especially week in almost all countries. Central social dialogue institutions (such as Tripartite Commission for example in case of Poland) seem to be well developed in all related countries. Bi-partite dialog on branch, regional or other multi-company level has been assessed as week in all countries with exception of Slovenia. The results of central negotiations are more of informative and indicative then obligatory character. Often they apply only to large (often state owned) companies and to state administration and other public sector employees. The rest of negotiations is taking place mainly on companies' level. It seems therefore that in most of NMS countries the mixture of centralised wage bargaining (mainly for state-owned sector) and decentralised bargaining takes place. Taking into account the Calmfors-Driffil relationship this mixture should be perceived positively from the point of view of wage rigidities and tax-employment elasticity. On the other hand however one has to remember however about the dominance of the employees' side over employers' in negotiations of any level in NMS countries and also about the strong political role employees' organisation possess. It stems from their strong positions in big post-communists enterprises or even branches which has to be restructured and thus far characterised (at least in case of Poland) by most rigid wages in economy. This political strength is especially important when we take into account the relative significance of centralised-tripartite consultations in these countries.

3.5. Conclusions: potential risk of negative interactions between skills and taxes

Tax wedge in NMS countries is not high taking into account European Standards although it is much higher than in some successful EU and OECD member sates such as UK, US, Ireland, Canada or Australia. Neither the wage bargaining system nor unemployment benefit systems in NMS are not expected to negatively influence the tax-employment relationship in NMS. It seems that skills composition in NMS member states could decide about the higher impact of taxes on employment, especially in the presence of restraining role of the minimum wage.

4. Cross-country evidence

Section 2 of this report showed that most of macroeconomic empirical research on aggregate impact of tax wedge largely ignored or neglected the of effect skill composition on the strength of relationship between tax wedge and employment[5]. The existing literature is also heavily dependent on the data from the 'old' OECD countries. Both characteristics imply a major weakness from the point of view of policy-making in EU New Member States.

To correct for these weaknesses, we are going to extend existing research in three directions. First we reformulate one particularly well known piece of research by Daveri and Tabellini (2000) to explicitly account for the role of skill composition in explaining unemployment rates in last decades of twentieth century. Secondly, we estimate the impact on tax wedge on employment rates among low and high-skilled using more recent international panel dataset from OECD countries. Thirdly, we compare employment growth dynamics between EU new member states and 'old OECD'. By including data for Central and Eastern European countries, we bring new general insights. Our hypothesis is that in the CEE countries, the tax wedge should play more prominent role than detected in existing studies due to the higher share of unskilled in the labour force. Confirmation of this hypothesis will constitute additional evidence for special impact of tax wedge on unskilled labour.

4.1. Daveri and Tabellini (2000) with skill composition effect

Daveri and Tabellini (2000) in their influential paper provided very convincing evidence about strong impact of labour tax wedge on unemployment. The authors show that a percentage point rise in tax wedge results in more than half percentage point employment reduction. This central finding is based on the panel data-set of 14 OECD countries divided according to the level of centralisation of wage-bargaining. We reproduce their original result in Table 4.1. The split in the sample is essential for

[5] Compare section 2 for the comprehensive literature review.

obtaining results as according to the theoretical model proposed by Daveri and Tabelliini in the spirit of Calmfors and Driffill (1988) and Alesina and Perotti (1997), impact of labour taxes on unemployment is much stronger in countries with continental type of wage bargaining due to high pass-through from tax to total labour costs and hence employment. The pass-through is weaker in countries with decentralised wage bargaining characterizing Anglosaxon OECD members and negligible among Nordic countries with highly coordinated bargaining.

Table 4.1. Impact of labour tax on unemployment rate (Daveri and Tabellini, 2000)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Continental x Labour Tax	0.582694	0.056918	10.23745	0.0000
Anglo-Saxon x Labour Tax	0.263578	0.108410	2.431322	0.0173
Nordic x Labour Tax	-0.072650	0.126288	-0.575270	0.5667
Benefit	0.089825	0.048197	1.863683	0.0660
Fixed Effects				
R-squared	0.855528	Mean dependent var		5.333190
Adjusted R-squared	0.808297	S.D. dependent var		3.652721
S.E. of regression	1.599304	Sum squared resid		133.0042
F-statistic	102.6439	Durbin-Watson stat		1.990610

Comment: 14 OECD countries, 5 year period averages 1965-1991, 70 observations.
Source: Own estimation based on database used in the original Daveri and Tabellini (2000) estimation.

In line with the goal of our research, we reformulate the original research question by asking whether the skill composition of labour force can also contribute to explaining the differences in the strengths of labour tax impact on unemployment. Following the approach adopted by Daveri and Tabellini (in their output growth equation), we proxy skills by share of population aged 14-18 enrolled in gross secondary education and divide analyzed countries into three groups according to this criterion. Our results are presented in table 4.2. Impact of labour tax on unemployment

Table 4.2. Impact of schooling on unemployment rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Low Schooling x Labour Tax	0.647849	0.085242	7.600141	0.0000
Medium Schooling x Labour Tax	0.446951	0.080661	5.541080	0.0000
High Schooling x Labour Tax	0.190014	0.124844	1.522010	0.1319
Benefit	0.006136	0.048117	0.127522	0.8988
Fixed Effects				
R-squared	0.797597	Mean dependent var		5.333190
Adjusted R-squared	0.731427	S.D. dependent var		3.652721
S.E. of regression	1.892987	Sum squared resid		186.3369
F-statistic	68.30444	Durbin-Watson stat		1.585459

Comment: 14 OECD countries, 5 year period averages 1965-1991, 70 observations
Source: Own estimation based on database used in the original Daveri and Tabellini (2000) estimation.

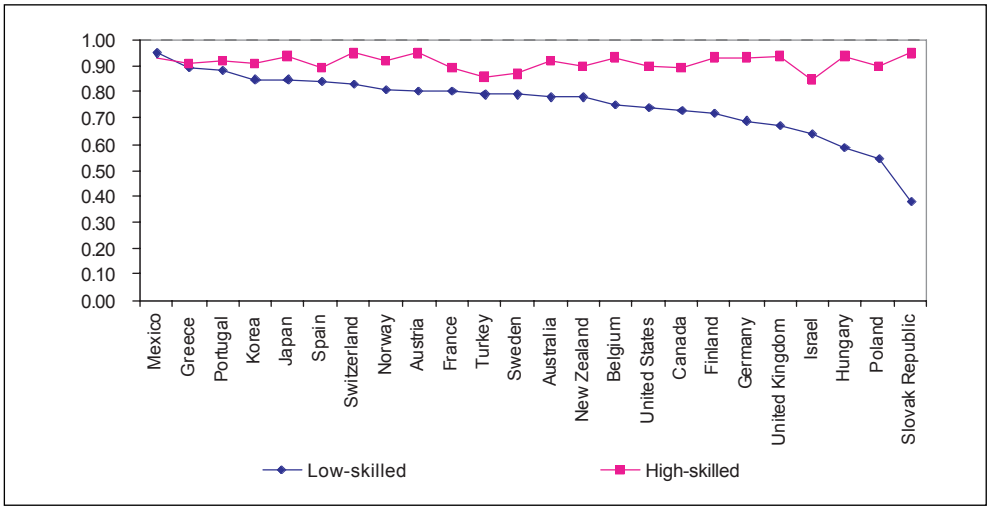
is significant and strong in countries will low education attainment, while labour tax does not seem to have an impact on unemployment in countries with high education attainment. Notably, the order of magnitude of maximum impact of labour tax on unemployment rate is similar as in the original estimation by Daveri and Tabellini.

4.2. Tax wedges and employment rates by skill levels

In this subsection, we attempt to test hypothesis about importance of interactions between skills and tax wedge further in more direct way and using more recent dataset. Namely, we test whether tax wedge affects employment rates of low-skilled in significantly stronger way than of those more skilled. This is likely as cross-country variations in employment rates is much higher among of low-skilled as compared to high-skilled as illustrated in Chart 4.1. To separate the impact of skills from other factors determining aggregate employment rates (like labour market situation of women, youth and old-aged individuals), we restrict our analysis to prime age males only. In this approach skill level is proxied by education attainment with low-skilled having at most lower-secondary and high skilled – at least first stage tertiary education.

In order to test for our hypothesis econometrically, we estimate two separate equations – one focusing on low-skilled and second focusing on high-skilled

Chart 4.1. Employment rates (male 25-54, 2003), OECD countries



Sources: OECD, Labour Market Statistics – DATALFS, www1.oecd.org/scripts/cde.

individuals. We use both cross section and time series aspect of the data as we investigate observations from two most distinct years for which data are available for wider set of countries, i.e. 1997 and 2003. We control for relative supply of low and high skilled labour, while aggregate employment rate, that includes large share of labour with intermediate set of skills, is a proxy for overall labour market situation as well as its institutional setup. What we find out is that the impact of tax wedge on employment rates of low-skilled is very strong while employment rates of high-skilled does not seem to be affected at all (compare tables 4.3 and 4.4). As a result much of differences among employment rates between two groups seem to be explained by different impact of tax wedge with all other coefficients roughly similar across both equations.

Table 4.3. High-skilled male 25-54 employment rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.719415	0.096264	7.473376	0.0000
Relative supply of high- and low-skilled	0.012381	0.004872	2.541137	0.0159
Tax wedge	-0.017818	0.063893	-0.278868	0.7821
Aggregate employment rate	0.220255	0.098359	2.239291	0.0320
R-squared	0.279678	Mean dependent var		0.920811
Adjusted R-squared	0.214194	S.D. dependent var		0.032692
Durbin-Watson stat	2.252028	Prob(F-statistic)		0.011816

Comment: panel 27 selected OECD and EU countries, 1997 and 2003.
Source: Own estimations based on employment data from OECD, Labour Market Statistics – DATALFS, www1.oecd.org/scripts/cde and tax wedge on labour costs from Eurostat.

Table 4.4. Low-skilled male 25-54 employment rate

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	0.687450	0.323271	2.126545	0.0410
Relative supply of low- and high-skilled	0.017518	0.009241	1.895692	0.0668
Tax wedge	-0.532282	0.210322	-2.530796	0.0163
Aggregate employment rate	0.275457	0.346463	0.795055	0.4323
R-squared	0.266377	Mean dependent var		0.757838
Adjusted R-squared	0.199684	S.D. dependent var		0.114967
Durbin-Watson stat	2.789088	Prob(F-statistic)		0.015662

Comment: panel 27 selected OECD and EU countries, 1997 and 2003.
Source: Own estimations based on employment data from OECD, Labour Market Statistics – DATALFS, www1.oecd.org/scripts/cde and tax wedge on labour costs from Eurostat.

4.3. Tax wedges and employment growth rates

So far we have looked at the impact of labour taxation on unemployment and employment levels. Such evidence is however very fragmentary in CEE countries due to short data series. Therefore we decide to study also short term dynamics in aggregate

employment. Our hypothesis is that impact of tax wedge is stronger in EU NMS due to relative endowment in low-skiled labour. Employment growth is the left hand side variable, while GDP growth is the only explicit control variable. It means that in our estimation tax wedge is treated as a factor negatively influencing the responsiveness of the employment for growing labour demand and additionally reinforcing the negative employment effect of falling demand.

Tables 4.5 and 4.6 present estimation results for EU NMS and other OECD countries, respectively. For EU NMS, the size of the coefficients indicates that given the GDP growth rate each percentage point of the tax wedge decreases the employment growth by around 0.5 percentage points. This result seems to indicate strong and significant negative relationship between tax wedge and employment. Although we expected weaker impact on tax wedge in other OECD countries due to their better skill endowment, its insignificance is somehow surprising.

Table 4.5. Employment growth rate, EU New Member States

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP growth rate	0.425504	0.154645	2.751481	0.0076
Tax wedge	-0.531383	0.290770	-1.827498	0.0719
Fixed Effects				
R-squared	0.238370	Mean dependent var		-0.002334
Adjusted R-squared	0.109037	S.D. dependent var		0.026545
S.E. of regression	0.025056	Sum squared resid		0.033275
F-statistic	16.58761	Durbin-Watson stat		1.886317

Comment: 8 NMS, 1996-2003, 63 total panel observations.
Source: Eurostat.

Table 4.6. Employment growth rate, other OECD

Variable	Coefficient	Std. Error	t-Statistic	Prob.
GDP growth rate	0.581230	0.061400	9.466335	0.0000
Tax wedge	0.014602	0.049346	0.295915	0.7678
Fixed Effects				
R-squared	0.757003	Mean dependent var		0.014020
Adjusted R-squared	0.719035	S.D. dependent var		0.014804
S.E. of regression	0.007847	Sum squared resid		0.005911
F-statistic	299.0665	Durbin-Watson stat		1.978008

Comment: 14 OECD countries, 1996-2003, 112 total panel observations.
Source: Eurostat.

The re-estimation of the original Daveri and Tabellini equation, widely used as the central piece of evidence about negative impact of labour taxes (and its interaction with inefficient continental model of wage bargaining) on labour market, leads to strong conclusions about negative interactions of labour taxes and low skills. We provide also the direct evidence that unlike in case of high-skilled, employment rates among low-skilled are strongly affected by tax wedge. Finally, tax wedge negatively affects

employment growth in EU New Members Sates, but not in other OECD countries that are characterized by better skill endowment.

4.4. Conclusions: partial but consistent results

Presented results provide partial evidence about the importance of the interaction about high tax wedge and low skills. One has to remember however about the limitations of the data used, its small size, small number of variables used and hence possibility of omitted variables problem which can result with overestimation of the absolute value of the coefficients. Still, the message for policymakers, especially those in Central and Eastern European countries about risks of high labour taxation in the presence of high share of low-skilled labour is rather robust.

5. Microeconomic evidence from Poland

Factors strengthening the negative influence of the tax wedge on employment characterised in section 2 can be summarised to four main points:

- reservation and minimum wages,
- inability of employer to pass payroll tax increases on employee and/or passing of income tax increases to the employer resulting in total labour cost increase,
- observed net wage adjustment in case of downward shifts of the tax wedge and lack of opposite adjustment in case of tax wedge increases,
- unfavourable labour market institutions.

All of them result or describe some kind of wage rigidity. If wages were flexible the tax wedge would be fully transmitted into lower net incomes of employees. Therefore the main aim of the microeconomic analysis below is to find evidence proving higher wage rigidity for unskilled workers with low productivity or, extending the scope of the analysis, for all workers characterised by low "value" on the labour market.

The wage rigidity definition for the needs of our analysis varies from the standard one. In our case rigidity does not mean that wages do not react to changes in unemployment levels since it is not a subject of our research. We define the wage rigidity as the lack (or insufficiency) of wage responsiveness to productivity (labour market value) variations.

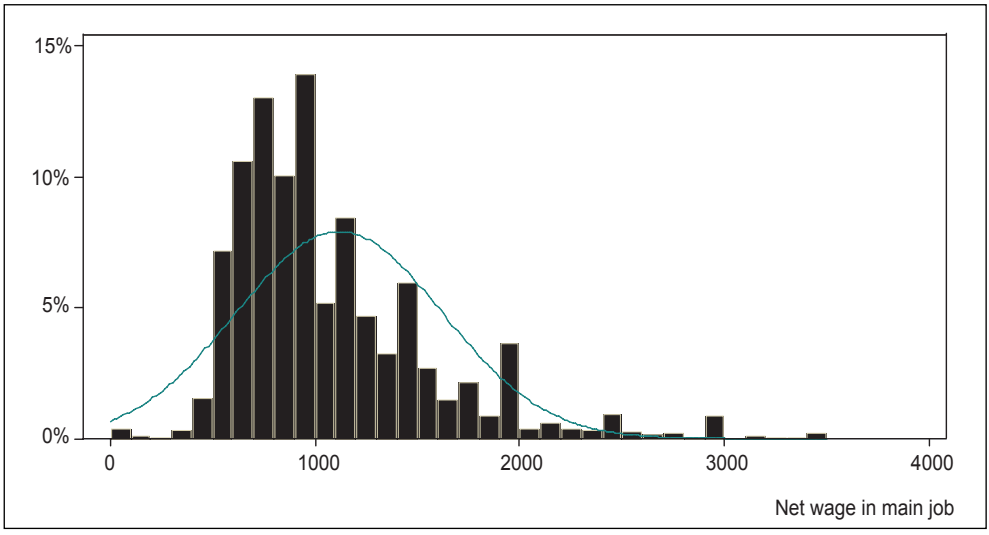
We start our investigation with the analysis of distribution of wages in Poland indicating for high wage concentration slightly below the median level. Then we run an analysis of annual wage dynamics for paid employees illustrating the tendency for higher wage growth among low-wage earners than for high-wage earners. Both of that are quite obvious statistical facts but we believe that presenting them explicitly can serve as a good starting point to the further analysis. We continue trying to prove the existence of negative relationship between productivity level of individual workers and wage rigidity. We estimate the wage model indicating (in several ways) for non-linear (flatter for low-productivity workers) relationship between productivity and wages. At last we simulate the result of the exogenous increase of the labour costs on employment rates for different groups of employees categorised by their expected value on the labour market.

All analyses in this section have been performed using the Polish Labour Force Survey (PLFS) data for year 2000-2004, but only results for years 2003-2004 are presented in the text. The quarterly datasets have been merged in one annual datasets for each year and all observations have been kept in order to end up with representative annual sample. The dynamic analysis has been performed using the matched annual pools exploiting the partially panel characteristic of PLFS[6].

5.1. Wage distribution

The asymmetry of the wage distribution with a clear cut-off point on the left hand side is the first indication (HM Treasury 2003) of downwards wage rigidity. It seems to be a case in Poland where most of the net wage distribution is concentrated slightly below the mean. (Chart 5.1) There are virtually no observations below the half of the median wage. Obviously this shape of the wage distribution is strongly influenced by the minimum wage regulations. In 2004 the minimum net wage was 560 zl and according to our analysis only 3% of workers earned below this statutory minimum. Then however more than 15% of

Chart 5.1. The histogram of distribution of declared net wages as in PLFS 2004



Source: Author's calculations based on LFS 2004.
Note: Only net wages of full time employed workers have been used. The last percentile of wage distribution (above 3500 PLN in last month) has been removed to keep the histogram readable.

[6] The authors are willing to respond to all questions related to the database used for this analysis.

workers earned between 600-700 zloty, next 10% between 700-800 and then 25% between 800-1000 zloty per month. Above the median wages start to be distributed normally – ie. closely mimicking the solid line symbolising the normal distribution. Disregarding the factors deciding about the shape of wage distribution, the observation of (possibly obvious) strong concentration of low wages in the vicinity of median wage means that potential workers with actual market value below the minimum wage (be it statutory or "market" minimum wage) are predetermined to become unemployed.

5.2. Distributional features of wage dynamics

In this section we analyse the real wage changes for various groups of workers defined by their payment. In order to perform the analysis we have created the pooled data set of employees[7] for 4 separate two-years periods between 2000 and 2004. Then we analyzed the central tendencies and distribution of real wage changes separately for 4 quartiles of wage distribution.

Our analysis shows that expected real wage dynamics are negatively correlated with original wage level[8], (see Table 5.1). The average real wage increase for the first

Table 5.1. Means of real growths of net wage according to initial wage quartiles and unemployment rates in years 2000(1)-2003(4)

	2000-2001	2001-2002	2002-2003	2003-2004	Average:
Unemployment rates					
General unemployment rate	15.4%	17.9%	19.8%	19.4%	18.1%
For those with tertiary education	5.5%	5.9%	8.2%	8.8%	7.1%
For those with vocational education	18.1%	21.1%	23.7%	23.3%	21.6%
Real wage growth for working employees					
First quartile	4.5%	4.1%	3.8%	2.1%	3.7%
Second quartile	1.1%	2.2%	1.9%	-0.3%	1.2%
Third quartile	0.1%	1.2%	0.8%	-1.4%	0.2%
Fourth quartile	-1.9%	-0.6%	0.5%	-1.8%	-1.0%
Total population:	1.2%	1.8%	1.9%	-0.3%	1.1%

Source: Authors' calculations based on LFS for years 2000-2004.

[7] Only full time contract employees that did not change a job during the reference period have been taken into account.

[8] Obviously it can not be claimed only on the basis of Table 4.1, the results of simple regression with real wage change as the dependent variable and initial wage level as one of repressors confirm that. (regression results available upon request from the author).

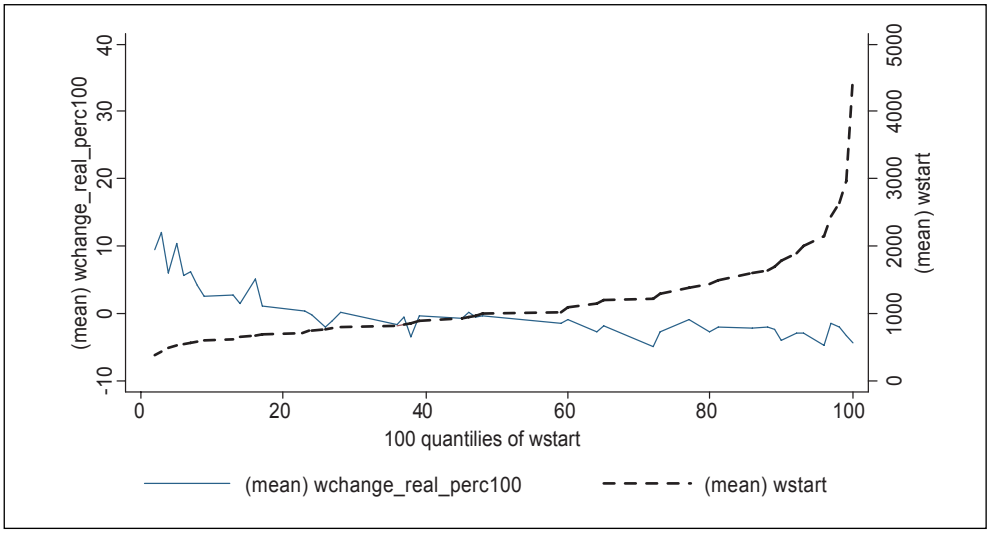
(lowest) quartile in analyzed period was 3.7%, for the last (highest) one -1%. This kind of relationship is quite stable for all sub-periods analyzed.

The observation of higher wage increases for low-wage workers is also confirmed by real wage growth curve for years 2003-2004, (see Chart 5.2). This curve presents the average real wage increases of employed individuals ordered by percentiles of net wage distribution in the starting year (2003 in Chart 5.2). It shows that there exists a continuous negative relationship between the wage level in the starting period and average wage dynamics. Continuity of this relationship means that results observed in Table 5.1 are not only the outcome of minimum wage regulations not allowing the lowest wages to fall further. The minimum wage seems to result only in clear steeping of the curve at the very beginning of the wage distribution.

The fact that wages grow faster for low-wage workers than for high-wage workers is the next interesting feature of the wage formation process. It seems as obvious as strong concentration of wages between the cut-off point and the median but also similarly as the latter it brings quite unpleasant consequences for some groups of actual and potential workers. It means that some of those unable to deserve the wage increase are losing again – they will be fired.

On the other hand the overall tendency for real wage increase for low-income workers tended to weaken during the period analysed and this is the optimistic

Chart 5.2. The real wage growths curve for employed individuals ordered by percentiles of net wage distribution in starting year for period 2003-2004



Source: Author's calculations based on LFS 2003-2004.

message (see Table 5.1). It means that although there is a problem, the experience of very high unemployment helped to reduce it over time. It seems that low wages grow faster on average than high wages, but on the other hand they do react to rising unemployment in expected manner. Slightly overinterpreting: the unemployment level for potentially low-wage groups could be lower if wages grew slower, but the situation of these groups would be even worse if the wage growth did not react to increasing unemployment. It is interesting how the last experience of stabilising and then falling unemployment influences the strength of the upwards twist of the wage dynamics for low-wage workers, but unfortunately we do not have data fresh enough to see it.

5.3. The wage model and the shape of productivity-wage relationship

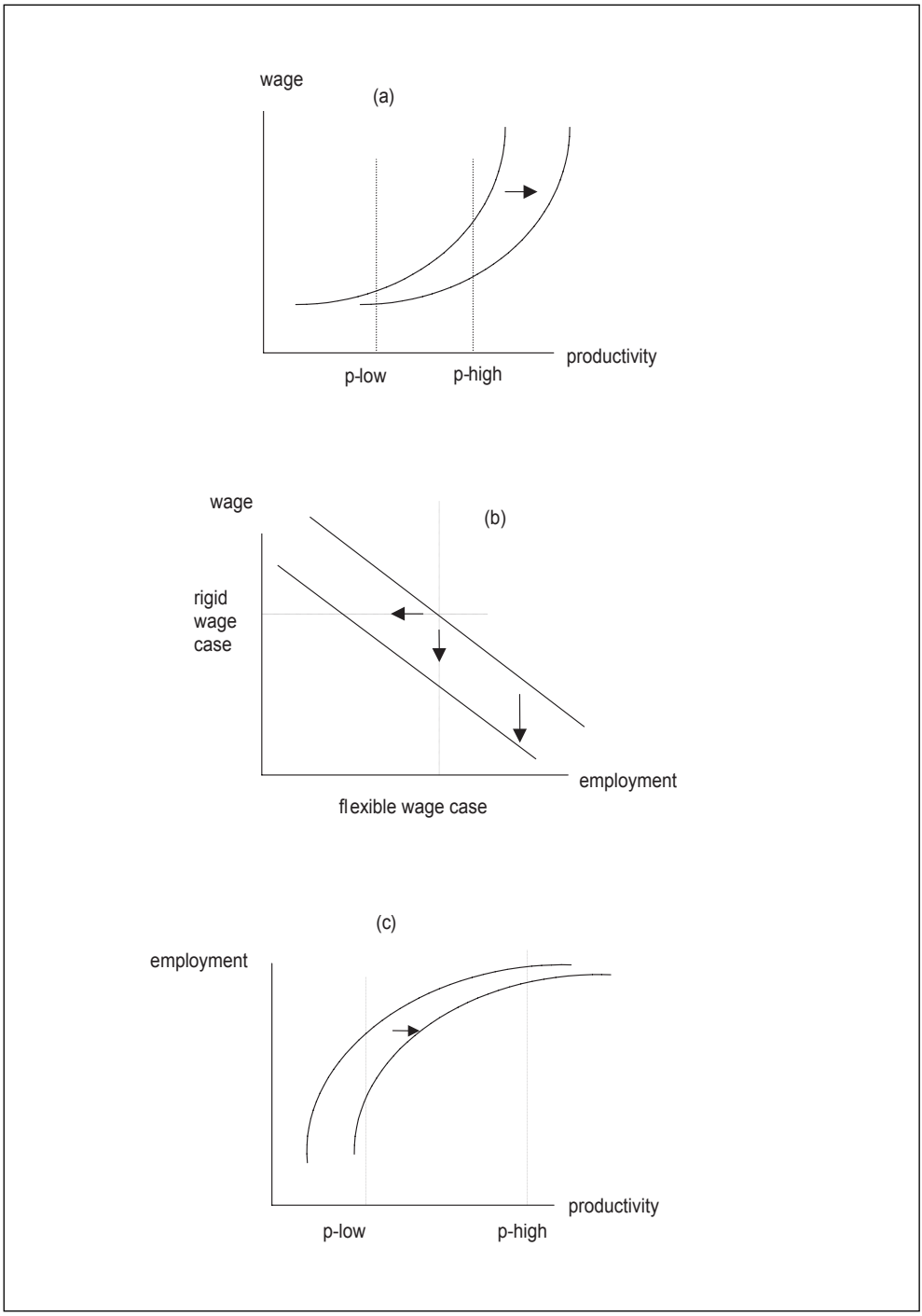
Let us start with some simple theoretical considerations, explaining our research strategy. Figure 5.1 (panel (a)) presents the theoretical relationship between productivity and (net) wages. Let's assume this relationship is convex. It means that for high productivity levels the productivity-wage elasticity is very high and then it decreases as the productivity level goes down. For very low productivity levels the wages are "rigid" – ie. they do not or hardly react to productivity changes.

On our schedule (Figure 5.1 panel (a)) an exogenous increase of labour costs, such as increased tax wedge, results in the rightwards shift of the productivity-wage curve. It means that the productivity of an individual has to increase in order to earn the same (net) wage, or that wage has to be reduced if productivity can not adjust. Saying bluntly: the worker's value for the employer has to increase as the exogenous costs of her/his employment go up. If the productivity-wage relationship is convex, as on our schedule, substantial wage reductions are possible only in case of high productive workers.

The rightwards shift of the productivity-wage schedule is equivalent to the downwards shift of the labour demand curve for given productivity level as on Figure 5.1 panel (b). Rigid wages of low productivity workers would result in large employment reductions and flexible wages of high-productivity workers will result in smaller employment reductions. This leads us to the concave productivity-employment relationship from Figure 5.1 panel (c). It illustrates explicitly the effect of tax-wedge increase on employment for the labour force strata characterised by varying productivity levels.

Our research strategy in this paper is to estimate the wage-productivity schedule empirically. We are trying to find evidence for convexity of wage-productivity schedule

Figure 5.1. Illustration of theoretical relationship between productivity, wages and employment consequences of a tax wedge increase



on the macro level and/or for higher wage elasticity for high-productive workers and for lower wage elasticity for less productive workers. If this was true the employment effect of high tax-wedge for low-productivity workers would be expected to be much higher than for high-productivity workers as in our simple theoretical illustration.

Our analysis is based on the assumption that the expected wage of an employee is a positive function of her/his productivity. The persons ex-post productivity – the value on the labour market – is related to the combination of his/her personal characteristics (age, education, gender) and to the environment the person works in ie: characteristics of the company such as: branch, size, ownership and characteristics of the locality: region, population density (proxy for local demand) and also on her/his working experience (firm specific human capital). We estimate the wage model based these quite classical assumptions. Then in the first step we analyse the model residuals to draw some conclusions concerning the shape of productivity – wage relationship and its rigidity, in the second step we run the simulation of employment effects of the tax wedge increase for labour force groups with different productivity.

The data from PLFS (BAEL) 2004 have been used to estimate the loglinear wage model using the simple OLS. – this kind of models are quite often used in empirical research (for example see Puhani 2000). The model has been estimated only for full time employees in order to minimize problems of varying time schedules as the data on hourly wage are not given. The first and the last percentile of wage distribution have been deleted in order to cut outliers[9]. 37074 observations in total have been used.

In the estimated basic model the log of actual net nominal wage has been regressed on the set of dummy variables describing personal characteristics of employees, characteristics of their companies and of local labour markets:

- voivodship,
- class of locality (rural, small towns, large cities),
- gender,
- education level,
- age group,
- economic sector of employment (agriculture, mining, manufacturing and construction, market services, non-market services),
- ownership sector, public-private,
- size of the enterprise (measured by number of employees),

[9] The Tobit model has also been estimated with the entire dataset used (first and last deciles has been used as censoring points) the results were qualitatively similar. The OLS model has been used afterwards in order to obtain straightforwardly interpretable coefficients.

- professional status of and employee (ISCO codes),
- and the employment tenure (for given employer).

The results of the model (the fitted values) represent the theoretical expected wage of a worker with given characteristics working in specific sector and locality ie. the expected wage of a worker with given productivity (value on the labour market).

Although the detailed results of the basic model (Table 5.2, column 1) are not the main subject of this paper they seem to be interesting enough to deserve at least rough description. Not all voivodship coefficients are significant and most of significant voivodship coefficients are lower than 0, except of Mazowieckie (with capital Warsaw) with average wages by more than 10% higher than in Wielkopolskie (the basic category). Higher wages are also observed in Zachodniopomorskie and Śląskie. In all other voivodship wages are *ceteris paribus* lower than in Wielkopolskie, or they don't differ significantly. The inhabitants of three voivodships: Kujawsko Pomorskie, Lubelskie and Podlaskie can expect their wages to be on average 5% lower than in Wielkopolskie. The expected wages in large cities (more than 100000 inhabitants) are by 7% higher than in villages, on the other hand living in smaller towns does not increase expected wage as much – only by less than 1%. Women can expect to earn less than man by more than 19%. Expected wages increase with age and education what seems obvious, however the results for the youngest workers (15-24) and tertiary education are much more acute than for intermediate categories. The expected wages for the youngest (age 15-24) are by almost 14% lower than for the basic category (35-44) and expected wages of the workers with tertiary education are by more than 22% higher than for those after vocational schools only (basic category). Working in public sector increases the expected wage by 2%. Working in smaller companies decreases expected wage, with the lowest value in smallest companies (employing less than 11 employees). The expected wage differs also in respect to profession, it is the highest for managers and professional soldiers and the lowest for unqualified labour. Expected wages strongly depend on tenure, with the lowest values for those working for maximum 1 year in their current workplace.

The first issue to examine is a shape of the actual productivity-wage curve. Our model is loglinear ie. it already assumes (and imputes) the convex relationship between the set of explanatory variables (productivity) and the expected wage . The results of the simple analysis of the model residuals show however that the actual shape this curve is even more convex than resulting from the model.

Estimating by OLS, as we do, results (by definition) in residuals with the sum equal to "zero". Obviously the residuals from our model display the same feature. However

Table 5.2. The results of the wage regression

		Basic model (1)		Model with "median dummy" (2)			M	odel for employment analysis (3)	
				Coefficients below median wage		Coefficients above median wage			
Characteristic	**Variable**	**Coefficient**	**P>z**	**Coefficient**	**P>z**	**Coefficient**	**P>z**	**Coefficient**	**P>z**
Voivodship - region	dolnośląskie	0.019	0.013	0.003	0.706	0.028	0.015	0.010	0.251
	kujawsko-pomorskie	-0.043	0.000	-0.030	0.000	-0.017	0.244	-0.047	0.000
	lubelskie	-0.048	0.000	-0.045	0.000	0.006	0.000	-0.051	0.000
	lubuskie	-0.001	0.916	-0.004	0.623	-0.003	0.989	-0.010	0.265
	łódzkie	-0.017	0.033	-0.012	0.082	0.005	0.132	-0.017	0.052
	małopolskie	-0.005	0.504	0.017	0.017	-0.008	0.024	0.000	0.969
	mazowieckie	0.102	0.000	0.050	0.000	0.086	0.001	0.092	0.000
	opolskie	0.005	0.627	-0.010	0.235	0.021	0.019	0.005	0.622
	podkarpackie	-0.025	0.002	0.016	0.019	-0.032	0.000	-0.017	0.055
	podlaskie	-0.051	0.000	-0.009	0.235	-0.040	0.014	-0.062	0.000
	pomorskie	0.014	0.094	0.010	0.160	0.003	0.505	0.004	0.676
	ślqskie	0.013	0.087	0.006	0.404	0.017	0.305	0.045	0.000
	świętokrzyskie	-0.039	0.000	-0.016	0.063	-0.034	0.175	-0.059	0.000
	warmińsko-mazurskie	0.011	0.154	0.019	0.007	0.016	0.838	-0.007	0.447
	zachodniopomorskie	0.032	0.000	0.015	0.049	0.020	0.698	0.010	0.320
Size of locality	large city	0.074	0.000	0.018	0.000	0.047	0.000	0.101	0.000
	small town	0.010	0.006	0.000	0.981	0.018	0.000	0.024	0.000
Gender	women	-0.193	0.000	-0.082	0.000	-0.105	0.000	-0.224	0.000
Age	young	-0.138	0.000	-0.061	0.000	-0.088	0.030	-0.293	0.000
	age 25-34	-0.051	0.000	-0.013	0.001	-0.036	0.000	-0.117	0.000
	age 45-54	0.009	0.040	-0.007	0.092	0.009	0.005	0.025	0.000
	age 55-64	0.026	0.000	-0.055	0.000	0.061	0.000	0.054	0.000
Education	tertiary	0.229	0.000	0.046	0.000	0.161	0.000	0.456	0.000
	secondary prof.	0.057	0.000	0.015	0.000	0.028	0.066	0.163	0.000
	secondary gen.	0.083	0.000	0.020	0.001	0.052	0.001	0.164	0.000
	primary or less	-0.049	0.000	-0.024	0.000	-0.023	0.921	-0.097	0.000
Economic Sector	agriculture	-0.067	0.000	-0.053	0.000	0.031	0.000		
	mining	0.224	0.000	0.037	0.042	0.131	0.000		
	martket services	0.015	0.002	-0.004	0.384	0.019	0.001		
	non-market serv.	-0.073	0.000	-0.027	0.000	-0.019	0.333		

Table 5.2. The results of the wage regression

		Basic model (1)		Model with "median dummy" (2)			M	odel for employment analysis (3)	
				Coefficients below median wage		Coefficients above median wage			
Characteristic	**Variable**	**Coefficient**	**P>z**	**Coefficient**	**P>z**	**Coefficient**	**P>z**	**Coefficient**	**P>z**
Ownership sector	public company	0.023	0.000	0.021	0.000	-0.046	0.000		
Size of the employer	Size less 10	-0.100	0.000	-0.028	0.000	-0.056	0.000		
	size 10-20	-0.057	0.000	-0.011	0.016	-0.053	0.000		
	size 20-50	-0.061	0.000	-0.016	0.000	-0.057	0.000		
	size 50-200	-0.039	0.000	-0.007	0.129	-0.043	0.000		
	size don't know	-0.075	0.000	-0.030	0.000	-0.048	0.107		
Profession	Managers	0.410	0.000	0.096	0.000	0.241	0.000		
	Professionals	0.260	0.000	0.111	0.000	0.088	0.077		
	Technicians	0.184	0.000	0.061	0.000	0.119	0.000		
	Clerks	0.071	0.000	0.040	0.000	0.037	0.777		
	Service workers	-0.038	0.000	-0.032	0.000	0.027	0.000		
	Skilled agriciltural	0.006	0.780	0.002	0.893	-0.015	0.619		
	Operators	0.051	0.000	0.018	0.000	0.021	0.665		
	Elementary	-0.108	0.000	-0.056	0.000	-0.022	0.008		
	Army	0.484	0.000	0.155	0.003	0.270	0.034		
Tenure	Tenure less than 1	-0.139	0.000	-0.073	0.000	-0.001	0.000		
	tenure 1	-0.129	0.000	-0.072	0.000	0.008	0.000		
	tenure 2	-0.086	0.000	-0.038	0.000	-0.014	0.015		
	tenure 3	-0.053	0.000	-0.007	0.284	-0.010	0.793		
	tenure 4	-0.036	0.000	-0.011	0.078	0.005	0.103		
	tenure 5	-0.018	0.015	-0.003	0.611	0.008	0.280		
	tenure 11-15	0.042	0.000	0.020	0.000	0.023	0.700		
	tenure more than 15	0.045	0.000	0.032	0.000	0.014	0.009		

Source: Author's calculations based on Polish LFS 2004.

Note: Estimation has been performed only for full time employees earning between 450 and 3500 PLN net (ie. the first and the last percentiles of the distribution have been cut). All coefficients should be interpreted as the percentage (ceteris paribus) average difference between the wage in given category and in basic category (for example coef = 0.01 means that wage in related category is 1% higher than in basic category). Basic categories: Rural area, Male, age 35-44, vocational education, industry, private, size of firm: +100, blue collar workers in manufacturing, voivodship – Wielkopolskie.

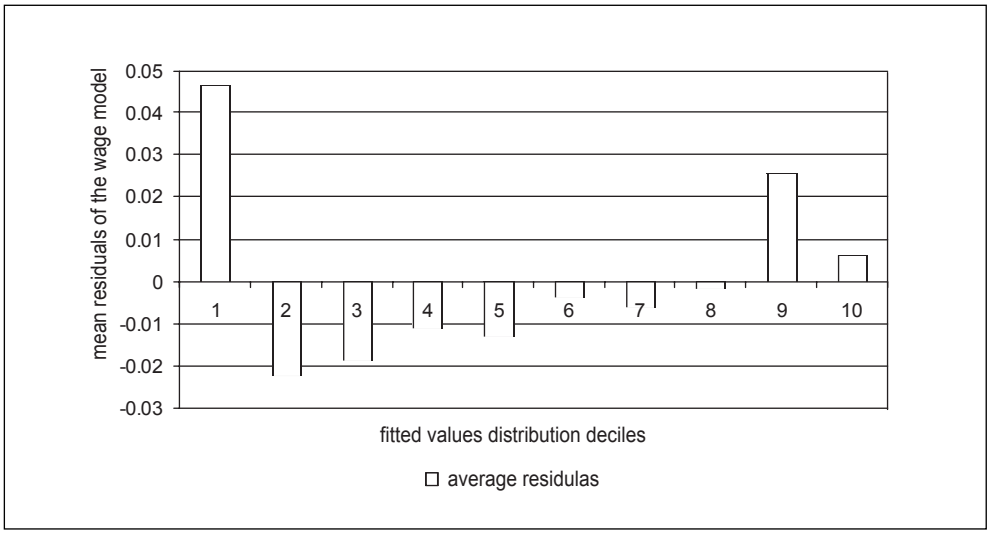
estimating the "truly" linear relationship one should also obtain the residuals being more or less equally distributed around the expected (estimated) values of dependent variable throughout its entire distribution. This is however not the case for our wage model.

Chart 5.3 presents the mean values of model residuals for deciles of the log wage fitted values. For the first decile the mean residual is strongly positive, then it becomes negative for next six deciles and positive again for the top three deciles. This distributional feature of model residuals is consistent with the nonlinear and convex shape of the actual relationship between our set of regressors (proxy for productivity) and the expected wage. (see Figure 5.2 for illustration).

The convexity of productivity-wage relationship would indicate for lower wage elasticity for low-productive and low-wage workers resulting in much more destructive employment effect of the increased tax wedge (or any other negative labour costs shock) for this group.

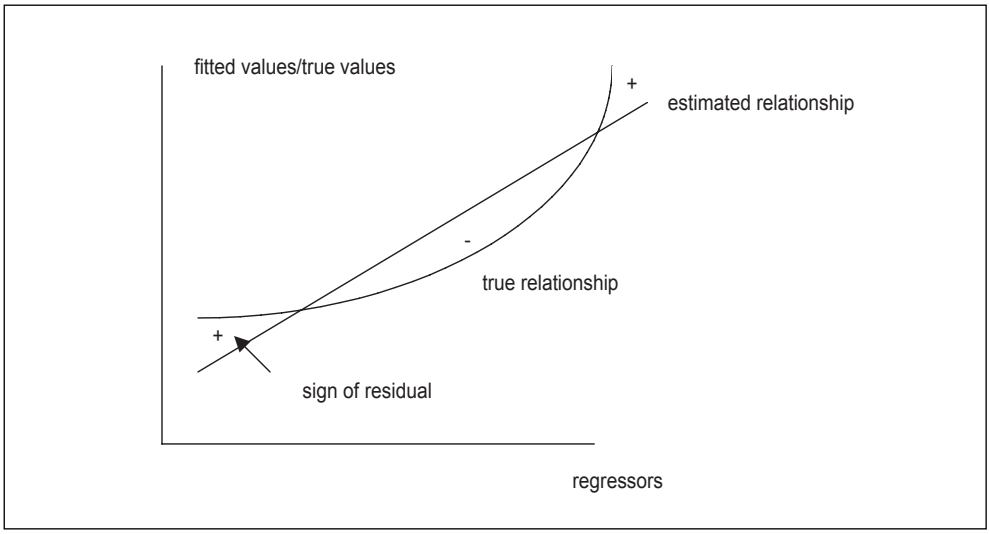
The shape of the productivity-wage relationship is not the only indicator of wage elasticity. It is also important to measure how much the actual wages of employees can differ from the model expectations. If workers with higher expected wages are in position (or simply able) to accept reduced wages easier than those with lower expected wages their chances for successful job search even during hard times will be relatively higher. It will also increase their chances to keep the job in case of an exogenous labour-cost shock (such as tax wedge).

Chart 5.3. The means of residuals from the wage model for deciles of fitted values distribution



Source: Authors' calculations based on LFS, 2004.

Figure 5.2. The distribution of residuals around the fitted values for the convex relationship estimated by linear model



If workers with higher expected wages were, on average, more willing to accept wage cuts the absolute value of the model residuals, especially those negative (actual wages lower than expected wages), should be a positive function of the expected wage. Hence, the residuals from the wage model have been regressed on the model fitted values. In order to control for purely numerical relationship (heteroscedasticity) the residuals have been recalculated as the percent of respective fitted values. Since mainly negative residuals are interesting from our point of view the regressions have been run separately for negative and positive residuals.

At first the R2 for both regression (see Table 5.3) are very low indicating for very weak total significance. On the other hand both coefficients on fitted values are significant, they are of expected sign and both the absolute size of the coefficient and its significance seems to be higher for negative residuals. It means that persons with higher expected wages, (higher productivity) tend to be offered and accept more differentiated wages than those with lower expected wages, (lower productivity). It means also that accepting the lower wage is more likely and feasible reaction to a negative shock among high-wage workers than among the low-wage workers. It seems to be the next indication of the higher wage elasticity among high-wage workers.

As the last test for higher wage elasticity among high-wage workers we re-run the wage regression applying the multiplicative dummy variable for all observations above the median wage, (see Table 5.2 column 2). As a result we obtained a double set of

Table 5.3. The results of regression of percentage model residuals on fitted values

FOR NEGATIVE RESIDUALS R^2=0.017						
	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
fitted_values	-1.23426	0.06824	-18.09	0	-1.36801	-1.1005
_cons	5.503089	0.47287	11.64	0	4.576218	6.42996
FOR POSITIVE RESIDUALS R^2 = 0.004						
	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
Fitted_values	0.709931	0.083419	8.51	0	0.54642	0.873442
_cons	-1.52877	0.578738	-2.64	0.008	-2.66316	-0.39438

Source: Authors' calculations based on LFS 2004

coefficients for all regressors: below and above the median wage. If the elasticity of wages differed between both groups the coefficients in both sets should vary significantly. If the elasticity of wages above the median was higher than below the median the absolute values of coefficient for the former should be higher and the sign of coefficients should be preserved.

It seems to be true for most of significant coefficients. In total 26 individual coefficients are significant both below and above the median. For 17 of them the absolute value of the coefficient above the median is higher and the coefficient is of the same sign as below the median, meaning the steeper relationship. What is even more important most of coefficients on "basic" variables such as gender, age, education and size of locality posses this feature. These variables decide about most of the explanatory power of the model – using only these variables would results in the R2 similar to the full version of the model.

High wages tend to react much stronger to the individual characteristics of employees or to characteristics of their working environment than lower wages do. If combination of these characteristics can be treated as proxy for individuals' productivity, (as we constantly assume) it is the next indication of higher productivity-wage elasticity for high-wage workers.

5.4. Simulation of employment effects of tax-wedge increase

The last element of our analysis is the simulation of the employment effects of an increase of the tax wedge for various groups of employees divided according to their expected wage level.

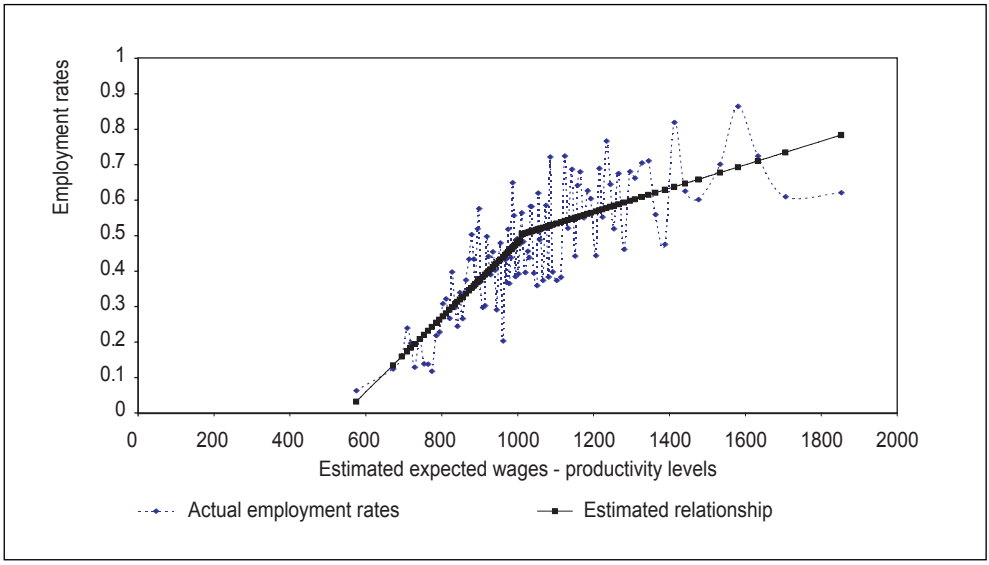
We have re-estimated the wage model again including only "personal" characteristics of individuals into the specification, (see Table 5.2 column 3). The

results of that are not qualitatively different to the basic specification (from Table 5.2, column 1), although coefficients for some variables such as: size of locality, age and education levels have much higher absolute values. It can be explained by omitted variables: sector, tenure and profession respectively. Obviously the explanatory power of such a reduced model specification is lower than of a basic model.

The next step of our analysis was to calculate the fitted values from the model (expected wages) for the entire working age population. These would serve us as the proxies for individual productivity levels. Actual employment rates[10] have been calculated for each percentile of the expected wage distribution, and two simple bivariate linear models relating the employment rates to percentiles' means of expected wage levels have been estimated: one below the median expected wage and one above. As the result we have obtained the function of employment rate to expected wage level as presented on the Chart 5.4. This function mimics the theoretical relationship presented on Figure 5.1 panel (c).

Having the positive expected wage-employment function we were able to simulate the exogenous one-time increase in labour costs (tax wedge) by 10%. Such an increase lowers the productivity and the market value of each worker by 10%. However since

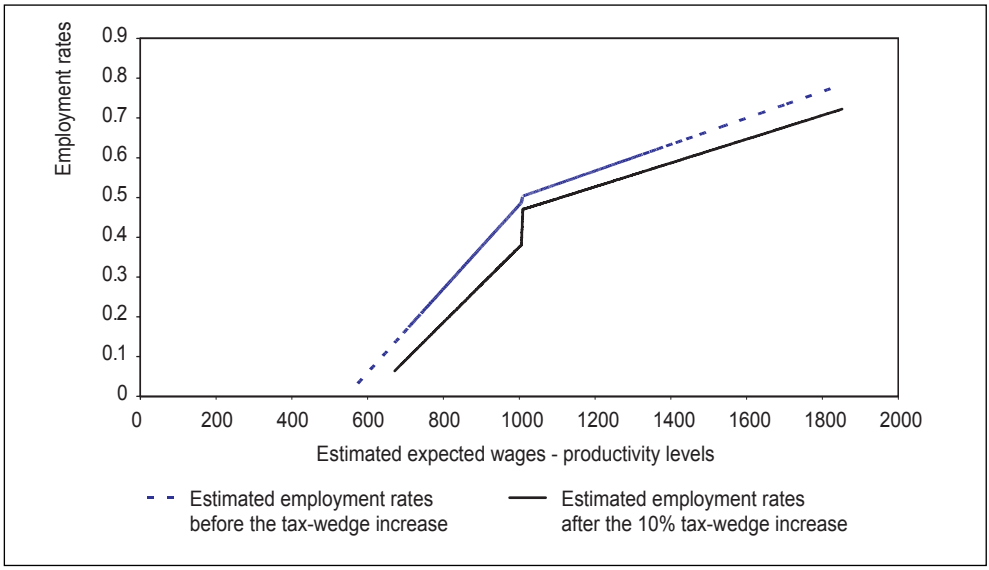
Chart 5.4. The estimated relationship between expected wage and employment rates



Source: Authors' calculations based in PLFS 2004.

[10] Only employment outside agriculture has been used to calculate those employment rates. Employed in agriculture have been excluded from the sample.

Chart 5.5. The estimated effects of 10% increase of the tax wedge for workers with different productivity levels



Source: Authors' calculations based on PLFS 2004.

the expected wage for low-wage earners do not fall due to rigidity the employment reductions for these group will be higher. It means that there exist a positive relationship between the expected wage and employment and the steeper is the relationship the higher is the employment reduction.

In our estimated function (as on Chart 5.4) the relationship is steeper for those characterised by lower than median expected wages, hence employment reduction will be higher for this group, (see Chart 5.5). The overall employment rate in falls from 46% to 39%. The average employment reduction for the first quartile of productivity distribution will reach 36%, for the second already 24% and for the last two quartiles only about 7%.

This simple illustration, although does not pretend to serve as estimate (or even "guesstimate") of effects of any real processes sheds some light on possible differences between tax wedge influence on employment levels of unproductive, unskilled workers characterised by low and rigid wages and highly productive skilled workers with high and flexible wages.

6. A few remarks on job search incentives in Poland

In this, slightly separate, section we try to identify selected supply side factors that may increase wage rigidity for unskilled. The analysis is of introductory character, however it may serve as a starting point for further research. It has been based on the Household Budget Survey (HBS) for Poland in years 2002-2003. HBS data allow for broader, behavioural analysis of actions undertaken by individuals on the labour market. HBS data provide detailed information on economic and social situation of individuals who are active (including employed and unemployed population) as well as of those, who do not participate in the labour market. Next to it, time-series data (panel) allows for identifying those, whose labour market situation has changed during these years, as well as costs and benefits of taking up or losing employment.

6.1. Income sources alternative to work

Evaluation of impact of different types of income on incentives to gain job is possible using the selection of HBS households with only maximally two working members: a head and a partner, both of which additionally of working age (male 18-64 and female 18-60). It means that all households with at least one additional working member have been excluded from the sample analysed. The two individuals represent three types of labour market activity: employed, unemployed or inactive. Different combinations of listed types of activities are analysed depending on labour status of each of the partner. However, only "pure" cases, when both partners are employed, both are unemployed and both are inactive are discussed (Table 6.1). These cases allow for comparisons of household's income level depending on head's and/or partner's labour market status. Individual income from employment is almost twice as high as income of inactive individual and income of unemployed. Income of non-active population includes different types of social transfers: social assistance, family benefits, disability benefits and pensions. Income of unemployed includes social security

income, mainly unemployment benefit. Some individuals living in households of unemployed or inactive tend to have also income from employment, however these amounts are relatively low (45-70 PLN monthly). In HBS, households are asked to evaluate their income situation in terms of income that would allow to make ends meet. Comparison of households' actual and income responding household's needs indicates, that only in households of unemployed there is an actual income deficit, while households of inactive observe small income surplus. High level of income of inactive is caused by relatively generous and preventing from poverty level of pre-retirement benefits and disability pensions. As a result result, inactive do not intent to return to labour market and take up employment. This is also reflected in expected wage from employment of inactive – it is higher than expected wage of unemployed. Unemployed are motivated to increase their income level by gaining employment, however their income aspirations – as refered to their actual income – are lower than income aspirations of other groups.

Table 6.1. Income level in different types of households

Earners composition	Average individual income level (in PLN)	HH's average actual income (in PLN)	HH's average income that is needed to "meet ends" (in PLN)	Ratio of actual HH income to income needed to "meet ends"	HH's income "surplus" or "deficit" (in PLN)
Employed (EE)	1088.68	2747.00	2024.92	1.36	722.08
Unemployed (UU)	315.77	1092.91	1241.24	0.88	-148.33
Inactive (II)	647.92	1599.55	1504.91	1.06	94.64

Source: Own calculations, HBS 2003.

6.2. Gain from finding a job

Static analysis of income levels in different types of households can be enriched by dynamic analysis of income changes depending on finding and/or losing a job. The model, as described above and applied to the panel of 2002-2003 HBS data, allows for identification of households where one of the two adults (head and/or partner) changes its labour market status. The change can occur in two ways: either gaining or losing employment. This leads to gain or loss in employment income and households' income level. If number of earners in the household increases by one, on average income from employment increases by around 470 PLN. This level is defined by the ceiling of

minimum wage on the one hand and labour costs on the other. Simultaneously, as overall households' income increases, income from social security decreases. Thus, net income gain from increasing employment income and loss of social security income is much lower, being on average at the level of 315 PLN. When household's income from other sources are taken into account, the actual income gain is even lower (246.38 PLN). These results indicate the scale of employment trap – taking up employment do not lead to high income gains for the household.

On the other hand, loss of employment leads to steep decrease in employment income (almost 600n PLN), and in result decrease in overall household's income. However, the loss is mitigated by access to social security benefits. In result, net income decrease while losing employment by one person is much lower, being at the level of 245 PLN and while taking into account other sources of income the loss is by 40 PLN higher.

Table 6.2. Relative income change in household while taking up or loosing employment, HBS 2002-2003

	Change in average household's income (in PLN) when:	
Source of income:	1 person takes up employment	1 person loses employment
Employment income	470.54	-594.59
Social security income	-155.39	349.26
Total household's income	246.38	-280.95

Source: Own calculations, HBS 2002-2003.

6.3. Factors related to probability of searching for employment

It seems, that inactive do not have strong incentives to take up employment. This can be caused either by their age or health status, or by satisfaction with the income level from social security. The next step is to identify factors that determine willingness of searching for a job. Probability of searching for a job is defined in opposition to being inactive. In fact, searching for employment is included in LFS/HBS definition of unemployment only a person who does not have a job, but is searching for a job and is able to take a job within the next week is unemployed. Two probit models were estimated, evaluating factors behind willingness to search for employment. In the first model a dependent variable is probability of searching for employment by household's head, while in the second one the subject of analysis is a partner . Again, the family model that the analysis refers to is a model with maximum two working individuals a

Table 6.3. Results of probit analysis of job search probability among those non-employed

Dependent variable: probability of HH head being unemployed and searching for employment				Dependent variable: probability of partner being unemployed and searching for employment		
Number of obs = 2715 Log likelihood = -1188.1149 Pseudo R2 = 0.1237				Number of obs = 2970 Log likelihood = -1298.1837 Pseudo R2 = 0.1257		
	dF/dx	Std. Err.	P>|z|	dF/dx	Std. Err.	P>|z|
Sex	0.0346399	0.0170789	0.041	-0.1193239	0.0194708	0.000
Numer of children	-0.0248559	0.0076147	0.001	-0.0231087	0.0071337	0.001
Numer of persons in HH	0.0266962	0.0053061	0.000	0.0262849	0.0050533	0.000
Social security income	-0.0001553	0.0000136	0.000	-0.0001495	0.0000131	0.000
Age: 15-24	-0.0344049	0.0310704	0.304	-0.1286306	0.0182526	0.000
Age: 25-34	0.0968063	0.0335277	0.001	0.0195296	0.0225605	0.401
Age: 45-54	-0.0134925	0.0206556	0.517	-0.0634038	0.0203152	0.003
Age: 55-64	-0.0623953	0.0241233	0.014	-0.1411698	0.0183596	0.000
Partner's employment	-0.1130483	0.0147407	0.000	-0.1307773	0.0139667	0.000
Farming	0.009528	0.0170841	0.574	-0.0045904	0.0156123	0.770
Expected wage	-0.0000624	0.0000336	0.064	-0.0000917	0.0000375	0.015

Source: Own calculations, HBS 2003.

head and a partner. Analysis is based on the HBS data for the year 2003.

Results indicate that not only economic variables are important while searching for employment, but also a set of social factors can play a decisive role. Being female partner has a negative impact on searching for a job. This can be related to other social roles that are filled by females: taking care of family and household. Similarly, number of children in a household is negatively correlated to looking for employment. Again, this is related to the need for care in families with many children. On the other hand, living in a household with many adults increases probability of searching for employment. Another important factor explaining probability of searching for employment is partner's job. Results show, that living in a household, where partner is employed and provides income, decreases probability of searching for a job by other person. The result is significant and valid for both: household's head and for the partner.

Hypothesis of lack of motivation for searching for a job while having social income is confirmed by probit analysis. The relation is negative, what means that high income from social security decreases probability of being unemployed and increases probability of being inactive. To some extent this can be an effect of generous disability benefits and rare employment among disabled. Another interesting result is that individuals with higher expected wages, where expected wage has been calculated using the results of the model from section 5, are less likely to search for a job.

Those with low labour market value are not able to find jobs matching their productivity level, although they are looking for it. Taking into account the result from table 6.1 suggesting that those unemployed have on average lower income aspirations

than other groups, we can suppose that reservation wage or minimum wage is not the only reason of their job search failure. They are unemployed in a classical sense. Lowering the wedge for this group could result in employment creation. It is consistent with results of estimations and simulations in section 5.4.

7. Concluding remarks

The literature review suggests several factors that may determine the strength of tax wedge impact on employment. These factors operate through higher wage rigidity that prevents tax wedge from being fully transmitted into lower net wages. In particular, some of reviewed contributions suggest that the employment consequences of tax wedge can be more severe for low-skilled as their wages are less flexible than average. Our research aimed to test this idea directly and to show that high tax wedge can be potentially more harmful in countries abundant in this kind of labour.

Our cross-country investigation confirmed the negative impact of interactions between labour taxes and low skills on employment. The re-estimation of the original Daveri and Tabellini (2000) equation that links unemployment to the size of labour taxation, showed that skill composition is an important factor determining the strength of the tax impact. Using panel of OECD countries, we also provided evidence that employment rates among low-skilled are strongly affected by tax wedge, but high-skilled are rather immune from this effect. Finally, we showed that tax wedge negatively affects employment growth in the EU NMS, but not in other OECD countries that are characterized by better skill endowment. Presented results have to be interpreted carefully due to limitations of the data and small number of control variables. Still, the message for policymakers, especially those in Central and Eastern European countries about risks of high labour taxation in the presence of high share of low-skilled labour seems rather robust.

The microeconomic investigation was based on the conceptual framework illustrating the possibility of more severe role of the tax wedge for low productivity workers due to higher wage-rigidity. By analyzing Labour Force Surveys for Poland, we find evidence for wage rigidity among low-skilled, including cut-off in wage distribution close to the minimum wage and upward wage pressure among unskilled despite their low employment rates. We also show that wages tend to react more strongly to characteristics of high productivity employees and their working environment. On contrary, it seems that wages of unskilled fail to fall enough to match their low productivity levels. As a result of this rigidity, employment levels are very low

among unskilled and impact of the tax wedge is strong. To illustrate the last result, we provide the simple simulation characterizing the variations of tax wedge-employment relationship depending on workers productivity. Finally, we provide some evidence on supply-side determinants of wage rigidity for low-productive workers. Our analysis of Household Budgets Survey suggests that social incomes may increase the reservation wages of those non-employed pushing part of the labour force out of the labour market.

Our results are based on the analysis of rather rudimentary character. The conceptual framework and econometric methods used are quite simple, therefore the conclusions can not be considered as a comprehensive proof for devastating role of the tax-wedge for the unskilled or other less productive groups of workers. On the other hand, our results are consistent with economic theory and constitute a good starting point for further research that should determine more precisely how much employment gains can be achieved by lowering tax wedge for the unskilled and ideally, provide systematic costs and benefits analysis of such policy option. Obtaining such results will be challenging but is essential for better policymaking in Poland and other countries abundant in unskilled labour.

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