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DOWNWARD NOMINAL WAGE RIGIDITY: UNIONS' MERIT OR FIRMS' FORESIGHT?

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This paper investigates the sources of the downward nominal wage rigidity in Russia. The empirical analysis is based on the RLMS-HSE household survey from 2004 to 2013. We show that, in spite of weak labor unions in Russia, the extent of downward nominal wage rigidity is high. Moreover, the probability of a wage freeze is decreasing in firm size and is lower for industries with industry-level tariff agreements. Our findings present empirical evidence that the main source of the downward nominal wage rigidity is not the labor unions, but firms' voluntary decision to prevent wage cuts, which may cause quits of valuable employees and/or a decrease in their efforts.

Keywords: Downward nominal wage rigidity, RLMS-HSE.

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1 Introduction

The downward nominal wage rigidity (henceforth DNWR) hypothesis has garnered much empirical evidence in a number of papers of the last two decades (Dickens et al., 2007; Dias et al., 2013; Smith, 2000). Although the macroeconomic effect of the DNWR is a debatable question (Elsby, 2009), its impact on individual wage dynamics is clearly significant and so the DNWR has to be considered as an important issue of labor market theories.

This paper contributes to the literature on sources of the DNWR. We present some evidence in favor of the morale theory, which states that firms prevent wage cuts and prefer wage freezes because wage cuts could cause valuable employees to quit and/or a decrease in their efforts. This theory is based on the models of Solow (1979) and Akerlof (1982), which assume that employees' morale and therefore their efforts depend on their wage and predict that wage cuts may dampen their efforts. The empirical evidence that employees' utility may fall sharply in response to wage cuts, even if this cut is quite small, can also be found in Smith (2002) and Kawaguchi and Othake (2007). A detailed review of morale incentives for the DNWR may be found in Bewley (2007).

The morale theory states that avoiding wage cuts is a firm's voluntary decision, in the sense that there is no pressure from the outside. This theory competes with labor unions as a possible reason for the DNWR (Dickens et al., 2007; Babecky et al., 2010; Holden and Wulfsberg, 2007; Goette et al., 2007). Labor unions may directly prevent wage cuts through industry-level or firm-level agreements, by setting precise rules about wage changes. It is assumed here that firms may not have their own incentives for wage freezes, but have to follow the agreements.

In this paper, we investigate the sources of the DNWR in Russia and present empirical evidence that the DNWR is not a merit of labor unions, but rather a result of firms' voluntary decisions. This point is not a direct conclusion of the estimation results, but is a good explanation of them. We present some new evidence, in the sense that it is based on the survey of employees, while most of the papers that consider morale incentives for the DNWR are based on the surveys of firms (Du Caju et al., 2013; Agel and Lundborg, 2003; Bewley, 1999). Moreover, our results may be interesting, since we investigate the DNWR under low bargaining power of the labor unions and high inflation.

To investigate the sources of the DNWR, we use RLMS-HSE data from 2004 to 2013 and construct a sample of employees', whose reported nominal wage has decreased or has not changed during the last 12 months. Using Klein and Spady (1993) semi-parametric

estimator for the binary choice model, we try to reveal factors that have an impact on the probability of a wage freeze, which we use as a measure of the DNWR.

Our main findings are the following. The first result is that the extent of the DNWR in Russia is much higher than in Europe and in United States, although under weak labor unions we might expect the opposite effect. At the same time, this result can be easily explained in the morale theory framework. The second result is that the extent of the DNWR for the industries with industry-level tariff agreements is the same as (or even lower than) for the industries without these agreements. And the third result, in favor of the morale incentives prevalence, is the negative relationship between firm size and the probability of a wage freeze. The only possible evidence in support of the institutional sources is that the tightening of the DNWR in Russia may be explained by the growth of the legal minimum wage over the last 10 years.

The rest of the paper is organized as follows. In Section 2, we present a brief overview of the wage setting process in Russia. In Section 3, we discuss the estimation strategy and its possible pitfalls, while in Section 4, we describe our data. In Section 5, we present the estimation results, and in Section 6, we conclude.

2 Labor Unions and Wage Setting in Russia: A Brief Overview

As many countries of continental Europe, Russia has a practice of industry-level tariff agreements, which are signed by labor unions and employers associations. The tariff agreements determine the basic principles of labor relationships and, most importantly for this research, set the minimum wage level for each particular industry. This level cannot be lower than the legal minimum wage and is often equal to (or at least depends on) the regional living wage (Vishnevskaya and Kulikov, 2009).

The legal minimum wage is determined at the state-level and until 2007, unlike the living wages, was equal for all regions aside from some Northern areas where wage coefficients were applied. In September 2007, the regions received the right to set their own regional minimum wage, which however cannot be lower than the state-level minimum wage (Kobzar, 2009; Muravyev and Oshchepkov, 2013). Until 2009, the legal minimum wage was much lower than the living wage. At that time, the legal minimum wage was used more as a reference point for computing penalties and various benefits, but not as way of regulating the wage

setting. In 2009, the state-level legal minimum wage raised to the minimum value of the living wage, and from that moment onwards, it could be considered as a natural barrier for wage cuts and therefore as a possible reason for wage rigidity.

Although the proportion of unionized employees in Russia is high[2], there is evidence for inefficiency of the labor unions in Russia. According to a poll conducted by The Russian Public Opinion Research Center in 2007, only 8% of unionized employees believe that unions have a significant impact on their working conditions. The hypothesis of the labor unions' inefficiency is partly supported by Kalabina et al. (2014). In addition, the proportion of unionized employees is constantly decreasing and there are industries (such as the financial and trade industries), which do not have industry-level tariff agreements and where the share of unionized employees is almost zero.

In order to reveal the impact of the labor unions, we distinguish between three groups of industries. The first group consists of industries, which, in contrast to the other two groups, do not have industry-level tariff agreements. The second group, which we call "budget industries", consists of industries where most salaries are paid through the federal or regional budgets — *Education*, *Health care*, *Utilities*, etc. The third group consists of non-budget industries with industry-level tariff agreements. If wage rigidity is a merit of unions, we should expect the extent of the DNWR for the first group to be lower than for the second and third groups, where wage cuts may be prevented by industry-level tariff agreements.

3 Estimation Methodology

Following Dickens et al. (2007) and Dias et al. (2013), we consider only those employees, whose wages would decrease in the absence of the DNWR, and define the measure of the DNWR as a probability of their wage to be frozen:

$$dnwr_{it} = \mathrm{P}(\Delta w_{it} = 0 | \Delta w_{it}^* < 0). \tag{1}$$

Here $dnwr_{it}$ is a measure of DNWR for i-th employee in period t, w_{it} is a nominal wage, $\Delta w_{it} = w_{it} - w_{it-1}$ is an observed change in the nominal wage, Δw_i^* is a change in the nominal wage, which we would observe in the absence of the DNWR.

It is assumed here that an employee's wage, who was "scheduled" for a wage cut, can only fall or stay the same and, what is more, all cases of frozen wages are due to the DNWR. There

[2]In 2010 the share of unionized employees in the total number of employees is 27%.

are at least two reasons why this assumption could be violated: rounding errors and long-term contracts (Smith, 2000). Rounding errors may be caused by employers (for example when they freeze wages due to menu costs) or by employees (for example when they round their reported wages to one thousand rubles). Long-term contracts imply that, under some conditions, wages may remain unchanged for a long period, such as longer than one year.

However, the share of rounded wages is low for the data we use — more than 40% of employees reported their wage with a precision of up to one hundred rubles (which is less than 1% of the average wage). Besides this, we expect that long-term contracts are rare, due to the high level of inflation in Russia. This is why we believe that these problems are not crucial for our results.

In order to reveal the sources of the DNWR, we estimate the binary choice model. The dependent variable takes the value "0" if we observe the nominal wage cut ($\Delta w_{it} < 0$), and it takes the value "1" if we observe the nominal wage freeze ($\Delta w_{it} = 0$). We assume that the decision about wage changes is made on the basis of latent variable y^*_{it}, which can be considered as a relative utility of wage freeze. This latent variable depends on the set of explanatory variables $x_{it,1}, x_{it,2}, \ldots, x_{it,K}$ and on the noise ϵ_{it}:

$$y^*_{it} = \beta_0 + \beta_1 x_{it,1} + \beta_1 x_{it,2} + \ldots + \beta_K x_{it,K} + \epsilon_{it}. \tag{2}$$

It is clear that y^*_{it} may depend on the size of the wage change Δw^*_{it}, which we would observe in the absence of the DNWR (Elsby, 2009). But since the distribution of Δw^*_{it} conditional on $\Delta w^*_{it} < 0$ is unlikely to be symmetric, we expect that the distribution of the noise ϵ_{it} is not symmetric either. This is why we do not specify the distribution function of ϵ_{it} and use semi-parametric estimator of Klein and Spady (1993) instead of the maximum likelihood estimator for logit/probit-models.

4 Data

Our empirical analysis is based on the RLMS-HSE[3] data from 2004 to 2013[4]. RLMS-HSE is a representative panel survey of Russian households which is conducted annually, so we can reveal the annual dynamics of employees' wages. The data on the legal minimum wage and

[3] "Russia Longitudinal Monitoring survey, RLMS-HSE", conducted by National Research University "Higher School of Economics" and ZAO "Demoscope" together with Carolina Population Center, University of North Carolina at Chapel Hill and the Institute of Sociology RAS. (RLMS-HSE web sites: http://www.cpc.unc.edu/projects/rlms-hse, http://www.hse.ru/org/hse/rlms)

[4] This period corresponds to the 13^{th}–22^{nd} waves of the survey.

regional living wages are drawn from The Federal State Statistics Service[5].

We define the reported wage as an answer to the question: "How much money, after taxes and royalties, have you received from your main job in the last 30 days?". If the reported wage has not changed since the previous interview, we refer to these observations as wage freezes. To detect wage cuts, we use an answer to the question: "Have your wage or working hours decreased (not by your request) in the last 12 months?". If the answer is positive, we refer these observations as wage cuts[6]. Therefore, our dependent variable y_{it} takes the value "1" if the wage of i-th employee has not changed during the last 12 months, and it takes the value "0" if the employee gives a positive answer about wage cut during the last 12 months.

We do not rely on employees' reported wages when detecting wage cuts because the problem of measurement errors: reported wages are known to be quite noisy (Dickens et al., 2007; Smith, 2000). The extent of this problem may be measured by the auto-covariance of wage changes: under the null hypothesis of no measurement errors and some not too restrictive assumptions, this auto-covariance must be equal to zero (Dickens et al., 2007). For our sample, this auto-covariance is significantly lower than zero and implies that almost 70% of the wage variation in time is due to measurement errors.

We believe that the direct question about wage cuts allows us to solve this problem, since an answer to the question about a single event from the past year is less likely to be wrong (in comparison with the question about the precise value of the wage). At the same time, we expect that reported wages would allow us to detect wage freezes correctly — if we assume the measurement errors in these answers, then the probability of these answers will be approaching zero, which contradicts the large number of such observations.

Nonetheless, if there are measurement (or rounding) errors in y_{it}, this may bias the estimates of the DNWR. However, if these errors are independent from the explanatory variables, they do not affect the signs of the marginal effects estimates and may only decrease their significance. Thus, the main results obtained in Section 5 are valid even in the presence of measurement (or rounding) errors.

When estimating the model, we assume that the probability of a wage freeze may depend on industry, region, firm size (number of employees), as well as on the employees' characteristics, such as age, sex and education. We also account for the time effects and the

[5]http://gks.ru

[6]If both conditions holds — an employee answers positively to the question about wage or working hours cut and her reported wage has not changed since the previous interview — we refer these observations as wage freezes, assuming that the wage has not changed and the positive answer is caused by working hours cut.

effects.

For the estimation, we use data from 2004 to 2013, since information about industries has only been available since 2004. The initial sample for this period consists of 52695 observations, about 5270 employees per year. We remove observations from the sample if they do not meet at least one of the following conditions:

1. time from the last interview is 12 months
2. an employee has worked for the company for more than 12 months
3. the number of employees in the company is greater than 1
4. an employee is not an owner of the company
5. if an employee is male, then he is older than 17 and younger than 60
6. if an employee is female, then she is older than 17 and younger than 55
7. an employee gives a positive answer to the question about nominal wage cuts during the last 12 months or her reported wage has not changed during the last 12 months.

The final sample contains 1530 observations, about 153 employees per year. Therefore, the final sample is less than 3% of the original sample of employees. The most significant loss of observations is due to the last condition: we remove 45313 observations, for which we observe a wage increase. However, we have to accept this loss of observations since, to reveal factors that prevent wage cuts, we should only examine those employees who were "scheduled" for a wage cut. Dias et al. (2013) show that if the full sample, which contains employees with the wage increase, is used, the estimates may be biased and cannot be used to measure the impact of explanatory variables on the DNWR.

A detailed description of the dependent and explanatory variables, as well as its descriptive statistics, are given in the Appendix (Tables 2 and 3).

5 Estimation Results

The mean value of the variable *Wage freeze* is 0.655, which, under the assumptions made in Sections 3 and 4, implies that 65.5% of the wages have not been changed due to the DNWR. This value is much higher than estimates of the DNWR obtained for developed countries. For example, Dickens et al. (2007) examined the US and 15 European countries, and found that the highest estimate of the DNWR was 58%, observed for Portugal.

Assuming that the bias of the DNWR estimates caused by rounding errors and long-term contracts is small, we could explain this result by high inflation in Russia: the average growth of the consumer price index and of the producer price index from 2004 to 2014 is 9.1% and 11.8% per year, respectively. The cost of the nominal wage freeze is low under high inflation, since real wages are decreasing fast enough, and so we should observe a high extent of the DNWR.

This explanation works well under the morale theory, when inflation directly affects firms' decisions about wage freezes. However, the picture with the labor unions is not so clear. Of course, under high inflation, firms have less incentives to assert wage cuts in negotiations with labor unions. But labor unions themselves have less incentives to resist wage cuts since the potential cases of wage cuts are not as frequent. Hence, the effect of inflation is lower or can even be negative. This point, together with weak labor unions in Russia, makes the assumption that the DNWR is a firm's voluntary decision more plausible. Another argument in favor of this assumption is that the extent of the DNWR in the US and in the UK, where labor unions are stronger than in Russia, is much lower even for periods with the same rates of inflation (see, for example, Elsby (2009)).

In Table 1, we present the estimates of marginal effects, obtained with the Klein and Spady (1993) semi-parametric estimator for the binary choice model. These estimates show how the explanatory variables affect the probability of a wage freeze.

Our main finding is that the extent of the DNWR for industries with industry-level tariff agreements is lower than (or is at least the same) for industries without these agreements. For example, the probability of a wage freeze for the *Base industry* is 22.2 percentage points lower than for the *Trade* industry. This result holds even for the "budget" industries and is robust to *government participation*, whose effect on the DNWR is insignificant.

Here, tariff agreements may be considered as a proxy for labor unions' activity and we may therefore conclude that labor unions are not effective in preventing wage cuts and cannot be considered as a source of the DNWR in Russia. Besides this, the morale theory gives a good explanation to the low extent of the DNWR in "budget" industries. These industries are regulated by the government and usual market reasoning such as profit maximization, upon which the morale theory is based, is not as important here.

Another, though not as straightforward, piece of evidence against labor unions and in favor of the morale theory is that the extent of the DNWR is decreasing in firm size: firms with a low number of employees are less likely to decrease their wages. This phenomenon is in line with Du Caju et al. (2009) results, obtained for Belgium. Du Caju et al. state that

Table 1. Estimation Results

Variable	Estimates	Variable	Estimates
Employee's and firm's characteristics			
Age	0.280***	Moscow, St. Petersburg	0.170***
	(0.102)		(0.035)
Higher education	-0.010	Blue-collar	-0.025
	(0.023)		(0.023)
Female	-0.004	Firm specific experience	-0.085
	(0.020)		(0.119)
Urban area	0.009	Government participation	-0.012
	(0.021)		(0.021)
Firm size (number of employees)			
From 2 to 10 (reference group)	—	From 101 to 1000	-0.191***
			(0.04)
From 11 to 100	-0.096**	More than 1000	-0.151***
	(0.038)		(0.045)
Industry			
Trade (reference group)	—	Food manufacturing†	0.014
			(0.053)
Finance	-0.001	Transport and	-0.073**
	(0.07)	telecommunication service†	(0.033)
Base industry†	-0.222***	Agriculture†	-0.089**
	(0.046)		(0.041)
Oil and gas†	0.082	Education$^{\dagger,+}$	-0.121***
	(0.075)		(0.032)
Military-industrial complex†	-0.085	Science and culture$^{\dagger,+}$	-0.156***
	(0.061)		(0.050)
Building†	-0.083**	Health care$^{\dagger,+}$	0.043
	(0.037)		(0.041)
Civil machinery-producing†	-0.184***	Other industries	-0.115**
	(0.038)		(0.056)
Consumer goods manufacturing†	-0.131***		
	(0.033)		
Year of interview			
2004 (reference group)	—	2009	0.018
			(0.040)
2005	0.038	2010	0.109***
	(0.04)		(0.040)
2006	0.057	2011	0.163***
	(0.042)		(0.043)
2007	0.139**	2012	0.140***
	(0.046)		(0.042)
2008	0.026	2013	0.198***
	(0.042)		(0.040)
Number of observations	1530	*Log-likelihood*	-878.6

Note: † — industries with industry-level tariff agreements. $^{+}$ — "budget" industries, *, **, *** denote significance at the 10%, 5%, and 1% levels, respectively. Standard errors are in parenthesis.

larger firms offer higher wages and therefore provide greater "cushion" (for example, above industry-level tariff wage) for wage cuts. In addition, higher wages may contain extra fees, which are easy to cut.

However, there is another possible explanation for this phenomenon. Low firms commonly face higher employees' mobility (or, in other words, firms' competition on the labor market), which may directly affect the DNWR. If an employee can easily find another job, the probability of quit in response to a wage cut will be higher and therefore the firm's incentives not to cut the wage and to save the valuable employee will also be stronger. Moreover, wage cuts may be considered as an alternative to dismissal and, under conditions of low mobility, when finding a new job is not as easy, the employees' reaction is unlikely to be as serious.

Anyway, larger firms are more likely to have a collective agreement, which prevents wage cuts, and therefore we might expect a higher extent of the DNWR in these firms. However, evidence suggest that this effect is not strong enough to compensate for the effect of firms' voluntary decisions, motivated by the reasons described above. The high mobility of employees in *Trade* and *Finance* may also explain why these industries present the extent of DNWR that is not only equal to but even *higher* than most of the industries with tariff agreements.

The direct effect of living wage dynamics, which is the basis for industry-level tariff agreements, is hard to estimate due to measurement errors in reported wages. Measurement errors do not allow us to detect employees whose wages are close to the living wage[7]. Nonetheless, the fact that the extent of the DNWR has increased by 19.8 percentage points since 2004 speaks in favor of the positive effect of the legal minimum wage, which has also increased over this period and is now close to the living wages.

6 Conclusion

In this paper, using data form the RLMS-HSE household survey, we investigated the sources of the DNWR in Russia from 2004 to 2013. To reveal the possible reasons for wage freezes, we used Klein and Spady (1993) semi-parametric estimator, which accounts for the possible asymmetry of the noise distribution. To detect wage cuts, we use the direct question, since in comparison with reported wages it is less subject to measurement errors. Thus, the

[7]However, ignoring the problem of measurement errors, we tried some specifications with closeness to living wage, but the effect of living wage was statistically insignificant.

dependent variable takes the value "1", if an employee's monthly wage has not changed during the last 12 month, and takes the value "0", if an employee positively answers the question about wage decreases during this period.

The estimation results allow us to conclude that the main source of the DNWR is not the labor unions, but firms' voluntary decisions, their foresight not to lose out on productivity and to avoid quits of valuable employees.

The first piece of evidence in support of this conclusion is that, in spite of weak labor unions, the extent of the DNWR in Russia is high. At the same time, the high extent of the DNWR can be easily explained by high inflation, which reduces real benefits from wage cuts and makes wage freezes more attractive. In addition, this result can be directly explained by the high responsiveness of efforts to wage cuts. Both of these explanations are in accordance with the morale theory.

The second piece of evidence, which is our main finding, is that the probability of a wage freeze for industries with industry-level tariff agreements is the same or even lower than for the industries without these agreements. This result holds even for the "budget" industries, where the effect of government regulations is expected to be positive.

And the third piece of evidence is the negative relationship between firm size and the probability of a wage freeze. Our reasoning here is that large firms are more likely to have a collective agreement with employees. However, since the extent of the DNWR is decreasing in firm size, the effect of these collective agreements is not significant, or it is dominated by other effects such as lower employees' mobility.

The only evidence of the DNWR's institutional sources that we have found is that the increase in the probability of a wage freeze over the last 10 years may be explained by the positive dynamics of the legal minimum wage.

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Appendix

Table 2. Description of the variables

Variable	Description
Wage freeze	Binary variable. It takes the value "1", if employee's reported monthly wage (questionnaire code: *j10) has not changed from the last interview. It takes the value "0" if two conditions hold: (a) employee positively answers the question "Have your wage or working hours decreased (not by your wish) in the last 12 months?" (questionnaire code: *j18.2) and (b) employee's reported monthly wage (questionnaire code: *j10) has changed from the last interview.
Age	Employee's age. Computed as a difference between the year of the interview and and employee's year of birth (questionnaire code: *h6).
Female	Binary variable. It takes the value "1" for women and "0" for men (questionnaire code: *h5).
Higher education	Binary variable. It takes the value "1", if an employee has completed higher education (questionnaire code *_diplom), and "0" otherwise.
Urban	Binary variable. It takes the value "1", if an employee lives in urban area (questionnaire code: status), and "0" otherwise.
Moscow, St. Petersburg	Binary variable. It takes the value "1", if an employee lives in Moscow or St. Petersburg (questionnaire code: psu), and "0" otherwise.
Blue-collar	Binary variable. It takes the value "1" for blue-collar employees (questionnaire code: *_occup), and "0" otherwise.
Government participation	Binary variable. It takes the value "1" for companies with government participation (questionnaire code: *j23), and "0" for other companies.
Firm specific experience	Number of years, which an employee has worked for a company (based on questionnaire codes *j5a and *j5b).
Firm size (number of employees)	Number of employees it the company, for which employee works (questionnaire code: *j13).
Industry	Represented by a set of binary variables for each industry (questionnaire code: *j35.1).
Year of interview	Represented by a set of binary variables for each year.

Note: * stands for a variable indicator of each particular wave of the survey (from "a" for the 5th wave to "r" for the 21st wave).

Table 3. Descriptive statistics

Variable	Mean	Variable	Mean
Dependent variable			
Wage freeze	0.655		
	(0.012)		
Employee's and firm's characteristics			
Age	40.946	Moscow, St. Petersburg	0.099
	(9.750)		(0.299)
Higher education	0.267	Blue-collar	0.437
	(0.442)		(0.496)
Female	0.565	Firm specific experience	9.767
	(0.496)		(8.560)
Urban area	0.675	Government participation	0.235
	(0.468)		(0.424)
Firm size (number of employees)			
From 2 to 10	0.101	From 101 to 1000	0.294
	(0.301)		(0.456)
From 11 to 100	0.455	More than 1000	0.150
	(0.498)		(0.358)
Industry			
Trade	0.175	Food manufacturing	0.041
	0.380		(0.197)
Finance	0.018	Transport and	0.100
	(0.134)	telecommunication service	(0.300)
Base industry	0.046	Agriculture	0.057
	(0.209)		(0.232)
Oil and gas	0.023	Education	0.137
	(0.150)		(0.344)
Military-industrial complex	0.022	Science and culture	0.033
	(0.145)		(0.180)
Building	0.075	Health care	0.084
	(0.263)		(0.278)
Civil machinery-producing	0.043	Other industries	0.024
	(0.203)		(0.154)
Consumer goods manufacturing	0.099		
	(0.298)		
Year of interview			
2004	0.077	2009	0.098
	(0.267)		(0.297)
2005	0.110	2010	0.096
	(0.313)		(0.295)
2006	0.071	2011	0.126
	(0.257)		(0.332)
2007	0.062	2012	0.131
	(0.241)		(0.337)
2008	0.077	2013	0.152
	(0.267)		(0.359)
Number of observations	1530		

Note: Standard deviations are in parenthesis.

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