

Estonian wage formation as a macroeconomic adjustment mechanism: comparative analysis with Baltic and Nordic states

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Abstract

The paper discusses challenges to the Estonian labour market that will arise after accession to the European Monetary Union. Because exchange rate and monetary policy will no longer be available as an instrument for macroeconomic policy, the most important mechanism of adjustment to asymmetric shocks will become labour market. We analyze two models of wage determination in Estonian: efficiency wage model and model with shared profit with employees. In empirical parts we first estimate, based on national account data, wage equations on national level for three aggregated sectors: manufacturing, market services and public services and then compare it with the national wage equations for the Baltic and Nordic States. Next we analyze deeper empirical evidences of rent sharing model. We estimate relation on the basis of panel data between relative wages and labour productivity by economic sectors. We find substantial rent-sharing in Estonia and in others considered countries. Finally we analyze how regional wages could act as an equilibrating mechanism by adjusting to local market conditions in Estonia. We estimate wage equation on the basis of regional panel data for wages and unemployment. We find empirical evidence that wages could help equilibrate labour markets and adjust regionally to asymmetric shocks.

JEL Classification numbers: E24, F16, J30, J41

Keywords: wage determination, efficiency wage model, rent-sharing, wage equation, wage curve model.

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1. Introduction

Estonia is going to join EMU in the nearest future. With the introduction of the euro the exchange rate and monetary policy will no longer be available as an instrument for macroeconomic policy. The fiscal policy has also been limited by the pact on Stability and Growth. The only possibility to adjust to adverse shocks is to make markets more flexible.

In this paper we concentrate on the Estonian labour market as a possible shocks absorber and compare it with the other Baltic and Nordic states. High speed of integration into the EU exerted also influence on the Estonian labour market institutions but the differences still remain high. Similarly to a majority of the CEE countries, Estonian labour unions are relatively weak and the wages are bargained principally at the enterprise level. This made economy more flexible and create a lot of problems of wage differentiation, inter-sectoral spillover, etc. We try to approach their using conventional wage-setting models. We also analyse relevance of these models to the Estonian labour market.

The rest of the paper is structured as follows. Section 2 discusses theoretical models of wage formation. In Section 3 Estonian labour market is analysed. Empirical result of Estonian wage formation and its comparison with Baltic and Nordic states are

presented in Section 4. Section 5 analyse regional dimension of Estonian labour market flexibility and in Section 6 we conclude.

2. Theoretical models of wage determination

The starting point of different wage setting models is the level of competitiveness of labour market. In perfectly competitive labour market wage is determined mainly by the interaction of demand and supply. In the modern economy only some sectors can be considered as competitive even in the US. In the Europe we can not consider any sector of economy as perfectly competitive. Nevertheless competitive model of wage formation is still considered by labour economists as a useful tool.

In this model, the homogenous actual and potential employees whose wage is determined by the opportunity cost of their time represent infinitely elastic labour supply. The firms are wage-takers and at each period their labour demand depends on the market real wage. Under these assumptions, there is no discrimination between endogenous characteristics of firms. Highly profitable companies will pay the same wages as relatively unprofitable ones. In a similar manner wages would by and large equalise across economic sectors, and only wage differentials will compensate for the employees' differences in skills and human capital and the firm-specific working conditions. In this model firms' profits occur as a result of the unexpected exogenous shocks that are not related to labour, and thus there is no reason why the firms should share the rents with their employees. This also means that empirical correlation between wages and profits should be zero.

Most empirical evidences do not to fit the competitive paradigm. In particular, wage volatility, and especially downward adjustment of wages, appears to be much lower than the theory suggests given the high levels and relative rigidity of unemployment. Serious attacks on the conventional competitive model arose from empirical studies that identified inter-industry wage variability and a positive relationship between profits and wages. Already in 1950 Slitcher found that wages of homogenous types of employees are different in different US manufacturing industries and that there is a positive correlation between wages and employer's ability to pay. In 1980s and 1990s an array of empirical studies emerged that used more sophisticated datasets. These studies largely found evidence of the unexplained inter-industry wage differentials and of a positive relationship between wages and profits. Positive impact of profitability on wages was identified in US (Dickens and Katz 1987) and in Europe (Blanchflower et al. 1990; Beckerman and Jenkinson 1990; Nickell and Wadhwani 1990).

Due to data limitations, the early empirical work failed to control for two major factors that potentially could affect wage-profitability relationships: first, industries' fixed effects (for example, technology differences that exogenously affect industrial wages due to higher returns on physical capital); secondly, the differences in quality of human capital, such as educational differences, training, etc. Later empirical studies used more sophisticated datasets (matched survey data, panel data) and confirmed positive impact of ability to pay on wages. Christofides and Oswald (1992) and Abowd and Lemieux (1993) for Canadian industry, Goos and Konings (2000) for Belgium and Van Reenen (1996) for Britain used microeconomic datasets that enabled to control for industry fixed effects. Abowd et al. (1999), Margolis and Salvanes (2001, on French and Norwegian data) used matched employer-employee dataset that also enabled to control for firms specific and time effects. Finally, Teal

(1995), Kramarz (2003), Gibbons et al. (2002), and Martins (2004) used matched datasets adding extensive controls for micro-level worker heterogeneity. All studies find a form of rent-sharing.

Most of the empirical evidence mentioned above was based on data for highly unionised industrial sectors. Therefore, the result of wage-profitability relation is theoretically non-surprising (Blanchflower et al. 1996). Influence of unionisation on wages was addressed directly in the wage bargaining models. They predict that wages may be set above the market clearing rate due to the labour market imperfections, which impose fairness considerations on firms. In principle, it is possible to distinguish three levels of bargaining. In case of a national, i.e. completely centralised bargaining the wage differentials reflect negotiating power and preferences of the central labour market organisations. In case of a sectoral or industry level bargaining the degree of centralisation is smaller and the wage differentials are greater. Finally, at an enterprise or completely decentralised level of bargaining wages are set within the firms and therefore wage differentials are infinite. The bargaining levels can also be considered in a context of wage flexibility and adjustment capacity of the labour market. The most long-term and redistributive agreements are made at national level, whereas in case of the enterprise level bargaining companies adjust wages depending on the size and direction of the exogenous shocks.

Bargaining models ultimately lead to a loss of efficiency due to distortions that trade unions cause to firms' labour demand decisions. Sectoral or occupational labour unions represent a monopoly on the labour market thus having a power to set the wage higher than competitive level. This can have two possible outcomes on national wages and employment depending on the degree and importance of union coverage. First, the overall employment may be reduced as firms demand less workers if wages are high. Second, firms may just lay off some unionised workers, inducing potential increase in supply of non-unionised labour whose wages will then fall. Taking into account these possible lay-offs, a standard unions' trade-off would be higher wages vs. higher employment.

Calmfors and Driffill (1988) conclude that completely decentralised or strongly centralised wage determination produce similar outcomes in terms of wages and unemployment. At a decentralised level, strong competition ensures classical efficient outcome. With a certain degree of centralisation there is strong wage-unemployment trade-off. Additional centralisation improves coordination of trade unions and induces the unions to accept lower wages for better employment. This unilinear relation is known as the hump curve.

Wadhvani and Wall (1991) and Konings and Walsh (1994) treated empirical profits-wage relation to highlight that apart from the rent sharing imposed by trade unions' there might be some micro competitiveness explanation why companies may wish to share the rents. They found that the neoclassical efficiency wage model developed by Shapiro-Stiglitz (1984) can be used to explain rents' impact on wages in low unionised sectors, while wage bargaining model explains how trade unions impose rent sharing on firms in the unionised sectors. Thus, both efficiency wages and rent sharing may be present in the labour market, and distinction between the two is crucial.

According to efficiency wage model imperfect monitoring induces firms to provide employees with special incentive in order to exert their effort: they set wage at a level that is higher than the market clearing. Labour effort depends positively on wage, and the 'effective labour' is one of the inputs in the production function. Therefore, firms can reduce some costs by increasing wages. The nature of wage

incentives depends on the likelihood of job loss and re-hiring. The efficiency wage model means that the labour supply is upward sloping and there is involuntary unemployment in the market equilibrium. This is consistent with the immediate empirical evidence.

Although theoretically appealing, the model is very difficult to test. In general, two methodologies are often used: a production function approach as in Wadhvani and Wall (1991) and Levine (1992), and the instrument variables approach as in Blanchflower et al. (1996) and Abowd and Lemieux (1993). Martins (2004) gives a thorough account of the main biases of the results, including a standard accounting relationship between profits and wages (so that higher rent-sharing will simultaneously decrease profits and increase wages and thus lead to the underestimation of rent-sharing effects); a potentially simultaneous determination of profits, wages and employment; a correlation between profits and missing variables that capture workers' ability; and a measurement error.

Overall, as noted in Johanson (2002), the presence of a permanent relation between industry wages and industry profitability is evidence against the competitive forces in the labour market, but also evidence against completely centralised wage determination. In a competitive labour market, wages would be equalised, except for compensating wage differentials due to differences in workers' human capital, or in working conditions. In a completely centralised wage setting system, wages are fully determined through nation-wide bargaining, and wage differentials reflect the preferences and bargaining power of the central labour market organisations.

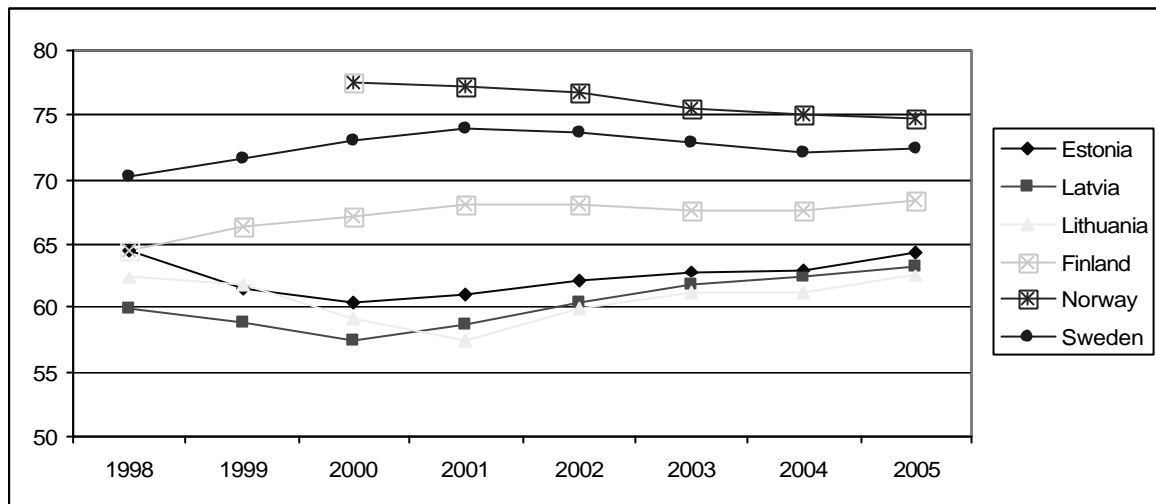
3. Comparative characteristics of the Estonian labour market

During the last 15 years there has been a noteworthy decrease in employment in Estonia. In 1990-2005 the employment rate has declined by about 10 percentage points (in 1990 the employment rate was 77.4 per cent, in 2005, 64.4 per cent). As to the branches of the Estonian economy, Estonia has been able to maintain employment in manufacturing: in 2005 the employment in manufacturing was almost the same as in 1991 (approximately 35 per cent). Moreover, Estonia has managed to drastically reduce agricultural employment. The share of employees in agriculture fell from over 20 per cent in 1991 to less than 5 per cent in 2005. One reason for some of these changes could be heritage from the Soviet economic system. The structure of the Estonian economy then did not satisfy the local needs but was part of the quite absurd division of labour of the large empire. Therefore, after Estonia regained its independence employment declined primarily in agriculture, fishery and mining, and increased in state administration, financial intermediation and trade. The labour force that became redundant during the rapid restructuring of the economy, attempted to find work in the new quickly developing areas of the economy like commerce, hotel business etc. In this new situation, a significant part of the labour force has had to acquire new qualifications. Technological changes, accompanied by the decline in labour intensity, have exerted influence on employment in transport and communications, etc. Such changes in sectoral employment have taken 15-20 years in most of the developed countries. In Estonia they happened 2 or 3 times faster. If we consider the relatively narrow export basis of Estonia, where timber and sub-contracts are dominating, the economic structure and thus the employment are expected to adjust further.

Comparing the changes of employment rate from 1998 to 2005, we can see from Figure 1 that the most substantial decline in Estonia took place in 2000. Similar

trend was observed in Latvia whereas Lithuania witnessed the biggest decline in 2002. Estonian employment rate is higher than that of Latvia and Lithuania. The employment rate in Baltic countries is much lower than in Nordic countries. For example the employment rate in Estonia was approximately 10 percentage point lower than in Norway in 2005 (see Figure 1).

Figure 1. Employment rate in % in 1998-2005



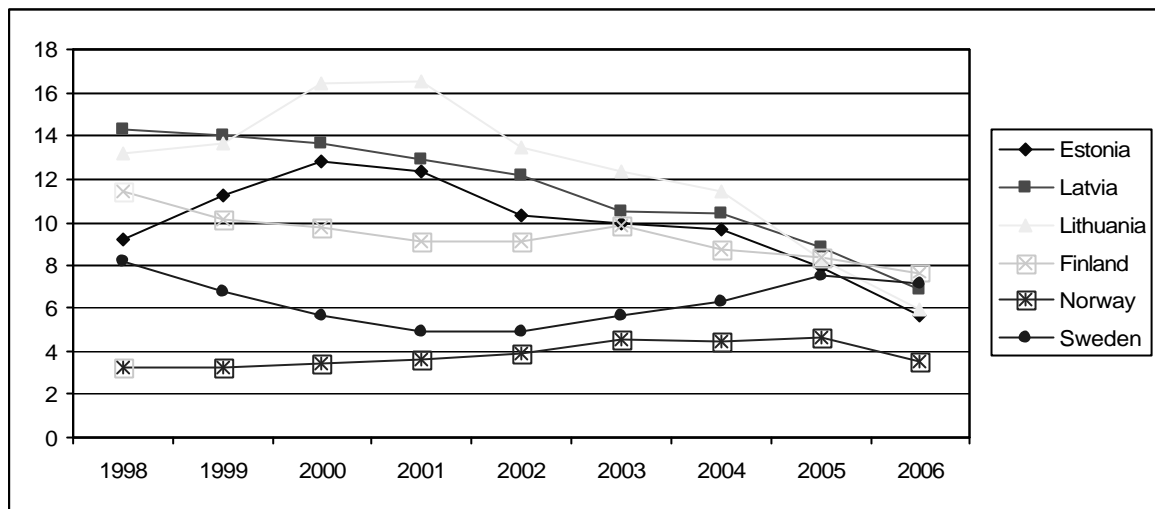
The job creation and destruction level in Estonia is very high in international comparison. The amount of job flows is above the amount that is needed to accommodate the net employment changes. According to Masso *et al* the net employment changes in Estonia was 23% per year. It is higher than has been found in any European country (except Lithuania). As noted in Masso *et al.* (2005) the Estonian economic development was a good example of the success story of economic shock therapy, as a result of which relatively fast restructuring was accompanied by high labour reallocation.

In spite of the quite high labour reallocation, different researches indicate that the labour mobility is relatively low both in Estonia and in the EU. According to Eurostat, the number of workers who have changed employer in the last year rarely exceeds ten percent in the EU Member States. According to Eurobarometer, the EU workers have had, on average, four jobs in their career. The number of jobs per worker in Estonia is close to the EU average (Eurobarometer 2006).

Baltic labour markets developments have been unlike those of other Central and Eastern European countries. This means relatively low unemployment rate at the beginning of the transition period and a rapid change in labour reallocation. In 1992 the unemployment rate was for the first time higher than 1 per cent (in Estonia 1.7 per cent, in Latvia 2.3 per cent, and in Lithuania 3.5 per cent).

As a result of the Russian financial crisis (1998-1999) and the loss of the Russian market, the unemployment rate rose sharply in 2000s reaching the record high – 12.8 per cent in Estonia and 16.5 in Lithuania (see Figure 2). According to the Eurostat, the unemployment rate in the Baltic countries was in 2006 lower than that in Finland and Sweden but much higher than that in Norway.

Figure 2. Unemployment rate in % in 1998-2006



The ratio of the long-term unemployed provides one measure of labour market flexibility (Europe in Figures, 2007). Long-term unemployed (persons in the labour force or among the unemployed persons, who have been without work for a long time, i.e. have been seeking employment for 12 months or more) form a significant part of all unemployed persons in Estonia. The long-term unemployment rate in Estonia (4.2 per cent) is close to that in Latvia and Lithuania. Corresponding figures are: for Finland - 2.2, for Sweden – 1.2 and for Norway – 0.9 per cent.

In Estonia a very serious problem is structural unemployment. It means that the skills and qualifications of the employees do not correspond to the demands of the labour market. Structural unemployment has been mentioned as the main reason for long-term unemployment in Estonia. It means that those people who have been released from enterprises mainly because of lay-offs are very often not ready to acquire modern skills and to adjust to the changes in the labour market and therefore are likely to become long-term unemployed.

Influence of unionization on the flexibility of labour and wages is addressed directly in the wage bargaining models. Bargaining models ultimately lead to a loss of efficiency due to distortions that trade unions cause to firms' labour demand decisions. Sectoral or occupational labour unions represent a monopoly on the labour market thus having a power to set the wage higher than a competitive level. This can have two possible outcomes on national wages and employment depending on the degree and importance of union coverage. First, the overall employment may be reduced as firms demand less workers if wages are high. Second, firms may just lay off some unionized workers, inducing a potential increase in the supply of non-unionized labour whose wages will then fall. Taking into account these possible lay-offs, a standard unions' trade-off would be higher wages vs. higher employment.

The bargaining coordination across firms and sectors in Estonia is weak. Estonia has a tripartite negotiating body at the national level. The Confederation of Trade Unions issues recommendations on the wage developments, but these are not binding for the concrete bargaining that takes place at lower levels. Also, bilateral bargaining at the national level sets the statutory national minimum wage. There is no obligatory wage indexation in Estonia.

The main level of collective wage negotiations is therefore the enterprise. In general, the firms of a given sector are quite diverse in terms of productivity, and employers are reluctant to delegate bargaining power to their sectoral organizations, which operate mostly as lobbies.

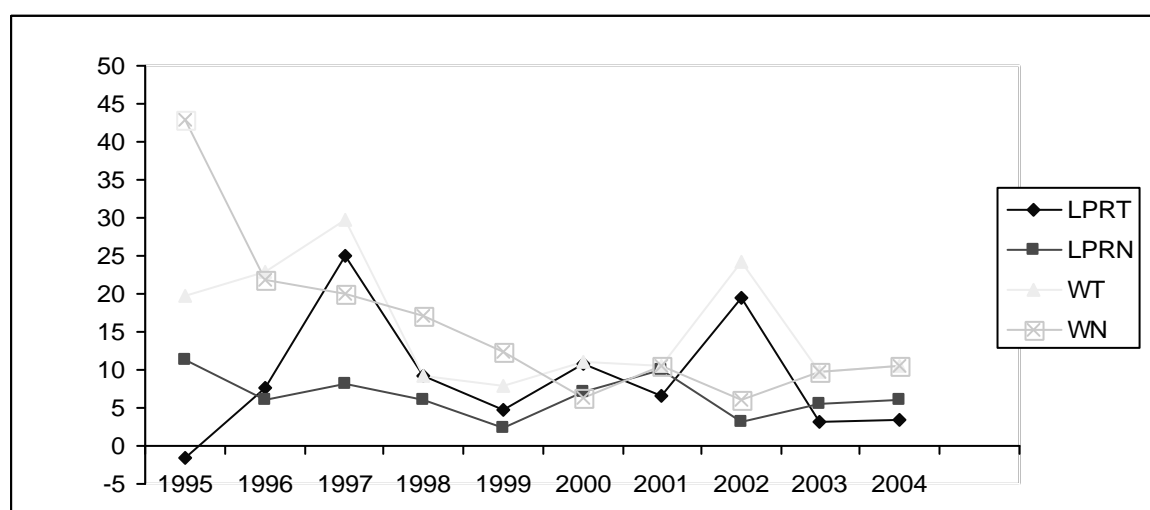
This low bargaining coverage is mostly related to low union presence, in particular in small and medium-sized firms in the private sector. Similarly to the majority of the former Soviet Republic's Central and Eastern European countries the average union membership in Baltic countries has significantly declined during independence and is much lower than in most of European countries. For international comparison of unionization is widely used union density, which express union membership as a proportion of the eligible workforce. The union density in Estonia is estimated at 12.9 per cent, which is much lower than in Finland and Sweden. According to Eironline the union density in Finland and in Sweden was 80-89 per cent and in Norway 70-79 per cent. Latvian union density is close to Estonia (10-19 per cent)

Similarly, Estonian tax legislation doesn't provide discouraging incentives for labour market participants. The income tax rate is flat at 22% (2007), and the unemployment benefits are the lowest in EU. The unemployment allowance (63.9 EUR per month) is paid to the unemployed who do not qualify or have exhausted the right to unemployment insurance benefit. The unemployment insurance fund was introduced in 2001. The contributions to this fund are divided between employer and employee (respectively 0.5% of total payroll and 1% of one's wages). The size of insurance payment depends on the person's previous average wage and the upper limit of the monthly payment is 50% of triple national average wage.

The subsistence benefit is paid to persons whose monthly income after paying for the dwelling remains below the subsistence line. Rõõm (2003) found that there is no effect of unemployment benefit and social assistance on the reservation wage in Estonia.

Important indicator of labour market flexibility is the relation between wage and productivity growth. Figure 3 shows that productivity growth in manufacturing (exposed sector) has been higher than in the market services (sheltered sector).

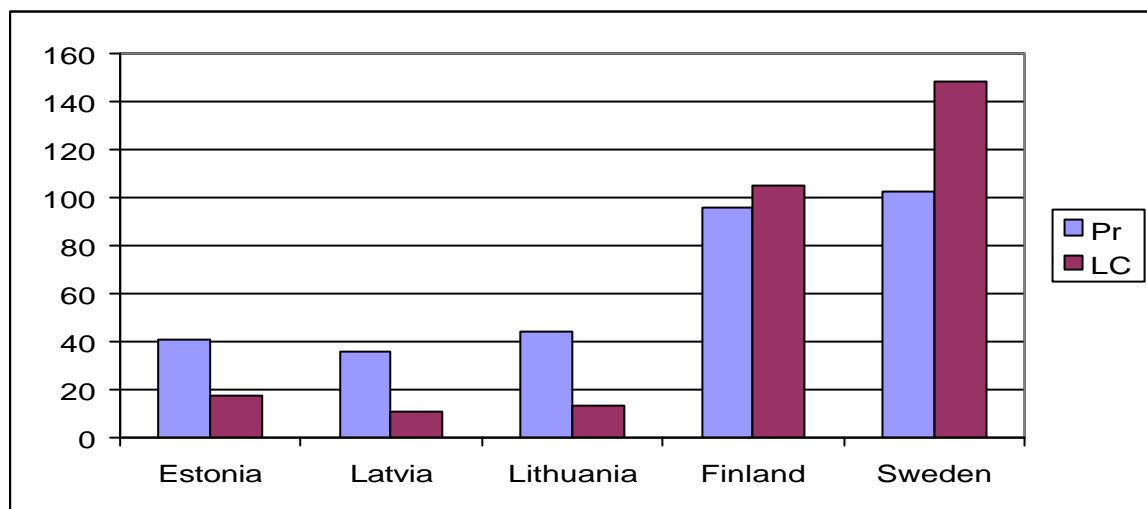
Figure 3. Productivity (LPRT) growth and wage (W) growth in exposed (T) and sheltered (N) sectors in Estonia in 1995-2004, (%).



Source: Estonian Statistical Office, authors' calculations

Figure 3 shows also that wage growth has been largely outperformed by productivity growth. This is a result of very low initial wages in Estonia relative to the EU countries and a consequent pressure on wages to converge with the EU countries. Second, there has been significant correlation between the wage increases and the productivity increases indicating that the efficiency wage explanation may be relevant in Estonia. If we compare labour cost and productivity in all considered countries (figure 4) we can confirm these conclusions for the all Baltic States.

Figure 4. Labour productivity (Pr) per hour worked and average labour costs (LC) in industry and services relative to EU-15 (EU-15 = 100) in 2004



Source: Eurostat

4. Empirical results

To test the relevance of wage setting to theoretical models we estimated wage equations for the Estonian aggregated sectors - manufacturing, market services and public services as follow.

$$\text{Log}(W) = c_0 + c_1 \log(\text{UR}) + c_2 \log(\text{CPI}) + c_3 \log(\text{LPR}) + e$$

Where: W is sector's wages, UR is unemployment rate, CPI is consumer price index, LPR is labour productivity in the sector.

Data is taken from the Estonian National Accounts, 1995-2004. The results are given in Table 1. This form of wage equation is standart and allows testing wage flexibility for unemployment, degree of wage indexation and response to labour productivity growth. We also test a concept of 'wage leader' sector as in the Scandinavian model (see, for example, Lindbeck 1979), Layard et al. 1991; Bradley and Whelan 1995) including labour productivity in manufacturing in other aggregated sectors.

As you can see from the Table 1, first, wages in manufacturing depend positively on consumer prices and on labour productivity in manufacturing; they depend negatively on unemployment rate. This is a fairly traditional equation for wages in manufacturing (see Bradley et al. 2001).

Second, wages in market services depend positively on productivity in this sector and on consumer prices. Labour productivity in manufacturing is statistically

insignificant. This is the evidence against the Scandinavian model hypothesis in case of Estonia.

Finally, wages in public services depend positively on inflation and on productivity in this sector. Labour productivity in manufacturing is also statistically insignificant.

Table 1. Estimation results of wage equations in manufacturing sector, service sector and public sector in Estonia (1995-2004)¹

Independent variable	Manufacturing wages (WT)	Public services wages (WG)	Market services wages (WN)
Intercept	0.074 (0.079)	-2.893 (-2.246)	-2.369 (-2.06)
Unemployment (UR)	-0.037 (-0.702)	-0.206* (-2.258)	-0.07 (-0.18)
Consumer price index (CPI)	0.758** (6.835)	1.013** (7.191)	0.83** (7.562)
Labour productivity in manufacturing	0.732** (9.73)	0.131 (0.722)	0.137 (0.692)
Labour productivity in public sector		0.895** (4.253)	
Labour productivity in services			0.78** (3.381)
Adjusted R-squared	0.996	0.996	0.997
F-statistics	946.9	635.2	917.5
Observations	10	10	10

¹ *t*-statistics are given in parentheses;

*, ** significant estimates at the 5% and 1% significance level.

Overall, the results show wage indexation *de facto* that is less than 1 in manufacturing and market services. The estimation also shows negative signs for the unemployment rate coefficient in all sectors, but the statistical significance is low.

To compare these results with the Baltic and Nordic states we estimate aggregated wage equations for Norway, Sweden, Finland, Latvia and Lithuania. The structure is the same as for Estonia. For the estimation we used yearly statistical books of national statistics of these countries. The results obtained presented in the Table 2.

Table 2. Estimation results of wage equations in Baltic and Nordic States (1997-2004)¹

Independent variable	Norway	Sweden	Finland	Latvia	Lithuania
Intercept	6.17 (1.22)	3.602 (1.46)	-2.13 (-0.37)	-4.69 (-2.39)	11.45 (3.02)
Unemployment	0.15	-0.09*	0.46	-0.41	-0.29*

(UR)	(2.35)	(-4.42)	(2.12)	(-0.23)	(-3.4)
Consumer price index (CPI)	0.76 (0.7)	1.33 (2.49)	0.108 (0.127)	1.8** (4.48)	-0.83 (-1.02)
Labor productivity	0.49** (11.61)	1.037** (19.3)	1.31** (4.77)	0.73** (25.16)	0.23* (2.55)
Adjusted R-squared	0.996	0.99	0.966	0.99	0.817
F-statistics	972	241	68	240	9.96
Observations	8	8	8	8	8

¹ *t*-statistics are given in parentheses;

*, ** significant estimates at the 5% and 1% significance level.

We can observe from the Table wage flexibility for unemployment for Latvia, Lithuania and Sweden. Statistical significant for Latvia is low. Increasing wage flexibility for Sweden confirms by several empirical research (Barkbu and al. 2003, Lundborg 2005, etc.).

Strong and significant relation between wages and labour productivity for all considered countries can be observed. Wage is elastic for Nordic countries (Norway is exception because of oil price fluctuation) and inelastic for Baltic states. The main reasons of that are the level of unionization and bargaining coordination. Wage indexation was not proven empirically because of low statistical significant.

Taking into account the low unionization of the labour market it is reasonable to assume that wage determination in Estonia follows the efficiency wage model (Beckerman and Jenkinson 1990; Nickell and Wadhvani 1990, Blanchflower et al. 1996). In the previous works (Fainstein et al. 2005) we test this hypothesis using micro data. Our objective was to test if there is a positive relationship between wages and profits. Basis on the financial data of enterprises we found a significant rent sharing using gross profits per employee.

In this paper we tried to prove rent-sharing model using aggregated data. We regress relative wages on labour productivity by economic sectors for Estonia and considered above countries. We estimated the following equation in panel data techniques.

$$\text{Log}(\text{RW}_{ij}) = c + \log(\text{LP}_{ij}) + e$$

where: RW is relative wage,

LP is labour productivity (GDP per worker),

i number of economic sector, j-year.

The estimation results are presented in the Table 3.

Table 3. Panel data estimation for relative wages and labour productivity¹

	Estonia	Norway	Sweden	Finland	Latvia	Lithuania
Independent variable	relative wage	relative wage	relative wage	relative wage	relative wage	relative wage
Labour productivity	0.73** (13.1)	0.4** (9.82)	0.47** (8.19)	0.12** (4.8)	0.4** (8.23)	0.19** (4.77)
Adjusted R-squared	0.83	0.57	0.59	0.21	0.84	0.21

F-statistics	53	84	56.3	5.91	43.1	22
Observations	36	62	38	24	104	78

[†] t-statistics are given in parentheses;

*,** significant estimates at the 5% and 1% significance level.

We found statistically significant relation between relative wages and labour productivity by aggregated economic sectors for all considered countries. This is not surprising result for the Nordic States because it widely confirmed in literature (Lundborg 2005, Nymoen et al. 2003 etc.). Large wage elasticity for Estonia could be explained by high level of aggregation. Anyway this is an additional evidence for wage sharing model in Estonia. This estimation also shows the similarity of the Baltic states labour markets in this respect.

5. Regional labour market adjustment

There is a widespread opinion in literature that EU labour market problems (including unemployment and wage formation) are substantially regional problems of countries and the labour market risk of EMU results from the high probability of regional-specific asymmetric shocks (Abraham 1996, Calmfort 1998). Accession of East-European countries into the EU was accompanied by increasing of regional disparities (Petracos 1996, 2000). This includes increasing of regional differences in labour market performance. So the problem of regional wage flexibility is extremely important in this context.

In this part we investigate the responsiveness of regional wages to regional labour market conditions which is an important indicator of whether or not wages can serve as an equilibrating mechanism and shock absorber on regional level (Iara and Traistaru 2003).

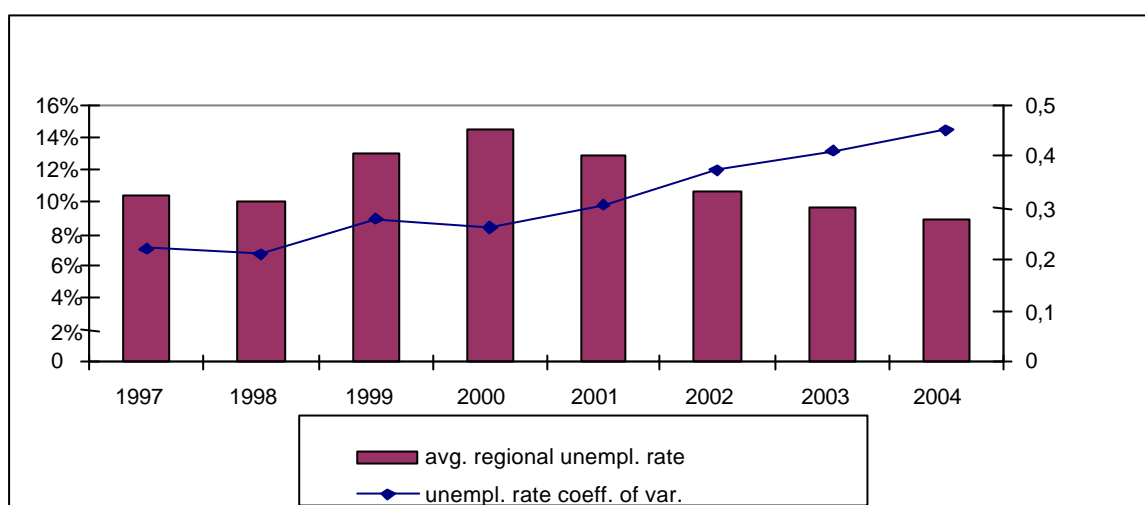
The wage curve model, which indicates relationships between wage level and local unemployment rate, was first defined by Blanchflower and Oswald (1994). They show a high sensitivity of wages to local market conditions in developed countries. They also documented that these countries have a negative unemployment elasticity to pay that is similar in all researched countries, approximately -0.1.

For the estimation of wage curve for the Estonian labour market we used regional average yearly real wages on NUTS3 level (we deflated nominal data by CPI) and regional unemployment rates for the same regional level.

Figure 5 shows average regional unemployment rates. We can see a U-shape development. Unemployment increased until 2000 and than began to decrease. The regional disparities in unemployment essentially increased during the period of 1997-2004 (the coefficient of variation increased by 23%).

In Figure 5 we can see that average regional real wages increased during the period of analysis by 49%. Unfortunately, this does not mean a proportional increase of the Estonian wage-earners domestic purchasing power because the Estonian Consumer Price Index (CPI) does not include the prices of some important cost articles (for example, living spaces). The Estonian CPI increased only 29% during the period 1997-2004. Generally, the prices of Estonian living spaces increased more than 200% in the same period.

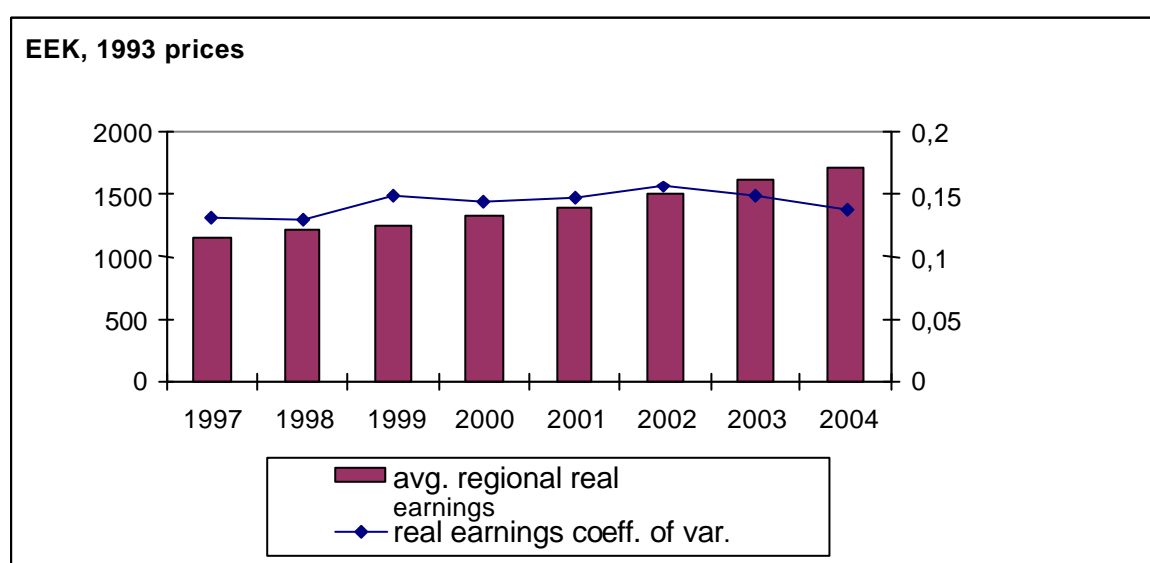
Figure 5. Estonian regional unemployment rates



Source: Estonian Statistical Office (2002, 2005)

The regional disparities in wages remain more or less stable, in spite of increasing disparities in unemployment rates. It means existing of inter-regional spillover of wages that makes the labour market less flexible.

Figure 6. Estonian regional monthly average real wages



Source: Estonian Statistical Office (2001, 2002, 2005)

Based on the panel we estimate the following fixed effect model:

$$\log(W_{ij}) = \log(U_{ij}) + \alpha_i + \mu_j + e_{ij}$$

where W_{ij} is yearly average wage in region i in year t ,

U_{ij} is unemployment rate in region i in year t ,

α_i is a time invariant region specific effect

μ_j is a region invariant time specific effect

e_{ij} is the remainder stochastic error term

Because for transition countries time is a very important factor, we estimate separately models for the periods when regional unemployment increases and for the periods when regional unemployment decreases. The estimation results are presented in Table 4.

Table 4. Panel data estimation for regional wages and regional unemployment rates¹

Model	1997-2000	2000-2004	1997-2004
Independent variable	Regional wages (W_{ij})	Regional wages (W_{ij})	Regional wages (W_{ij})
Unemployment rate (U_{ij})	-0.06 (-1.57)	-0.06* (-2.45)	-0.05** (-3.09)
Regional dummies	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes
Adjusted R-squared	0.92	0.95	0.96
F-statistics	261	392	416
Total panel observations	60	75	120

¹ t-statistics are given in parentheses;

*,** significant estimates at the 5% and 1% significance levels.

We can observe negative and statistically significant relationship between regional wages and unemployment rates as theory predicts. For the years of increasing unemployment rates the result is less significant. The level of unemployment elasticity to pay is less than the predicted level (0.1) but large enough to serve as an equilibrating mechanism to local labour market conditions.

6. Conclusions

Increasing of labour market flexibility through improving of labour mobility and wage formation will have to be very important aim of Estonian economic policy. Because in Estonia the Trade Unions are relatively weak and wage bargaining is decentralized, the wage determination can be explained by the efficiency wage model. However our empirical finding shows a substantial rent-sharing in the Estonian wages which could induce imbalances in wage formation and labour market equilibrium.

For comparison we estimated wage equations for Norway, Sweden, Finland, Latvia and Lithuania. We found similarity for wage response to unemployment and labour productivity for Baltic States. Wage formation in Nordic countries is more rigid. Our analysis of relation between wage formation and inflation in Estonia shows that since there is no obligatory indexation of wages, in market sectors inflation parameter is significant and less than 1. It means that wages are not fully indexed *de facto*. Indexation in the sheltered sectors is the highest and in the exposed sectors it is the lowest. Absence of full indexation is a sign of labour market flexibility.

To prove rent-sharing model we regress relative wages on labour productivity by economic sectors for Estonia and considered above countries. We found statistically significant relation by aggregated economic sectors for all considered countries.

Empirical estimation of wage function in regional level shows that regional wages can respond to local market condition and therefore serve in some extent as a shock absorber in regional level.

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