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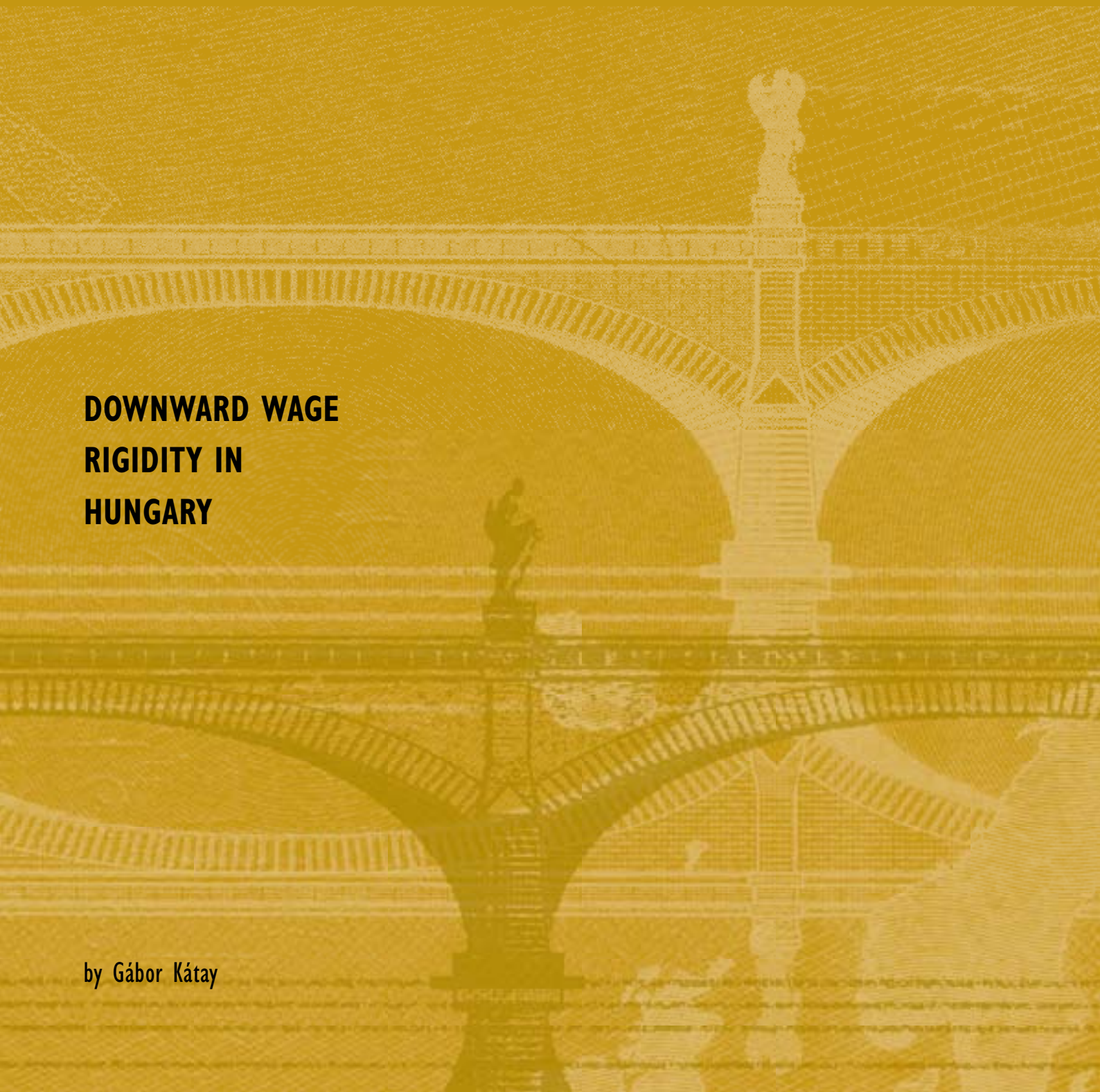

DOWNWARD WAGE RIGIDITY IN HUNGARY

by Gábor Kátay

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1 Magyar Nemzeti Bank, Department of Economics, 1850 Budapest, Szabadság tér 8-9, Hungary; e-mail: katayg@mnb.hu

Wage Dynamics Network

This paper contains research conducted within the Wage Dynamics Network (WDN). The WDN is a research network consisting of economists from the European Central Bank (ECB) and the national central banks (NCBs) of the EU countries. The WDN aims at studying in depth the features and sources of wage and labour cost dynamics and their implications for monetary policy. The specific objectives of the network are: i) identifying the sources and features of wage and labour cost dynamics that are most relevant for monetary policy and ii) clarifying the relationship between wages, labour costs and prices both at the firm and macro-economic level.

The WDN is chaired by Frank Smets (ECB). Giuseppe Bertola (Università di Torino) and Julián Messina (World Bank and University of Girona) act as external consultants and Ana Lamo (ECB) as Secretary.

The refereeing process of this paper has been co-ordinated by a team composed of Gabriel Fagan (ECB, chairperson), Philip Vermeulen (ECB), Giuseppe Bertola, Julián Messina, Jan Babecký (CNB), Hervé Le Bihan (Banque de France) and Thomas Mathä (Banque centrale du Luxembourg).

The paper is released in order to make the results of WDN research generally available, in preliminary form, to encourage comments and suggestions prior to final publication. The views expressed in the paper are the author's own and do not necessarily reflect those of the ESCB.

Address
Kaiserstrasse 29
60311 Frankfurt am Main, Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main, Germany

Telephone
+49 69 1344 0

Internet
http://www.ecb.europa.eu

Fax
+49 69 1344 6000

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CONTENTS

Abstract

Following the approach recently developed for the International Wage Flexibility Project (IWFP), the paper presents new estimates of downward real and nominal wage rigidity for Hungary. Results suggest that nominal rigidity is more prominent in Hungary than real rigidity. When compared to other countries participating in the IWFP, Hungary ranks among the countries with the lowest degree of downward real rigidity. The estimated downward nominal rigidity for Hungary is higher, the measure is close to but still below the overall cross-country average. Using the same methodology, the paper also confirms the widespread view that the wage growth bargained at the national level has little compulsory power in Hungary. On the other hand, the minimum wage remains an important source of potential downward wage rigidity in Hungary.

JEL classification: C23, E24, J3, J5

Keywords: Downward nominal and real wage rigidity, wage change distributions, wage flexibility

Non-technical summary

In recent years there has been a growing interest in the extent of downward wage rigidity, motivated by the concern that low inflation might hamper the adjustment of relative wages if workers are reluctant to accept reductions in their nominal wages. In a low inflation environment, workers' aversion to wage cuts may lead to higher and more persistent unemployment, as employers are forced to layoff workers in order to keep costs low. It is not surprising then that a growing number of studies concentrate on estimating the downward nominal wage rigidity (DNWR) and the downward real wage rigidity (DRWR) and their effect on the optimal inflation or the real economy. One of the most notable recent evidence on downward wage rigidity is the comprehensive work of the International Wage Flexibility Project (IWFP), which initially involved over forty researchers with access to micro level earnings data for 16 countries. Later, in the context of the Wage Dynamics Network (WDN), new results using the same methodology were produced for a number of European countries. The primary goal of the project was to map and possibly to explain cross-country differences in DNWR and DRWR using similar micro data and a common methodology for all countries.

Following the same approach, the present paper discusses new estimates of downward real and nominal wage rigidity for Hungary. The estimated measures indicate the fractions of workers who are potentially subject to downward nominal and downward real wage rigidity, i.e. the fraction of those who would received nominal or real wage freeze instead of nominal or real wage cut in the absence of rigidity. Results suggest that nominal rigidity is more prominent in Hungary than real rigidity. The estimate of the fraction of workers potentially affected by downward nominal wage rigidity is on average 0.344 while the average downward real rigidity estimate is 0.097. When compared to other countries participating in the IWFP, Hungary ranks among the countries with the lowest degree of DRWR. The estimated DNWR for Hungary is higher, the measure is close to the overall cross-country average. Such combination of very low real rigidity and moderate nominal rigidity places Hungary among countries with relatively high wage flexibility. However, the estimated measures say nothing about the specific wage component through which the adjustment takes place. Previous survey results suggest that base wage is generally rigid and employers use regular and irregular bonuses to adjust labour costs to shocks.

These results are consistent with the institutional background in Hungary. Based on previous findings, downward wage rigidity is highly related to the specific institutional

features of the countries. The Hungarian labour market is much less regulated than most of the eurozone countries, which gives firms a lot of freedom for adjustments. The wage setting process is largely dominated by individual company or plant level agreements. The coverage of industry-wide or occupational wage agreements is less than 40%, which is very low in international comparison. The national level tripartite forum, the National Interest Reconciliation Council (Országos Érdekegyeztető Tanács, OÉT) only provides recommendations for wage increases and set the level of the legally guaranteed minimum wage. The recommendation for the average wage growth is not legally binding nor is it meant to be blindly followed. In fact, OÉT also recommends a minimum and a maximum level of wage increases and suggests firms and unions to set wage increases within this range rather than automatically accepting the average value. The automatic wage indexation mechanism - the principal source of DRWR - is practically unknown in the country.

The paper also confirms the widespread view that the wage growth bargained at the national level has little compulsory power in Hungary: the estimated proportion of workers being subject to downward rigidity due to the bargained wage is close to zero. On the other hand, the minimum wage is an important source of potential downward wage rigidity: although at the time of writing the paper, the level of the minimum wage in Hungary cannot be considered as excessive, the share of the workforce earning below or close to the minimum wage is very high in international comparison.

1 Introduction

In recent years there has been a growing interest in the extent of downward wage rigidity, motivated by the concern that low inflation might hamper the adjustment of relative wages if workers are reluctant to accept reductions in their nominal wages. The presence of downward wage rigidity is particularly relevant in light of the increasing popularity of implicit or explicit inflation targeting systems adopted by central banks. The targeted inflation rate is very low in most of the industrialized countries, often 2% or less. In such a low inflation environment, workers' aversion to wage cuts may lead to higher and more persistent unemployment, as employers are forced to layoff workers in order to keep costs low.

It is not surprising then that a growing number of studies concentrate on estimating the downward nominal wage rigidity (DNWR) and the downward real wage rigidity (DRWR) and their effect on the optimal inflation or the real economy. Early papers use macro data to estimate wage rigidity. However, such studies are unable to differentiate the effects of downward real and nominal rigidity from each other or from other concepts of rigidity.

Since the beginning of this century, many researchers turned their attention to individual-level wage data and found diverse results for different counties. For instance, Smith (2000) and Nickell and Quintini (2003) found much less evidence of DNWR in the UK than in US, whereas Knoppik and Beissinger (2001) found substantial DNWR in Germany. However, it was not clear whether these are differences in cross-country variation or simply methodological differences.

The need for a clearer view on the growing number of unanswered questions gave birth to the International Wage Flexibility Project (IWFP). It is a comprehensive multi-country study which primarily aims at demonstrating the existence and measuring the extent of downward nominal and real wage rigidity for continuing workers. Coordinated by Erica Groshen (New York Federal Reserve) and William Dickens (Brookings Institution), the project initially involved over forty researchers with access to micro level earnings data for 16 countries.

The first goal of the IWFP was to map and possibly to explain cross-country differences in DNWR and DRWR using similar micro data and a common methodology for all countries. The first findings of the project are summarized in Dickens et al. (2007). The methodology is described in details in Dickens and Goette (2006). The participants

found notable differences in both real and nominal downward wage rigidities across countries. For instance, wage changes in Ireland are relatively flexible, downward rigidity in nominal or real wages are both low. For other countries like Netherlands, Greece or the US, DNWR is an important factor, but not the DRWR. For Finland, Sweden and Portugal, both downward real and nominal rigidity are considerable. The authors examined a large set of institutional variables in order to explain these differences, but only union density proved to be relevant in explaining downward real rigidity.

Later, the Wage Dynamics Network (WDN) gave a new impulse to the IWFP. While the original IWFP included a large number of countries, the coverage of European countries was incomplete and, in some cases, the samples were very outdated. In the context of the WDN, new results using the IWFP methodology were produced for Belgium (Caju et al. (2009)), Luxembourg (Lünnemann and Wintr (2009)), Spain (Messina et al. (2010)) and for Hungary (this paper).

Last but not least, Messina et al. (2010) investigated sectoral differences in DRWR and DNWR using the same IWFP methodology for four eurozone countries (Belgium, Denmark, Portugal and Spain). They found that although downward wage rigidity differs significantly across sectors, national factors dominate. The authors find evidence of higher real wage rigidity for prime-age and white-collar workers in line with efficiency wage theories. Regarding structural factors affecting wage rigidities, they find that more decentralized wage agreements is associated with a higher degree of real wage flexibility.

In line with other studies conducted within the IWFP framework, this paper estimates the measures of DNWR and DRWR for Hungary. These measures indicate the fractions of workers who are potentially subject to downward nominal and real wage rigidity. The analysis is motivated by several reasons. First, Hungary is the first CEE country involved in the IWFP, which may provide an interesting point of comparison or contrast to previous findings given the discrepancies in the institutional structures and the economic background between this region and the other - mostly Western-European - countries for which similar results are available. Second, the estimation results provide valuable additional information about wage rigidity in Hungary, where the negative effects of downward nominal wage rigidity have been alleviated so far by the relatively high inflation history. In other words, it helps to explain the causes and predict the consequences of wage rigidity during the current crisis when productivity dropped significantly and in the hopeful future when price stability with low inflation will be achieved in Hungary. Accordingly, potential downward nominal and real wage rigidity is also of primary

concern for monetary policy in setting the optimal inflation target. Finally, the research provides useful input for any analysis on the costs and benefits of Hungary's eurozone accession when the country loses its own monetary and exchange rates instruments and adjustment through wages to negative shocks gain importance.

The methodology, summarized in the next section, follows the same approach as in other IWFP papers, whereby resistance to nominal and real wage cuts is measured through the difference between the observed individual wage change histogram and the estimated counterfactual wage change distribution that would have prevailed under the absence of rigidity. Section 3 presents the dataset I use, then Section 4 describes the economic and institutional background and discusses wage flexibility in Hungary based on previous empirical research and the observed wage change distributions. Estimation results are presented in Section 5. I also explore two other possible sources of downward rigidity, namely the bargained wage growth at the national level tripartite forum, the National Interest Reconciliation Council (Section 5.2) and the statutory minimum wage (Section 5.3).

2 Econometric methodology

The methodology follows the approach developed for the IWFP, as described in details in Dickens and Goette (2006). It is based on the following assumptions: (1) in the absence of rigidity the distribution of wage changes would be symmetric, (2) the rigidity does not affect wage changes above the median and (3) the symmetric (often referred to as notional or counterfactual) wage change distribution is well approximated by a two-sided Weibull distribution.[1] The motivation behind using a two-sided Weibull distribution is that a typical wage change distribution clearly diverges from the normal distribution even at the right tail unaffected by rigidity: workers' wage changes are tightly clustered around the median change, which makes the distribution much more peaked with fatter tails compared to the normal. Previous empirical findings show that the Weibull distribution generally fits well the histogram above the median. Once the notional distribution is estimated, nominal and real wage rigidity are measured as the deviation of the observed wage change histograms from the estimated notional wage change distribution that would have prevailed under the absence of rigidity.

Figure 1 presents a hypothetical wage change distribution and the asymmetry caused by downward wage rigidity. The left tail of the distribution shows that a fraction of workers facing hypothetical wage cuts are subject to downward nominal rigidity and experience a wage freeze instead. This effect leads to asymmetric histogram with fewer wage cuts and a spike at zero. Similarly, a fraction of workers affected by downward real wage rigidity are piled up in the histogram cell containing the (expected) rate of price inflation.

Based directly on the histogram, we can construct simple measures of downward nominal and real wage rigidity without estimating the shape of the notional distribution. These measures show the fraction of workers affected by downward nominal or real wage rigidity, i.e. the fraction of those who received nominal or real wage freeze instead of nominal or real wage cut. For downward nominal wage rigidity, this fraction is equal to the ratio of the number of workers receiving no wage change to the total receiving no wage change plus those receiving a cut. As for downward real wage rigidity, the concept is

[1] The cumulative density function of a two-sided Weibull distribution is defined as:

$$F(x) = \begin{cases} .5\exp\left(\frac{x-\mu}{\beta}\right)^{\alpha} & \text{for } x \leq \mu \\ 1 - .5\exp\left(\frac{x-\mu}{\beta}\right)^{\alpha} & \text{for } x > \mu \end{cases}$$

with the three parameters allowing variation in the mean (μ), the dispersion (β) and the peakedness (α).

also based on the asymmetry caused by the rigidity. In this case, the measure of DRWR is the fraction of observations missing from the area below the expected inflation rate as compared to the equivalent area at the right hand side from the median, i.e. the part starting from the median plus the distance between the median and the expected rate of inflation. However, inflation expectations can differ between firms and individuals, so there is no single point at which all workers subject to DRWR pile up. Assuming that the distribution of expectations is symmetric, half of the workforce - for which inflation expectations are lower than the average - susceptible to DRWR will not be missing from the area to the left of the mean expected rate of inflation. Thus, we obtain a correct measure of DRWR by multiplying the missing observations in the lower tail by two.[2]

Nevertheless, these simple measures are potentially subject to a number of biases, the most important being bias due to measurement errors. Reporting and recording errors create spurious variance in wage changes and false wage cuts. The IWFP method for correcting for measurement errors is based on the findings of Abowd and Card (1989), suggesting that all serial correlation in wage changes is due to measurement error. That is, the methodology uses the assumption that any observed wage change which is compensated the following year is an error.[3]

Using annual income data instead of monthly wages causes two additional problems. First, if wage changes are not exactly synchronized with the period over which income is observed the change in annual earnings from period $t-1$ to period t confounds wage changes that took place during the period $t-1$ with the one during the period t. Second, it is easy to see that it creates a positive autocorrelation in the observed earning change which contradicts the basic assumption of the error correction method. In order to overcome these difficulties, Dickens and Goette (2006) modified the original version of the error correction method and extended the methodology to annual income data. As an additional moment condition, this procedure uses external information that gives the fraction of wage changes normally taking place at different months of the year. In our case, this information comes from the Hey group survey.

[2] The mean expected rate of inflation is estimated from a regression of the current year's inflation on the previous year's inflation.

[3] Probably the best way to show the merits of the correction method is to use it on the Portuguese data. This latter dataset contains two earning variables: a highly reliable base wage and a total earnings with higher error rate. The error correction technique yields negligible correction to the one that measures the base wage, but makes substantial correction to the earnings measure. After correction, the distribution of earnings becomes very close to the distribution of base wage. For details about the method and its assumptions, see Dickens and Goette (2006).

The Mixed method of Moments (MMM) estimates of downward nominal and real rigidity consists of fitting a simple model of wage changes to the "true" distribution corrected for measurement errors. The procedure jointly estimates the three parameters of the symmetric two-sided Weibull distribution, the mean and the standard deviation of the expected price inflation rate as well as the share of workers affected by DNWR and DRWR using a wide range of iterative optimization routines. The main advantage of the MMM estimates of downward rigidity over the simple measures (even if computed on the error-corrected histogram) is that the latter shows the fraction of workers *actually affected* by downward rigidity. On the contrary, the model behind the MMM procedure explicitly includes the probability of being subject to downward wage rigidity and thus gives an explicit estimate for the fraction of workers *potentially affected* by downward rigidity, independently of the level of price inflation, productivity growth or any other macroeconomic conditions.

3 The data

The database consists of the National Pension Insurance records of a random sample of nearly 200 000 individuals for the years 2000-2004. The first step of the sampling process was to select a random sample of individuals, representative of the population with respect to age, gender and geographical area for the year 2004. The database was then completed with the selected individuals' data for the previous years. The records include information on annual income, the source of income (employee in private or public sector, self employee, maternity leave, disability or other transfers...) and the starting and ending date belonging to each specific source. If a person has two or more sources of income, parallelly or one after the other, the two sources and the corresponding periods are recorded in separate cells.

I kept only employees in private sector with continuous employment status, that is, individuals who have worked at least two whole consecutive years. As a result, the sample size dropped to 48 289 workers. I also excluded all minimum wage earners (or who earn less than the statutory minimum wage) and ended up with an unbalanced panel of 29 003 workers. Although it is an important source of downward rigidity, excluding minimum wage earners is crucial for at least two reasons. First, anecdotal evidence and several empirical researches suggest that a large fraction of employees officially paid at the minimum wage are remunerated by way of cash payment hidden from the tax

authorities in addition to the declared minimum wage. In each year, the histogram is distorted by a false huge peak at the growth rate of the minimum wage, which may bias the estimated parameters of the Weibull distribution.[4] Second, as the minimum wage was frozen in 2003 and it was raised by about the inflation rate in 2004, therefore leaving minimum wage earners in the data would lead to spurious DNWR in 2003 and DRWR in 2004. It is probable that the adjustment takes place through the undeclared part of the income, whereas the declared part (observed in the dataset) seems to be rigid. This issue is further discussed in section 5.

4 What do we expect? - Some stylized facts

The period under investigation is characterized by high and quickly decreasing inflation, relatively stable labour productivity growth around 5% and a series of large-scale economic policy shocks. In 2001, the crawling peg regime was replaced by inflation targeting system and an ambitious disinflation strategy was announced. As a result, the inflation dropped from 9.2% to 4.7% in just two years but due to an increase in indirect taxes, the inflation raised to 6.8% in 2004. As the fast disinflation took the agents by surprise, inflation expectations remained stuck at a high level at the beginning of the period and adjusted only slowly afterward, which may have led to overly high nominal wage agreements.

Beside the unexpected disinflationary trend, two other policy measures have contributed to the limited adjustment of nominal wages to the falling inflation. First, the minimum wage was nearly doubled in two steps in 2001 and 2002. Second, the sharp wage increase in the public sector in 2002 (+29.2%) coupled with an increase in government employment in 2002 (+1.5%) and 2003 (+3.3%) might also have fed through into wages in the private sector. The strong upward pressure on wages has hit different sectors in different ways and led to a new wave of economic restructuring from labour-intensive towards capital-intensive industries.[5]

[4] This distortion is clearly visible during the two excessive hikes of the statutory minimum wage in 2001 (+57%) and 2002 (+25%). When minimum wage earners are included in the sample, the distortion is so large that the estimation procedure does not converge for these years, the routine is unable to produce results.

[5] The primary victims of the rise in labour costs were companies in the textile industry. Wage push combined with the increasing competition from cheap Asian competitors forced more and more firms to

Under these circumstances, the observed wage persistence may equally reflect the effects of poorly anchored inflation expectations, government-induced wage shocks and/or rigid wages and macro data clearly cannot unambiguously discriminate between alternatives. Sluggish wage adjustment has always been a primary concern for the monetary authority as so far nominal wage growth has never been consistent with the targeted inflation rate.[6] On the other hand, real wages seemed to adjust quickly in periods of economic stabilization: net real wages[7] fell by a cumulative of 16% as a consequence of the austerity measures introduced by the government in 1995-1996 and although real wage growth remained positive after the second stabilization package in 2007, net real wages fell again by 2% (see figure 2)

The picture is clearer when looking at the micro data. Figure 3 presents the observed and the true wage change distributions of workers between 2001 and 2004.[8] Several remarks are worthwhile.

First, note that the empirical distribution has heavier tails and it is less peaked than the true distribution. The difference between the two distributions is generally limited with good quality administrative data. This is the case with the Hungarian dataset as well, although it seems that the correction engendered by the procedure is somewhat higher compared to the case of previous similar administrative datasets used within the IWFP, suggesting that recording errors are slightly more important in our case.

Second, the variance of wage changes is relatively high (Table 1), the distributions have broader tails than it is in general in eurozone countries. The large variance is partly the result of the absence of minimum wage earners from the sample. Furthermore, the fairly high volatility of economic data in general is a characteristic feature of transitional economies because of the quickly changing macroeconomic conditions and the higher uncertainty surrounding the future. Previous empirical studies also suggest that changes in workers' wages are more related to firm specific shocks than in Western-European countries. For example, Kátay (2008) showed that unlike in Italy or Portugal, even transitory productivity shocks translate into wage changes in Hungary. These findings

cut back on production, relocate operations or close down. Since early 2000, employment declined by more than 60% in this industry.

[6] See *any* Inflation Report.

[7] Net real wage is defined as the pay received by the employee after all taxes, pension insurance and social insurance fees and other employee expenses have been substracted from the gross wage agreed with the employer, divided by the consumer price index.

[8] The vertical lines denote current inflation.

point towards relatively flexible wages and give an explanation to the dispersed wage change distribution.

Third, a first look at the distribution clearly displays an indication of DNWR but reveals little evidence of DRWR. There is a visible spike at zero wage changes and a missing mass of observations below it, but the modest spike and the limited asymmetry around zero real wage change illustrate moderate DRWR. As shown in Table 1, the proportion of wage cuts is relatively high, especially if we consider that the average nominal wage growth as well as inflation and productivity growth were considerably higher in Hungary than in the eurozone and therefore the wage change distribution was more shifted to the right. DNWR was less of a concern in 2001 and 2002, when inflation and/or inflation expectations were stuck at a high level. The following two years, inflation expectations dropped considerably and, as a side effect, the fraction of nominal wage freeze doubled: DNWR was at work. At the same time, the fraction of wage cuts also increased, showing that a significant fraction of firms are not reluctant to cut nominal wages if needed.

There is, however, no sign to indicate significant DRWR. There are some small spikes in the positive wage change histograms, but the asymmetry around the focal points is limited. The graphs also show that the focal point lies around the inflation rate in 2001 and 2004, but it seems to lie above the inflation rate in 2002 and 2003, suggesting that in these two years, inflation expectations exceeded the realized level of inflation.

All together, previous empirical research and micro data suggest that wage changes are relatively flexible, DNWR is moderate and DRWR is very small. These priors are consistent with the institutional background in Hungary. Based on previous findings, downward wage rigidity is highly related to the specific institutional features of the countries.[9] The Hungarian labour market is much less regulated than most of the euro-zone countries[10], which gives firms a lot of freedom for adjustments. The wage setting process is largely dominated by individual company or plant level agreements. The coverage of industry-wide or occupational wage agreements is less than 40%, which is very low in international comparison. The national level tripartite forum, the National Interest Reconciliation Council (Országos Érdekegyeztető Tanács, OÉT) only provides recommendations for wage increases and set the level of the legally guaranteed minimum wage. The recommendation for the average wage growth is not legally binding nor is it

[9] See e.g. Dickens et al. (2007) or Messina et al. (2008).

[10] For a full review of the Hungarian labour market institutions, see Horváth and Szalai (2008)

meant to be blindly followed. In fact, OÉT also recommends a minimum and a maximum level of wage increases and suggests firms and unions to set wage increases within this range rather than automatically accepting the average value. The automatic wage indexation mechanism - the principal source of DRWR - is practically unknown in the country.[11]

5 Results

Downward nominal and real wage rigidity are estimated using the IWFP routine.[12] The mean expected inflation rate is estimated by a simple AR(1) model and the expectations are allowed to fluctuate between min(*current inflation, past inflation, mean expected inflation*) and max(*current inflation, past inflation, mean expected inflation*) +0.025 with a maximal variance of 0.0036. The choice of these parameters relies on the specificities of the Hungarian economy: in a transitional country with high and volatile inflation path, expectations are likely to fluctuate with rather high variance in a relatively large interval compared to the case of stable economies. Therefore, I increased the upper boundary of the expectations by 0.025 compared to the "baseline" routine and raised the maximal variance from 0.000036 to 0.0036.[13]

However, two other possible sources of downward wage rigidity may interfere with the results obtained in the previous estimation procedure. First, if the bargained wage growth by the unions at the sectoral or national level - which is often higher than the expected inflation rate - is binding for the firms, the focal point in the wage distribution may lie above the expected rate of inflation as firms are forced to increase employees' wages at least by the bargained rate. In order to address this issue, I also estimated the possible binding effect of the wage growth bargained at the National Interest Reconciliation Council. I only focus on the national-level recommendation for wage increases as the dataset I use does not include NACE codes and thus it cannot be linked to the

[11] In 2003, the OÉT agreed on real wage growth instead of nominal wage growth, but the agreement remained a simple recommendation and wages have not been reviewed and updated later on depending on the realized inflation. Hence, even this unique case cannot be considered as wage indexation. This was also the only year that no threshold was given around the recommended average wage increase.

[12] More precisely, I used the version updated on 15 November 2007.

[13] Without increasing the upper boundary, the routine gave unrealistically low values for the mean expectations. In case if we leave the maximal variance at its baseline value, the routine is unable to estimate the rigidity measures. Nevertheless, some robustness checks - not presented in this paper - show that further increasing these two values does not change significantly the results.

wage increases bargained at the sectoral level. I used the same routine developed for the IWFP, but instead of the expected inflation rate, I used the wage development recommended by the National Interest Reconciliation Council as possible focal point and explored its influence on individual wage agreements. The minimum and the maximum recommended wage growth rates are used to set the boundaries of the interval in which OÉT is expected to exert its impact.[14] Results are presented in Section 5.2.

Second, the existence of the minimum wage creates an additional downward wage rigidity missing from the estimated results. As the minimum wage is legally binding for all workers and thus by definition *all workers* are potentially affected by downward rigidity, the same logic and the same IWFP routine cannot be applied here even if high wage earners are unlikely to ever be influenced by the minimum wage. The number of workers actually affected by the level or the increase in the national minimum wage and the wage push engendered by the legislation depend on the actual macroeconomic conditions and the share of the workforce earning below or close to the new minimum wage agreed as a result of the tripartite bargaining process at the beginning of each year. Nevertheless, it is an important source of potential downward wage rigidity that must be taken into account.

5.1 Downward nominal and real wage rigidity

Figure 4 reports simple measures computed on the empirical and the true distributions together with the MMM estimates of DNWR and DRWR for the period 2001-2004. By construction, all these measure vary between zero and one, where zero indicates perfect flexibility and one indicates full rigidity. As expected, the simple measures increase after the error correction. The figure also shows that MMM estimates provide similar results to the simple measures, with a somewhat higher DNWR and a somewhat lower DRWR. These differences are in line with the rigidity measures obtained for other countries.

Overall, nominal rigidity appears to be more important in Hungary than real rigidity. Estimate of the fraction of workers potentially affected by downward nominal wage rigidity is on average 0.344 while the average downward real rigidity estimate is 0.097. The estimated rigidity measures are not completely stable over time: real rigidity is somewhat higher at the beginning of the period when price inflation was higher whereas

[14] For 2003, I used the sum of the realized CPI inflation and the agreed real wage growth as the proxy for the bargained nominal wage and I set the threshold to ±1%p. Of course, results obtained for this year have to be treated with great caution.

nominal rigidity increases to some extent with decreasing inflation. While the variation in the measures and their correlation with the actual inflation rate go against the assumptions and the purpose of the MMM estimation method, the variance is limited and does not affect the qualitative interpretation of the results. Differences from one year to another are more likely due to estimation error than to any change in workers' resistance to nominal and real wage cuts.

When compared to other countries participating in the IWFP, Hungary ranks among the countries with the lowest degree of DRWR (see Figure 5). The estimated downward nominal rigidity for Hungary is higher, the measure is close to the overall cross-country average. As predicted by institutional characteristics and previous empirical research on wage flexibility, such combination of very low real rigidity and moderate nominal rigidity places Hungary among countries with relatively high wage flexibility. However, the estimated measures say nothing about the specific wage component through which the adjustment takes place. Survey results suggest that base wage is generally rigid and employers use regular and irregular bonuses to adjust labour costs to shocks (see Kézdi and Kónya (2010) for details). Unfortunately it is not possible to differentiate different wage components in the database I use so this issue cannot be investigated.

5.2 National-level bargained wage

Results are presented in Figure 6: the continuing lines show the average wage growth (red), the median wage growth (grey) and the modus of the wage change distributions. The black horizontal segments are the mean wage increases recommended by OÉT, the corresponding vertical segments denote the bargained thresholds and the bars represent the estimated probability of being subject to downward wage rigidity due to the bargained wage. Results confirm the widespread view that the wage growth bargained at the national level has little compulsory power in Hungary: with the exception of 2001, the estimated proportion of workers being subject to downward rigidity due to the bargained wage is below 3%, i.e. basically zero. In 2001, the bargained wage was presumably too close to the realized inflation to distinguish between real downward wage rigidity and the influence of the bargained wage increase. Nevertheless, even the result for 2001 indicates the lack of significant concentration of observations around the bargaining focal point.

It is important to note, however, that this does not necessarily mean that OÉT has no any influence on firms' wage decisions. Even if the collective wage agreements do not

seem to inhibit low wage increases it is still possible that the outcome of the tripartite negotiations guides firms in their wage decisions.

5.3 Minimum wage

The simplest way to capture the importance and the effectiveness of the minimum wage in a country is to look at (1) the Kaitz index (defined as the ratio of the minimum wage to average wage) and (2) the share of the workforce paid at the minimum wage. The Kaitz index was very low in Hungary prior to the two disproportionate rises in minimum wage in 2001-2002, when it increased dramatically from around 30% to 43% in just two years. The following years, smaller-scale increases in the minimum wage reduced the index below 40%. This ratio cannot be considered as excessive as it is still below the OECD average (see figure 7).

On the other hand, the share of workers earning the minimum wage is very high in Hungary. According to Eurostat data, proportion of full-time employees with earnings on the minimum wage is relatively high in Hungary in international comparison (8%). The picture is even worse if we include small firms with less than 4 employees and part-time employees.[15] Different estimates for the ratio of minimum wage earners over total employment range between 22% in Elek et al. (2008) and 30% in Krekó and Kiss (2007). Comparing the official Eurostat statistics with the income tax returns, Krekó and Kiss (2007) conclude that around 70% of the employees in small firms and self-employees are declared at the minimum wage. As Krekó and Kiss (2007) could not separate employees who have not worked during the whole year, this latter proportion is likely to overestimate the share of minimum wage earners.

The uncertainty surrounding the effects of the minimum wage is further aggravated as there is no consensus about the true number of workers employed at the minimum wage. If employees declared at the minimum wage are remunerated higher, the adjustment to earnings may be conducted through the undeclared part of the income in which case the minimum wage is not truly binding. On the other hand, downward wage rigidity engendered by the minimum wage is particularly important for workers actually paid at the minimum wage.

[15] The Hungarian part of the Eurostat data is based on firms with more than or equal to 5 employees.

6 Conclusion

Following the approach recently developed for the International Wage Flexibility Project (IWFP), the paper discusses new estimates of downward real and nominal wage rigidity for Hungary. The estimated measures indicate the fractions of workers who are potentially subject to downward nominal and downward real wage rigidity, i.e. the fraction of those who would received nominal or real wage freeze instead of nominal or real wage cut in the absence of rigidity.

Results suggest that nominal rigidity is more prominent in Hungary than real rigidity. When compared to other countries participating in the IWFP, Hungary ranks among the countries with the lowest degree of downward real rigidity. The estimated downward nominal rigidity for Hungary is higher, the measure is close to but still below the overall cross-country average.

The paper also confirms the widespread view that the wage growth bargained at the national level has little compulsory power in Hungary: the estimated proportion of workers being subject to downward rigidity due to the bargained wage is close to zero. On the other hand, the minimum wage is an important source of potential downward wage rigidity: although at the time of writing the paper, the level of the minimum wage in Hungary cannot be considered as excessive, the share of the workforce earning below or close to the minimum wage is very high in international comparison.

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Appendix

Tables and Figures

Table 1: Descriptive statistics

	2001	2002	2003	2004
	Empirical distribution			
Mean wage change	0.143	0.132	0.112	0.070
S.d. of wage changes	0.195	0.195	0.197	0.199
Fraction of wage cuts	0.114	0.116	0.169	0.205
Fraction of nominal wage freeze	0.016	0.019	0.042	0.039
Mean wage cut	-0.138	-0.131	-0.114	-0.190
Mean wage increase	0.189	0.178	0.174	0.148
	True distribution			
Mean wage change	0.145	0.135	0.115	0.070
S.d. of wage changes	0.151	0.127	0.151	0.161
Fraction of wage cuts	0.067	0.065	0.115	0.148
Fraction of nominal wage freeze	0.021	0.025	0.055	0.051
Mean wage cut	-0.107	-0.078	-0.048	-0.158
Mean wage increase	0.171	0.158	0.149	0.120
Inflation rate	0.092	0.053	0.047	0.068
VA growth*	0.044	0.041	0.040	0.064
Labour productivity growth*	0.056	0.055	0.043	0.048

* *Private sector*

** *Source: Social Security database, 2000-2004 and CSO*

Figure 1: Observed and counterfactual wage distributions

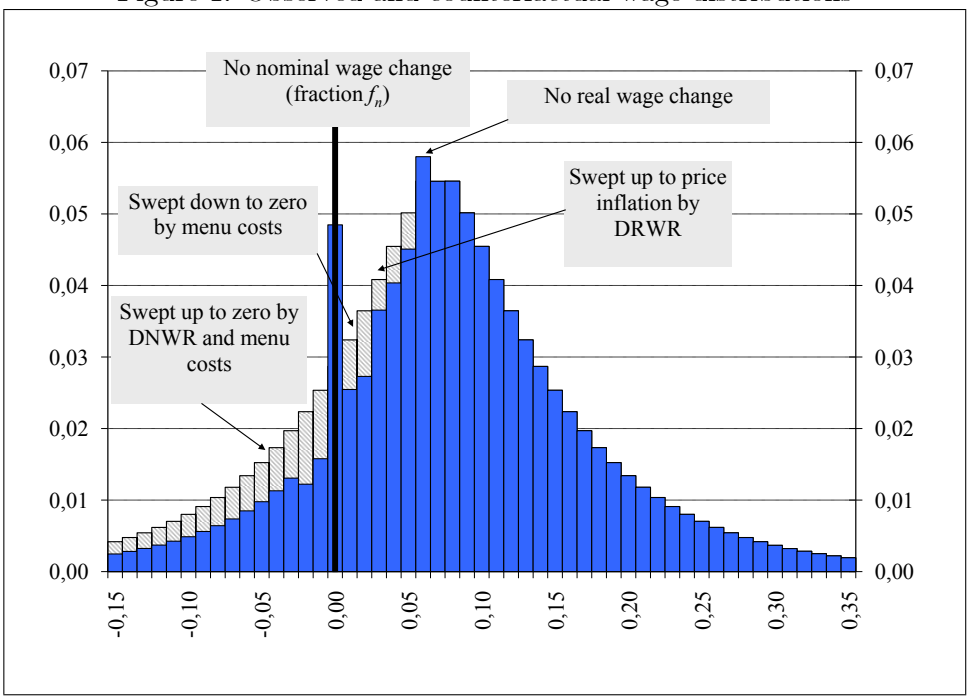


Figure 2: Aggregate wage growth and inflation

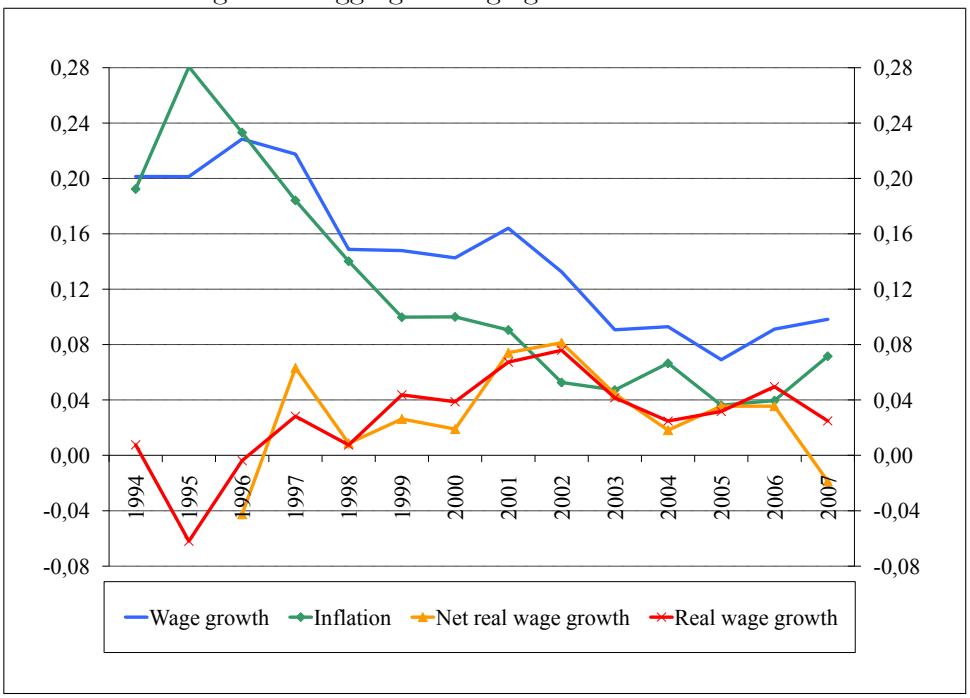
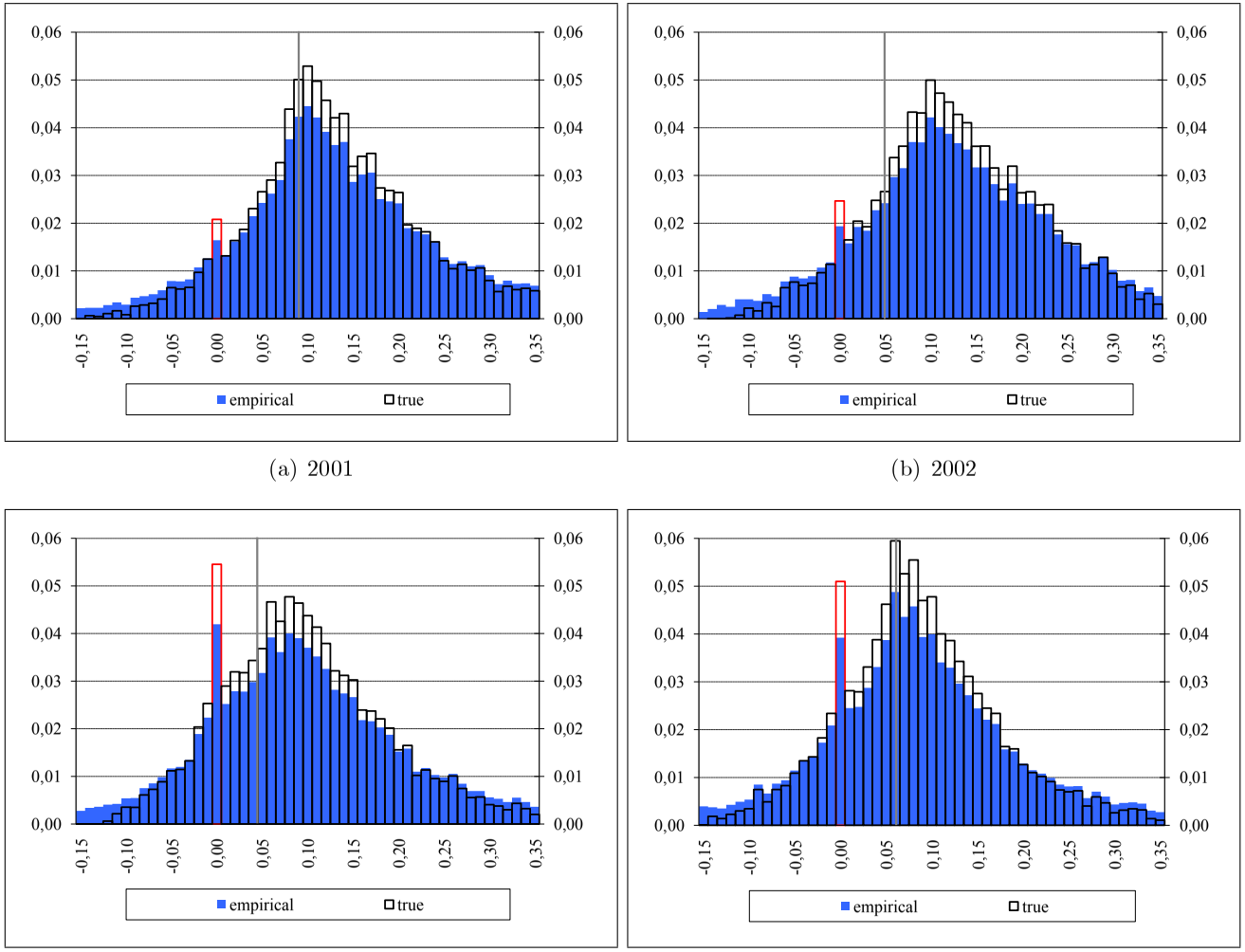


Figure 3: Histogram of wage changes



(a) 2001

(b) 2002

(c) 2003

(d) 2004

Figure 4: DNWR and DRWR in Hungary

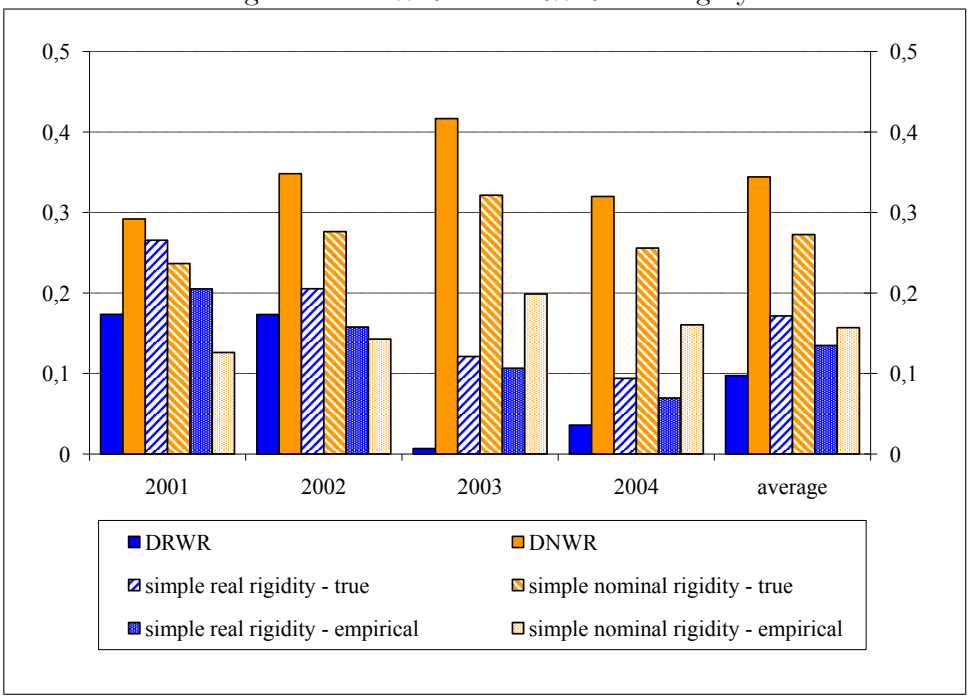
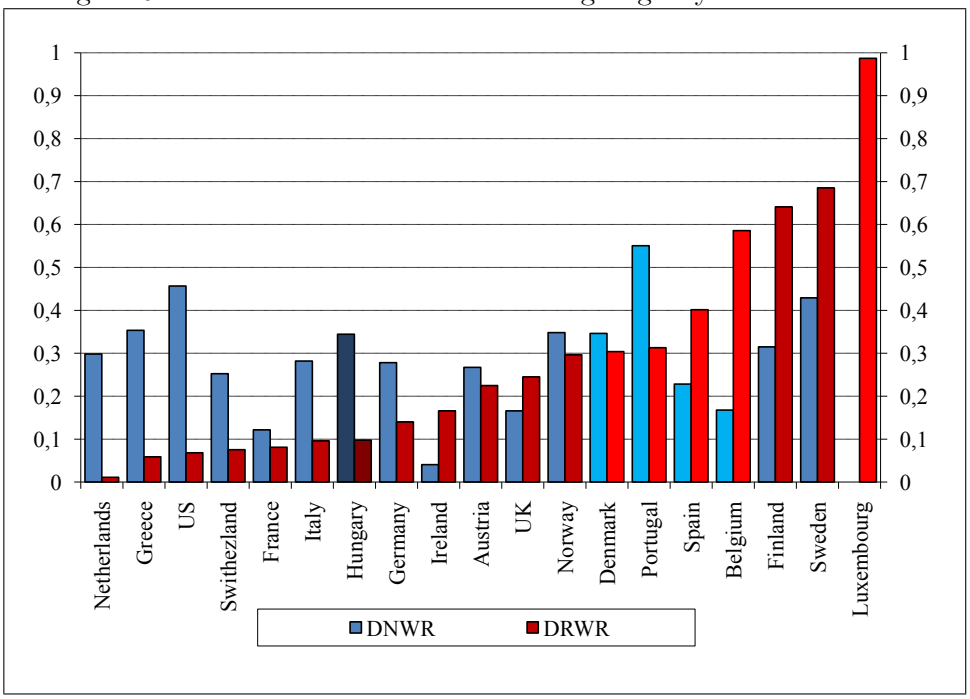


Figure 5: Downward nominal and real wage rigidity across countries



Source: the figures for Belgium, Denmark, Portugal and Spain are from (Messina et al (2009), for Luxembourg are from Lünnemann and Wintr (2009), and the rest are IWFP figures from Dickens et al (2007). The measures from Dickens et al (2007) are simple measures from empirical distributions while those from the other papers are model based and have been corrected for measurement error.

Figure 6: Downward rigidity due to bargained wage

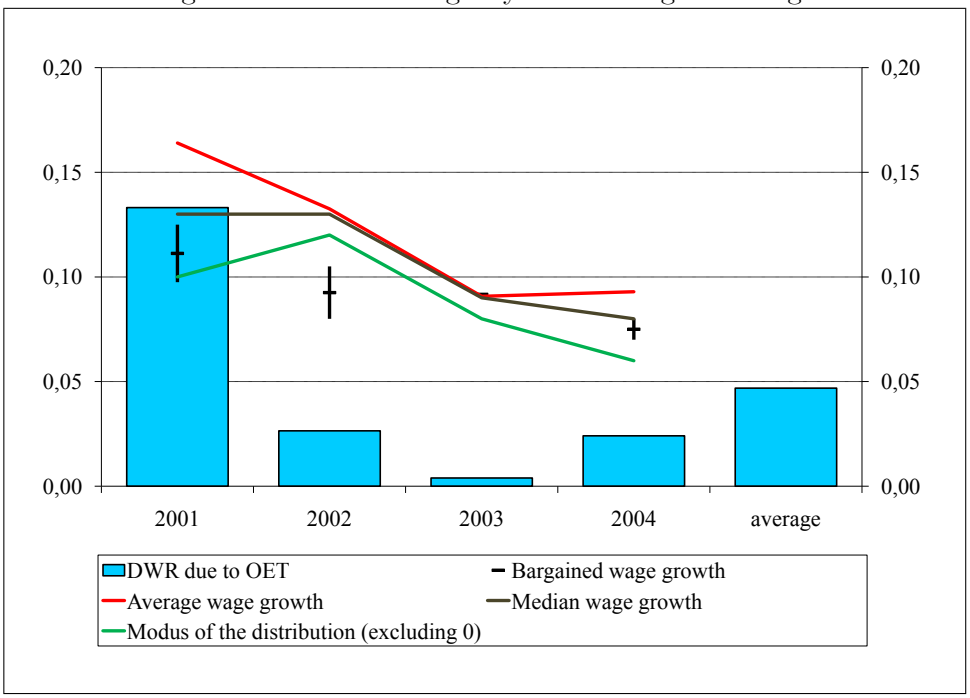


Figure 7: Kaitz index and Proportion of minimum wage earners