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Effects of minimum wages on the Russian wage distribution[2]

The available minimum wage literature is mostly based on evidence from developed countries or developing countries of Latin America. Little empirical work has been done on the effects of minimum wages in transition economies, where labour institutions experienced rapid changes and law enforcement differs in many important ways. This paper presents the first empirical evidence on minimum wage effects for Russia, the largest transition economy. I use regional variation in the relative level of the federal minimum wage to identify the impact of the threefold increase in the real value of the minimum wage on the Russian wage distribution between 2005 and 2009. The analysis suggests that the minimum wage can account for the bulk of the decline in the lower tail inequality, particularly for females.

Keywords: minimum wages, wage distribution, transition economies, Russia
JEL Classification: J31, J38, K31, P23

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1. Introduction

The minimum wage literature contains limited evidence concerning transition economies. The existing literature for developed countries shows that minimum wages narrow the wage distribution and have a small adverse effect on employment (Brown, 1999; Neumark and Wascher, 2007). Studies for developing countries, which are mostly based on evidence from Latin America, suggest that wage compression effects are larger in those countries but often disagree on the magnitude of employment effects (Gindling and Terrell, 1995; Maloney and Mendez, 2004; Lemos, 2009).

Very few studies have attempted to estimate minimum wage effects in transition countries. Ganguli and Terrell (2006) use data for Ukraine and employ kernel density techniques to study the impacts of minimum wages on the wage distribution in 1996-2003. By 2003, the minimum wage in Ukraine reached 40% of the average wage. Ganguli and Terrell demonstrate that the minimum wage hikes played an important role in lowering the growth in inequality, more for women than for men. Kertesi and Köllő (2003) use data for Hungary and find that a significant increase in the minimum wage (by 57% in nominal terms in their study) caused significant job losses in small firms despite widespread non-compliance.

Russia provides a good case to study the impact of minimum wages on wage inequality and employment, as the country experienced a dramatic rise in minimum wages in the second half of the 2000s. Over a short period between 2005 and 2009, the statutory federal minimum wage increased by a factor of 5.4 in nominal terms and by a factor of 3.6 in real terms. After more than a decade of being merely symbolic, minimum wages reached 25% of the average wage in Russia and became binding for certain types of low-wage workers. The consequences of this minimum wage hike have not yet been examined in the literature.

This paper aims to fill this gap and estimate the impact of minimum wages on the distribution of wages in Russia. I use the methodology developed by Lee (1999) and recently refined by Autor et al. (2010). This methodology builds upon an observation that the effects of minimum wage policies are more pronounced in low-wage regions than in high-wage regions. Lee (1999) proposes using the cross-region variation in the gap between the minimum wage and the median wage to estimate a counterfactual wage distribution that would have existed in the absence of the minimum wage. Applying this model to a regionally representative dataset from Russian workers employed in the corporate sector, I find that the minimum wage can account for the bulk of the decline in the lower tail inequality, particularly for females in 2005-2009.

I show that the impact goes far beyond the 'neighbourhood' of the minimum wage and produces significant spillover effects. The average regional spillover effects persist up to the 30th

percentile of the female wage distribution. These spillover effects should be accounted for when designing the minimum wage policy.

The paper proceeds as follows. Section 2 describes the key features of wage adjustment and the role of minimum wages in the institutional framework of the Russian labour market. Section 3 discusses the data and its appropriateness for the goals of this research. Section 4 proceeds with descriptive analysis. Section 5 presents the methodology for estimating causal effects of the minimum wage on wage distribution. Section 6 estimates a set of specifications based on different identification assumptions. In Section 7 I calculate counterfactual wage distributions, holding the real minimum wage constant. The final section concludes.

2. Wage adjustment in transition and institutional background

Russia experienced a dramatic change in its political and economic structures during the last two decades. Its transition from a command economy to a market economy began with a radical set of reforms in 1992 known as 'shock therapy'. Major reforms included price liberalization, mass privatization, and liberalization of foreign trade. Since that time there have been three sub-periods in the evolution of the Russian labour market. The early transition period lasted from 1991 to 1998 and was marked by deep transformational recession. The second sub-period (1999-2008) was a time of dynamic economic recovery and rapid improvement in labour market performance. Finally, the economic crisis of 2008 initiated the third sub-period.

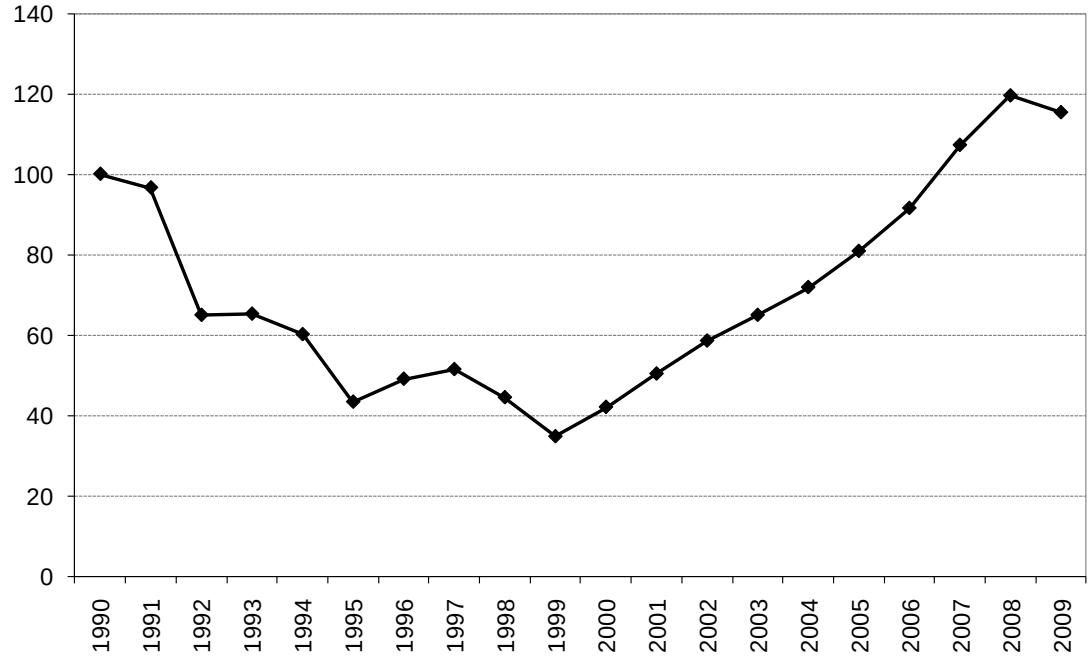

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Fig. 1. Real wages (1990 = 100)

In all sub-periods most of the labour market adjustment was acted out through wages, which were extremely flexible during this time. Fig. 1 shows the development of real wages. During the 1990s, real wages fell to one-third of the pre-transition level. The largest decreases in real wages were related to inflation hikes that followed major macroeconomic shocks in 1992, 1994, and 1998. However, starting in 2000, Russia experienced a sustained growth of real wages at a rate that exceeded that of output growth. During 1999-2007 real wages grew by 10-15% annually and tripled over this period. The 2008-2009 crisis resulted in a new episode of wage decline, though this time inflation was relatively low and the drop in real wages was limited. However, the cyclical drop in real wages was dramatic taking into account the high growth of wages before the crisis.

The introduction of market reforms led to an immediate increase in wage inequality. The sharp growth of wage dispersion was observed in the early stage of transition, but later it slowed down. The Gini coefficient for wages rose from 0.22 at the beginning of transition period to 0.5 in 1996, and the 90/10 decile ratio increased from 3.3 in the late 1980s to 10 in 1995 (Flemming and Micklewright, 1999). The peak of inequality was recorded in 2001, a few years after the 1998 financial crisis occurred and economic recovery began. Since 2002, earnings inequality has been declining (Fig. 2).

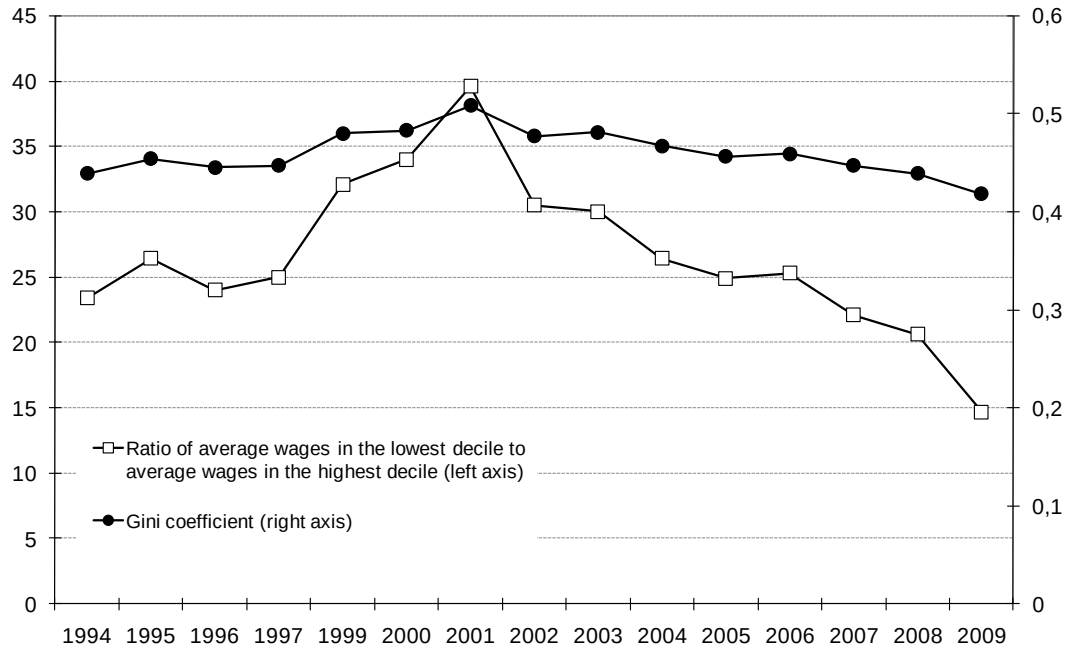

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Fig. 2. Wage inequality

The changes in labour market institutions are ultimately responsible for the observed wage flexibility and for wages being chosen as the main tool of labour market adjustment. Labour

market institutions generally failed to moderate the growth of wage inequality in the early transition period.

Trade union density has been decreasing since the early 1990s, but it is still at around 50% (Lehmann and Muravyev, 2009). Despite the relatively high trade union membership and legal provisions for full collective bargaining rights at various levels, bargaining on wages and working conditions is very limited in practice. Wages are now mostly set through informal individual and firm-level bargaining with little trade union influence. Even inside the 'old' corporate sector, trade unions have a weak voice and low mobilization capacity. Managers often have broad discretion to make decisions regarding pay. Wages in the public sector are still set in a rather centralized manner. However, regional authorities and management of state establishments are given the freedom to decide on regional allowances and other bonuses.

Minimum wages and unemployment benefits normally serve as wage floors that constrain downward wage flexibility. Unemployment benefits have never been generous in Russia. Different from many Eastern European countries, the unemployment benefits introduced in 1991 were initially set at a low level. At the peak in 1998, the ratio of average unemployment benefit to average wage reached 30% but then gradually decreased to less than 10% (Gimpelson and Kapeliushnikov, 2011). Therefore, unemployment has never been an attractive option and unemployment benefits were not able to exercise upward pressure on the wage floor.

Minimum wage legislation was established in the USSR in 1976 and continued to exist after the collapse of the USSR. Formally, the value of the federal minimum wage is set through the bargaining between trade unions, the government, and the parliament. This process takes into account budget revenues and domestic politics but largely disregards labour market considerations. In practice, the government makes the decision on minimum wages while other parties have only a weak voice (Vishnevskaya, 2007). The federal minimum is legally binding and covers all full-time employment contracts. It is not differentiated by age groups, occupation categories, branches of economic activity, establishment types, ownership, or firm size.

The major reform of the statutory minimum wage was undertaken in 2007. It changed the list of payments to be covered by the minimum wage regulation and introduced regional minimum wages. Before 2007 the minimum wage related to gross monthly earnings net of mandatory regional wage supplements, shift pay, other bonuses and compensations (hereafter, for convenience we will call this wage concept the "tariff" wage). Since 2007 the minimum wage legislation has been applied to the total wage amount, which includes all bonuses and compensations.

Before 2007 legally the federal minimum wage was the same for all workers in all regions, but in fact it varied from one region to another because of mandatory regional coefficients. These

regional wage coefficients were introduced in the Soviet times and aimed to provide different levels of compensation for workers depending on the location of the job. The value of the regional wage coefficient ranges from 1.0 (base wage and no extra regional compensation) in central Russia to 3.0 (triple the base wage) in Siberian Chukotka[3]. Being applied to tariff wages, these regional coefficients generated multiple wage minima for different locations. Since 2007 the federal minimum wage has been applied to the total wage amount regardless of the location of the job. Therefore, the new system of minimum wage fixing does not have mechanisms for automatic adjustment for regional conditions. Instead, regions were allowed to set their own minimum wages above the federal minimum[4]. Regions were given much discretion in deciding the amount and the coverage of the regional minimum wage. By October 2009 about one-third of Russian regions had adopted regional minimum wages, but in half of them the regional minimum wage was set to cover only the private sector. Even for the regions that have adopted the regional minimum wages, it is unclear whether they are enforced.

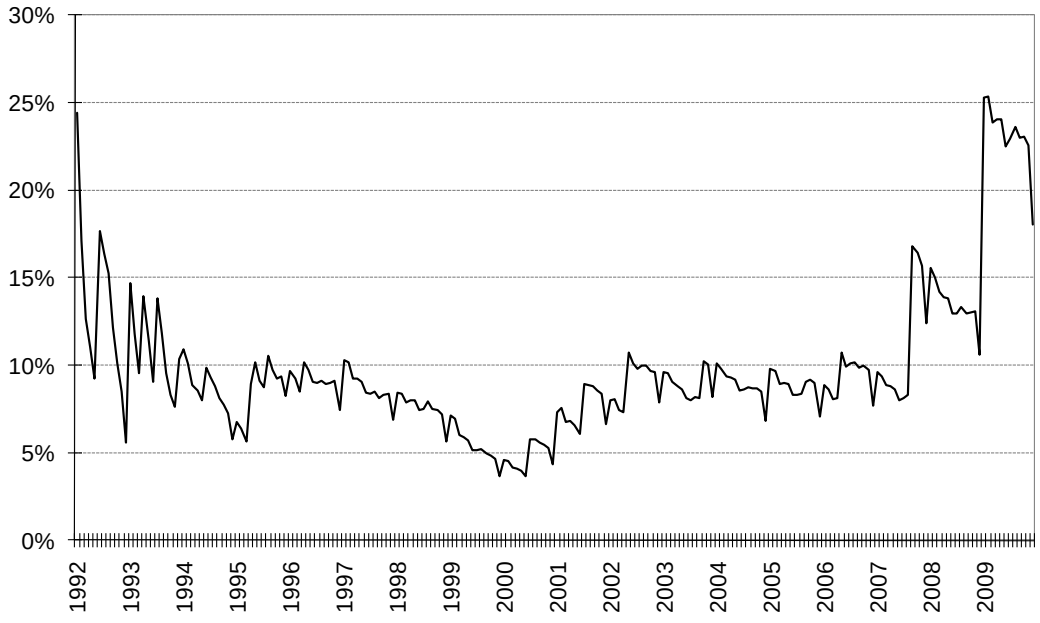

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Fig. 3. Minimum wage as % of average wages

According to the law, the minimum wage should exceed the minimum subsistence level calculated on the basis of the minimum consumption basket for a working-age individual. However, this provision has never been enacted. Over the transition period the Russian minimum wage has been below the minimum subsistence level. Indexation has been held on a

[3] The system of regional compensations in the USSR and Russia is described in some detail in Berger *et al*. (2008).

[4] However, this article of the Labor Code is not clearly written and allows for different interpretations. Some lawyers and trade union representatives referring to other articles of the Labor Code argue that the old rules are still in force. Court decisions on this issue are also ambiguous, though the State Labor Inspectorates in most regions stick to the new procedure described in the text.

discretionary basis with no regularity in the recommendations of the government. In political debate, bringing the minimum wage in line with the minimum subsistence level remains a long-run target.

Economic recovery and the rapid rise of oil prices improved budget conditions. Significant steps have been made to reduce the direct and indirect effects of future increases in the minimum wage. The Unified Tariff Scale was gradually replaced with a more flexible system with weaker ties to minimum wage standards. The reform of the minimum wage setting mechanism decoupled it from the social security system and administrative fines.

Since 2000 the minimum wage has been more and more widely used as a social policy tool. In 2000 it was set at 132 RUB a month and was regularly indexed. But in spite of indexation, until mid-2007 it fluctuated around 8% of the average wage. In mid-2007 and early 2009 the minimum wage was substantially increased. Both times, it nearly doubled. In September 2007 it rose from 1100 RUB to 2300 RUB. In January 2009 it was further increased to 4330 RUB, reaching the level of 25% of the average wage.

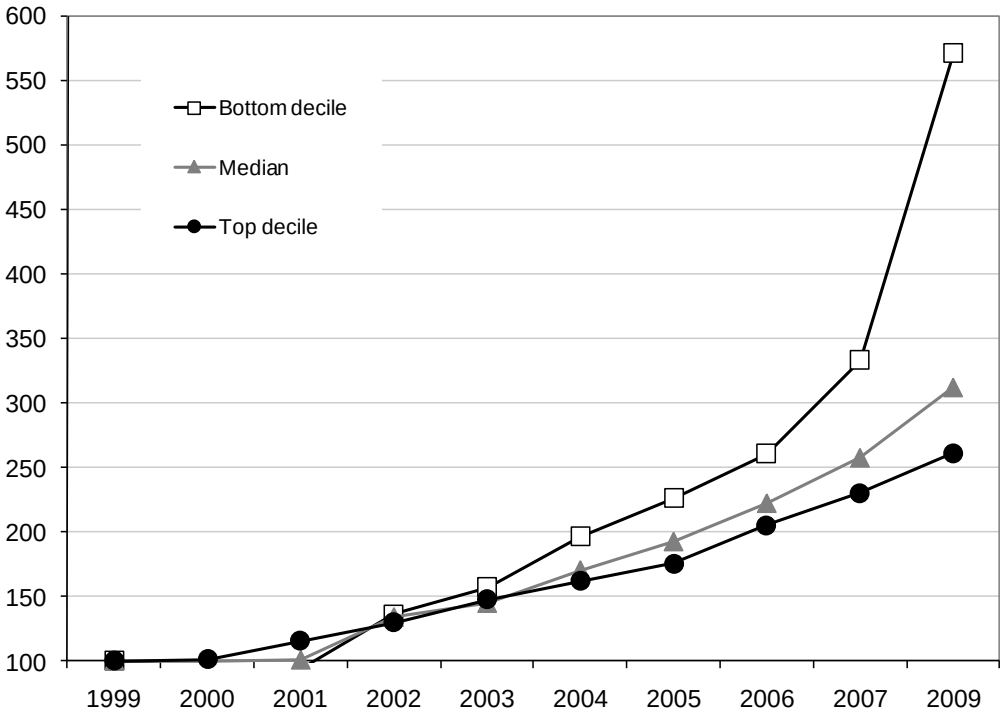

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Fig. 4. Evolution of real wages in different parts of the distribution (1999=100%)

In this paper I examine the impacts of these two increases of the federal minimum wage on wage inequality. Official estimates of wage growth by deciles of the wage distribution suggest that since 2002, wage growth occurred more rapidly at the bottom of the distribution (Fig. 4). Moreover, wage growth at the low end has substantially accelerated since 2007. Over the period

2000-2009 the average real wage in the lowest decile increased by a factor of 5.7 while the median wage 'just' tripled.

3. Data

The data come from the bi-annual Survey of Occupational Wages carried by the Russian Statistical Office (Rosstat). I use the rounds of the survey administered in 2005, 2007, and 2009. In each round, the reference month of the survey is October. Over the period under consideration, the federal minimum wage grew from 800 RUB to 4330 RUB and was indexed three times – in May 2006, September 2007, and January 2009. Thus, using data from 2005-2009 is potentially illuminating, as the minimum wage rose over the period by a factor of 5.4 in nominal terms and by a factor of 3.6 in real terms.

The Survey of Occupational Wages is an establishment survey. It first samples establishments and then workers within establishments. Data on wages, worker characteristics, and establishment characteristics are provided by the establishments. This minimizes the number of missing observations and reporting errors that are common in household surveys. Large- and medium-size establishments from all branches of economic activity are sampled with notable exceptions for agriculture, fishing, public administration, and financial intermediation. The survey covers only workers who worked full-time in the reference month. The samples are very large – about 700,000 for each round – and representative at the regional level for 79 Russian regions. Another unique feature of this dataset is that it distinguishes between tariff wage, mandatory regional wage supplements, and other bonuses and compensations. This distinction is very important because before 2007 the minimum wage was applied to the tariff wage. All these features make the survey of occupational wages a particularly appropriate data set for the study the effects of minimum wage increases in Russia.

Of course, potential drawbacks also have to be considered in connection with the use of the The Survey of Occupational Wages:

- The data do not cover the informal sector, small-sized firms, and agriculture. This is the segment of economy where firms are least likely to be in compliance with legislation. Wages are likely to be lower and more dispersed. However, studies on Latin America and on the uncovered sector in the US document that in practice the minimum wage is paid in both the formal and informal/uncovered sectors (Brown, 1999; Maloney and Mendez, 2004; Lemos, 2009). Empirical evidence suggests that non-compliance with the labour regulations is observed in other aspects of the labor contract, such as social security taxes, flexible hours, firings, etc. (Amadeo and Camargo, 1997). Furthermore, I can only speculate about crowding out effects on employment caused by the minimum

wage increases. Workers could lose their formal sector jobs and move to the informal sector in response to minimum wage increases. Official statistics does not confirm that this was the case, as the proportion of those employed in the informal sector remained stable over the period. Informal employment amounted to 17.6% of total employment in 2005, 17.1% in 2007, and 18.0% in 2009. Apart from the minimum wage hikes, there have been other reasons for the informal sector expansion. The growing informal economy has been observed since the early 2000s when the Rosstat started to collect the relevant data in labour force surveys.

- The second doubling of the minimum wage coincided with the midst of the 2008-2009 economic crisis. The decision about raising the minimum wage in January 2009 was made in June 2008, shortly before the start of the crisis. However, it was not cancelled in the end of 2008 when it became clear that Russia was hit hard by the crisis. To combat the labour market consequences of the crisis the Russian government introduced an anti-crisis package in early 2009. The programme was focused on public and temporary works schemes both for unemployed people and for employed people who were at risk of dismissals (mostly workers on reduced working time). The proposed scheme included income support exactly at the level of the minimum wage (plus mandatory regional wage supplements) to the programme participants. Workers on reduced working time could additionally enjoy part of their normal wage for the time actually worked. In the survey data it is not possible to differentiate between programme participants and ordinary workers. Therefore, I cannot give an idea of how the anti-crisis active labour market policy (ALMP) could affect the proportion of workers at the minimum wage. However, according to official estimates, the peak fraction of ALMP participants never exceeded 1% of corporate employment.

Table A1 in Appendix presents some descriptive statistics. More than a half of the surveyed workers are employed at state and municipal establishments. This fraction is high compared to the economy average (31-33% for the same period), but due to sample design all state and municipal establishments are included into the sampled population. The largest groups of survey participants are concentrated in three branches of economic activity – education, manufacturing and health. The structure of the sample reflects some important changes in Russian economy – increasing educational attainment and the reduced importance of manufacturing. Over this period, the fraction of university graduates increased by almost 5 percentage points. The share of manufacturing decreased by 3 percentage points.

4. Descriptive analysis

The wages variable used is monthly gross real wages. I deflate wages using the Consumers Price Index, using October 2005 as 100. Average real wages rose over the period, especially rapidly between 2005 and 2007 before the wage growth was suppressed by the crisis (Table 1). In 2005, the minimum wage represented 9% of the value of average wage and 20% of the value of the average unskilled wage. By 2009 these ratios increased to 24% and 52% respectively.

Fig. 5A and Fig. 5B (in Appendix) plot kernel distributions for log real wages and log real tariff wages respectively. A vertical line is shown at the minimum wage level. The most striking feature of Fig. 5A and 5B is that a spike at the minimum wage level was not observed in 2005 and substantially grew in magnitude by 2009. The spike is more evident in the distribution of tariff wages. In 2005 it was small and close to the bottom of the distribution. By 2009 it moved towards the centre of the distribution. It may signal that because of uncertainty of regulation in 2007-2009 many establishments continued to follow an old definition of the minimum wage, relating it to the tariff wage rather than to the total wage.

Table 1. Average wages and bindingness of the minimum wage

	2005	2007	2009
Mean wage (2005 prices), RUB	8694	11216	11956
Mean tariff wage (2005 prices), RUB	5154	6843	7656
Minimum wage/mean (all workers), %	9.2	16.9	23.9
Minimum wage/mean (unskilled workers), %	20.4	37.1	51.7
Fraction at MW-1 (based on the total wage), %	0.3	1.3	4.0
Regional variation in fraction at MW-1:			
Minimum	0	0	0
Maximum	1.6	18.1	23.2
Fraction at MW-2 (based on the tariff wage), %	1.1	7.8	14.0
Regional variation in fraction at MW-2:			
Minimum	0.1	1.2	0.6
Maximum	3.8	29.2	45.8
Number of observations	680,764	752,793	717,557

The size of the spike, the fraction below or at minimum wage (fraction at MW), is shown in Table 1. This measure indicates the degree of 'bindingness' of the minimum wage. Being applied to total wages ("fraction at MW-1") it increased over 2005-2009 from 0.3% to 4.0% of all workers. For tariff wages ("fraction at MW-2") it jumped from 1.1% to 14.0%.

Regional variation in the bindingness of the minimum wage was considerable for both measures in 2005 and increased dramatically over the period. The proportion at MW-1 based on total wages varied from 0 to 1.6% in 2005. By 2009 the regional maximum increased to 23.2%. This

means that at least in some regions the minimum wage has become binding at sufficiently high percentiles. For the fraction at MW-2, results are even more striking as the regional maximum went up to 45.8%.

Part of this increase may be driven by non-compliance with the fiscal regulation as employers report low wages in official bookkeeping and pay the rest of the wages "in envelopes". Tonin (2011) gives a theoretical justification of how this effect can emerge in an environment with low enforcement of fiscal regulation. According to public opinion polls, about 20% of Russian employees receive at least part of their wages in cash-in-hand (Kurakin, 2008). When the minimum wage was extremely low, on-the-book wages might have been low but still higher than the minimum wage. Recent minimum wage hikes should have led to the increase of on-the-book wages of such workers (if they were not dismissed). Given that the minimum wage increases were substantial, employers who use this strategy might have raised wages exactly to the minimum wage level. These minimum wage hikes may have also caused an increase in the number of workers who receive pay partly on the books and partly off the books. As a result a growing share of workers may be clustered at exactly the minimum wage.

Table 2. Risks of being at the minimum wage or below by age, gender and education, in percent

	Based on tariff wages		Based on total wages	
	2005	2009	2005	2009
Gender				
Males	0.9	9.6	0.3	2.5
Females	1.3	17.5	0.3	5.1
Education				
University	0.3	4.2	0.1	0.8
Some university	1.3	15.5	0.4	4.7
College	0.9	14.7	0.3	4.0
Vocational	1.0	19.0	0.3	5.2
Upper secondary	1.9	22.6	0.5	7.0
Low secondary and less	2.7	32.6	0.6	11.4
Age groups				
Under 19	3.6	26.5	0.9	8.5
20-29	1.2	12.6	0.3	3.2
30-39	0.9	12.3	0.3	3.4
40-49	0.9	13.2	0.2	3.8
50-59	1.0	14.9	0.3	4.2
60+	2.1	19.8	0.3	6.6

Table 2 reports that risks of being at the minimum wage or below vary across population sub-groups. Females are twice more likely than males to be directly affected by the minimum wage provisions. The likelihood of being paid at the minimum wage is declining with education. About 11% of those with elementary education receive wages at the minimum wage or below,

while less 1% of university graduates are paid in this range. The risks of low wage are the highest at the margins of the wage distribution. Teenage and elderly workers take minimum wage jobs more often than workers in other age groups. These results are remarkably the same to what is known for other countries.

Table 3 reveals that minimum wage workers are disproportionally concentrated in the state and municipal sector. Recreation, arts and sports industry, education and health have the highest fraction of low-paid jobs. In 2009 94% of all workers paid at minimum wage or below were employed at state or municipal establishments. The private sector – at least large- and medium-size firms – seems to cope well with the minimum wage regulation.

Table 3. Risks of being at the minimum wage or below by ownership type and industry, in percent

	Based on tariff wages		Based on total wages	
	2005	2009	2005	2009
Ownership type				
State or municipal	1.3	19.5	0.3	6.5
Domestic private	1.1	7.5	0.0	0.6
Foreign or joint venture	0.2	2.9	0.1	0.2
Domestic mixed (private-public)	0.3	6.0	0.1	0.5
Branches of economic activity				
Recreation, arts and sporting activities	2.8	24.7	0.9	9.5
Mining and quarrying	0.3	5.9	0.1	0.2
Manufacturing	0.6	7.3	0.1	0.5
Electricity, gas and steam supply	0.2	8.0	0.0	0.4
Construction	0.5	5.4	0.1	0.5
Wholesale and retail trade	2.0	7.5	0.9	0.9
Hotels and restaurants	1.0	12.6	0.2	1.1
Transport and communications	0.3	5.6	0.1	0.7
Real estate, renting and business activities	0.9	9.4	0.3	1.1
Education	2.4	24.3	0.5	10.4
Health	6.6	22.3	0.1	6.0

To address the question of how much change there has been in wage inequality from 2005 to 2009, I calculate several measures of wage dispersion that illustrate the changes in different parts of the distribution (Table 4). The general picture that emerges is that wage inequality narrowed substantially over the period. For the total wage distribution, the 90-10 log-wage differential fell by 18 log points. The decline was stronger in the lower tail of the wage distribution: the 50-10 log-wage differential declined by 15 log points while the 90-50 log-wage differential went down by 4 log points. The entire narrowing of the upper half of the distribution occurred in 2005-2007. In 2007-2009 the upper half of distribution remained stable while the bottom half continued to

shrink. The level of male wage inequality is higher than female wage inequality in each year, but the female distribution is wider in the upper half than the male distribution. Both males and females experienced greater contraction of wage inequality in the bottom of the distribution, but for males there was also some reduction of wage dispersion in the upper half of the distribution.

Table 4. Wage inequality: log-wage differentials

Inequality	All workers			Females			Males		
measure	2005	2007	2009	2005	2007	2009	2005	2007	2009
90-10	2.03	1.90	1.85	1.89	1.79	1.73	1.98	1.85	1.82
75-25	1.05	1.00	0.98	0.97	0.93	0.91	1.00	0.94	0.93
90-50	0.97	0.93	0.93	0.91	0.89	0.91	0.90	0.85	0.86
50-10	1.06	0.98	0.91	0.98	0.91	0.82	1.08	1.00	0.96

5. Methodology

To understand the role of minimum wage in accounting for the changes in wage inequality, I use the methodology proposed by Lee (1999) and recently refined by Autor et al. (2010). They use regional variation in the gap between median wages and the federal minimum wage to separate the impact of the minimum wage from the growth in underlying ('latent') wage inequality.

The basic departure point for Lee (1999) and Autor et al. (2010) is that the effect of the minimum wage on wage inequality depends on how high the statutory minimum wage is set relative to the overall distribution of wages. This level varies across the regions. Unfortunately, the observed wage distribution is a poor guide since it is 'distorted' by the minimum wage. Such distortion comes from two effects. First of all, a disemployment effect emerges if the minimum wage exceeds the market-clearing wage. As a result, employers are not willing to hire all of those who want to work at the minimum wage. Those who do not succeed in getting work either stay unemployed or move to the uncovered (often informal) sector. However, by excluding some of the least skilled workers from the market, the minimum wage leads to the compression of the wage distribution. The second effect is related to wages per se. An increase in the minimum wage raises the wages of those workers who were initially making less than the minimum wage to exactly the level of the wage floor (if they are not displaced because of the minimum wage changes). These workers are directly affected by the minimum wage. Potentially, a larger group is affected indirectly[5]. It contains those who were originally paid above the minimum wage and whose wages were increased to preserve the relative-wage ratios and maintain the incentives structure. This 'spillover' effect diminishes the higher the wage percentile. Both direct wage effects and spillovers lead to narrowing of the wage distribution. Lee (1999) and Autor et al.

[5] See Grossman (1983) for the relative wages explanation of spillover effects and Teuling (2000, 2003) for an explanation based on imperfect substitution between workers with different skills.

(2010) ignore disemployment effects and focus on direct wage and spillover effects of changes in the real minimum wage.

The main idea of Lee (1999) is to construct the latent distribution – the distribution of wages that would prevail in the absence of any minimum wage. He speculates that the shape of such distribution depends on the gap between the log of the statutory minimum wage and the log regional median (m_{reg}):

$$m_{reg} = w^m_{reg} - w_{reg}(50), \quad (1)$$

which he calls the 'effective minimum wage'. The minimum wage can have an effect on *p*-th percentile of the actual wage distribution and this effect is a function of the effective minimum wage ($w_{reg}(p) - w_{reg}(50) = g(w^m_{reg} - w_{reg}(50))$. With the state-level data Lee estimates such functions for each percentile of the distribution using the following equation (*t* subscripts are dropped for the sake of clarity):

$$w_{reg}\ p\ - w_{reg}\ 50\ =\ w^*_{reg}\ p\ - w^*_{reg}\ 50\ + \beta_1(w^m_{reg} - w_{reg}(50)) + \beta_2(w^m_{reg} - w_{reg}(50))^2 + YearDummies + \varepsilon_{reg} \quad (2)$$

Where $w^*_{reg}\ p$ denotes the latent values of percentile *p* in each region, β_1 and β_2 are allowed to vary by percentile. The percentiles of the latent distribution are unobserved, but this is not a problem as they enter as a constant into the equation (1). Here is where the basic identification assumption of Lee (1999) comes from: each percentile $w^*_{reg}\ p\ - w^*_{reg}\ 50$ is assumed to be constant across regions. This means that the shape of the latent wage distribution in year *t* is believed to be the same for all regions, though the median can, of course, be different.

Equation (2) is estimated on the panel of Russian regions. This panel was constructed using micro-data from the Survey of Occupational Wages described in Sections 3 and 4. I estimate Equation (2) for the entire sample and for sub-samples of males and females. Regional observations are weighted by the number of individual observations in each region-year.

Fig. 6 plots the relationship between the 10-50 log-wage differential and effective minimum wage in our data for 80 Russian regions. The three solid lines represent the fitted values of OLS regressions, one for each year. This figure also shows that the relationship is not linear but, in general, consists of two segments. The first segment is flat, suggesting no relationship between the differential and the relative minimum wage. It is the area where effective regional minima are smaller than the differential and thus have no effect on its value. The second segment lies along the 45-degree line. It presents the regions for which the differential is exactly equal to the effective minimum. This shape motivates using quadratic form in Equation (2). In Russia the relationship between the 10-50 log-wage differential and effective minimum wage was almost

flat in 2005 and 2007 but became strong in 2009, reflecting the fact that the 'bindingness' of the minimum wage grew over the period.

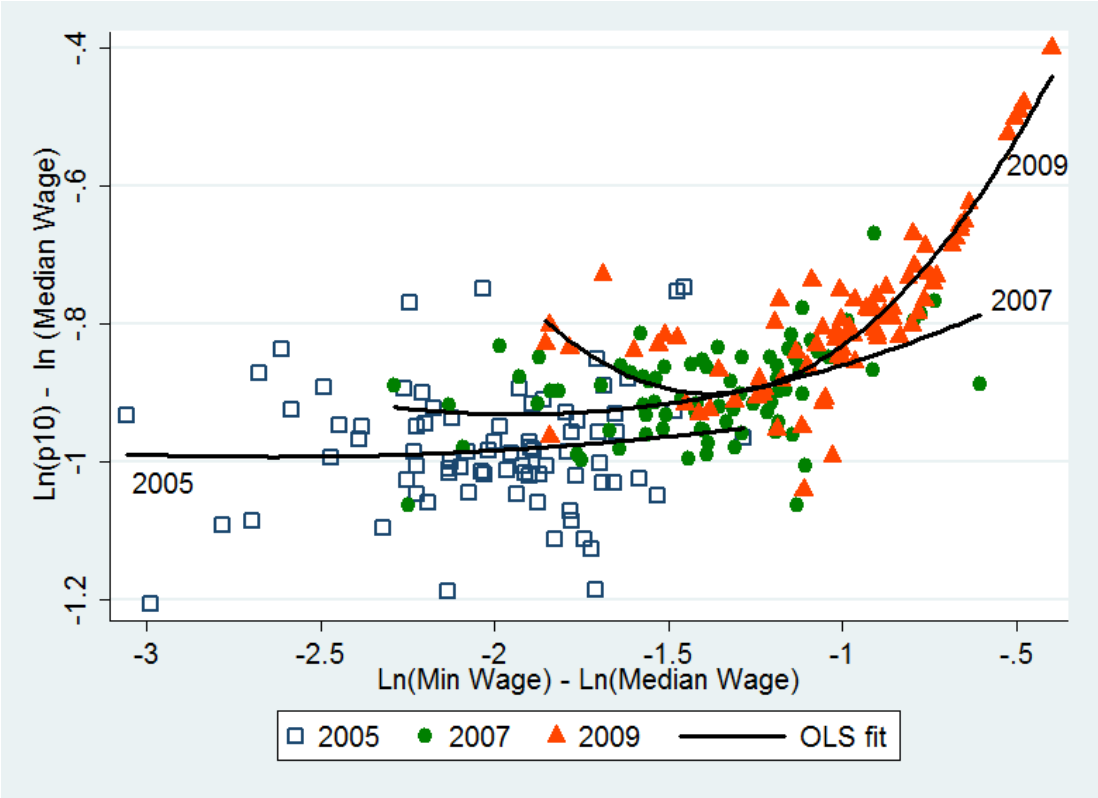

Fig. 6. 10-50 log-wage differential vs relative minimum wage

To account for the changing minimum wage regulations, I re-estimate some specifications using the gap between the log of the statutory minimum wage and the log of the median tariff wage. If employers continued to follow the old definition of the minimum wage in their wage-setting practices, these specifications should have more explanatory power. To control for the probable effects of the crisis, which led to a reduction in working hours, growth of unemployment, and significant expansion of ALMPs, I include three additional variables into Equation (2): average hours worked last month (H_{reg}), unemployment rate (U_{reg}) and the share of state and municipal sector in total employment ($State_{reg}$). Data on regional unemployment rates are taken from the LFS, while the other two variables were calculated from the main survey by aggregating the data at the regional level.

All of my amendments can be summarized as follows:

$$w_{reg}\ p\ - w_{reg}\ 50\ = \alpha + \beta_1 m_{reg} + \beta_2 m_{reg}^2 + \\ + h_1 H_{reg} + u_1 U_{reg} + s_1 State_{reg} + YearDummies + \varepsilon_{reg} \quad (3)$$

Autor et al. (2010) consider possible sources of misspecification in Lee (1999). The major problem comes from Lee's identifying assumption that the shape of the latent wage distribution in year *t* is constant across regions. This assumption implies that regional latent wage inequality

is uncorrelated with the median. They argue that if this assumption is violated, regional fixed effects should be included in the estimation of Equation (2). In fact, Lee was aware of this problem and included state fixed effects into the model, but in his study this magnified the biases because the within-state variation was small. Autor and his co-authors have longer panel and therefore more within-state variation and conclude that ignoring the differences between the states leads to significant biases and erroneous inference. Unfortunately, with three years of data I am not able to include regional fixed effects. Thus, I use fixed effects for macro-regions defined as 7 federal districts plus a dummy for residing in Moscow or Saint Petersburg.

The second source of misspecification is the division bias that stems from the inclusion of the state median wage variable in both the dependent and independent variables in Equation (2). It may cause an upward simultaneity bias in the estimates, since the median enters with the same sign on both sides of the equation. Lee (1999) recognizes this problem and attempts to address it by replacing the median on the right-hand side with the trimmed mean (the mean after excluding the bottom and top 30 percentiles).

Table 5. Description of specifications

Specification	Effective minimum variable	Controls
1	Effective minimum: $w^m_{reg} - w_{reg}(50)$	Effective minimum, effective minimum squared, year dummies
2	Effective minimum: $w^m_{reg} - w_{reg}(50)$	Specification (1) + regional dummies, dummy for living in Moscow or St. Pet
3	Effective minimum: $w^m_{reg} - w_{reg}(50)$	Specification (2) + average hours worked last month, unemployment rate and the share of state and municipal sector in total employment
4	Reduced-form effective minimum: $w^m_{reg} - w_{reg}(50)$	As in Specification (2)
5	Reduced-form effective minimum: $w^m_{reg} - w_{reg}(50)$	As in Specification (3)
6	Effective minimum based on tariff wage: $w^m_{reg} - w^{tariff}_{reg}(50)$	As in Specification (2)
7	Effective minimum based on tariff wage: $w^m_{reg} - w^{tariff}_{reg}(50)$	As in Specification (3)

Autor et al. (2010) show that the trimmed mean is still highly correlated with the median, and propose two solutions. Their first solution is to instrument the effective minimum with the state-specific statutory minimum wage in each state and year. Their second solution is to model region median wages as a function of time effects, region effects, region-specific time trends, and an error term:

$$w_{reg}\ 50\ = \alpha_t + \gamma_s + \ \gamma_s \times t\ + e_{reg} \quad (4)$$

Then they replace the effective minimum wage in the right-hand side with what they call the 'reduced form effective minimum' equal to $(w_{reg}^m - w_{reg}(50))$ where $w_{reg}(50)$ refers to the regression prediction from Equation (4). Autor et al. (2010) demonstrate that both approaches produce very similar results. Based on this conclusion I apply to my dataset the second solution for the division bias problem.

All together, I estimate seven specifications that differ in the effective minimum variables and sets of controls. The considered specifications are described in Table 5.

6. Estimating the impact of the minimum wage on wage differentials

Tables A2.1-A2.3 report non-linear estimates of six specifications for the 10-50 log-wage differential. I did the estimation for the entire sample and sub-samples of males and females. Yearly effects are positive and significant in most specifications. This finding implies that the dependent variable was increasing in 2005-2009, thus inequality was shrinking. The main effects of my key variables of interest, effective minimum and effective minimum squared, are positive and significant only in the equations estimated for females. For males we have oddly significant negative coefficients in the specifications where the bindingness of the minimum wage is measured on the basis of the tariff wage (Specifications 6 and 7). These negative coefficients, if correct, would mean that increase in the relative minimum wage leads to expansion of the lower part of distribution. This goes against the expectations and is, probably, a sign of misspecification. Poor performance of Specifications 6 and 7 may indicate that employers quickly adapted their wage-setting practices to the changes in the list of payments to be covered by the minimum wage regulation.

Regional variables are jointly significant in most specifications. Specifications with regional variables have better empirical fit. It is true for the entire sample and for males. For females, specifications without regional variables behave as well as those with regional variables. But in general, including regional fixed effects yields more appropriate specifications.

Coefficients of the crisis variables (average hours worked last month, unemployment rate and the share of state and municipal sector in total employment) are jointly insignificant for the entire sample and both considered sub-samples except specifications in which effective minimum is based on the tariff wages. This might suggest that the 2008-2009 economic crisis had no sizeable effects on the wage distribution, at least at the 10^{th} percentile.

Tables 6 and 7 report marginal effects of unit changes in the effective minimum wage for a longer list of log-wage differentials. Marginal effects were estimated at the 2009 mean. Table 6

gives results for specification with the effective minimum variable used as an explanatory variable. In Table 7 the calculations account for the possibility of the division bias.

Table 6. Marginal effects: Effective minimum used as an explanatory variable

Log-wage	All			Males			Females		
differential	ME	SE	Adj.R^2	ME	SE	Adj.R^2	ME	SE	Adj.R^2
Specification 1									
5-50	0.223*	0.056	0.68	0.150*	0.054	0.53	0.275*	0.044	0.74
10-50	0.102*	0.041	0.55	0.035	0.031	0.35	0.140*	0.038	0.60
20-50	0.010	0.027	0.38	-0.013	0.018	0.22	0.034	0.026	0.44
30-50	-0.002	0.014	0.26	-0.012	0.010	0.16	0.005	0.014	0.27
40-50	-0.001	0.006	0.16	-0.007	0.006	0.09	0.002	0.008	0.11
75-50	0.010	0.012	0.13	0.019	0.016	0.05	-0.006	0.011	0.04
90-50	0.003	0.019	0.06	-0.002	0.043	0.01	-0.031	0.017	0.03
Specification 2									
5-50	0.248*	0.067	0.72	0.188*	0.078	0.57	0.277*	0.052	0.77
10-50	0.128*	0.044	0.61	0.016	0.056	0.47	0.152*	0.040	0.63
20-50	0.034	0.026	0.48	-0.026	0.034	0.43	0.048*	0.023	0.54
30-50	0.017	0.015	0.40	-0.016	0.015	0.35	0.018	0.012	0.42
40-50	0.012	0.008	0.32	-0.009	0.007	0.29	0.010	0.007	0.29
75-50	0.001	0.016	0.29	0.022†	0.012	0.37	-0.017	0.016	0.23
90-50	0.002	0.025	0.28	0.006	0.025	0.39	-0.048†	0.028	0.22
Specification 3									
5-50	0.144†	0.074	0.74	0.100	0.089	0.58	0.233*	0.057	0.77
10-50	0.077	0.048	0.62	-0.004	0.064	0.48	0.143*	0.045	0.63
20-50	0.016	0.029	0.48	-0.008	0.041	0.45	0.056*	0.027	0.54
30-50	0.008	0.018	0.41	0.015	0.022	0.40	0.024	0.015	0.42
40-50	0.011	0.010	0.32	0.017	0.011	0.37	0.011	0.008	0.29
75-50	-0.001	0.022	0.29	-0.025	0.024	0.46	-0.029†	0.017	0.28
90-50	-0.025	0.040	0.30	-0.094*	0.047	0.49	-0.057*	0.029	0.29

Note: Estimated at the 2009 mean. Specifications are described in Table 5 in the text. ME = marginal effect, SE = standard error, Adj.R^2 = adjusted R^2. * - p-value <0.05, † - p-value<0.1.

These marginal effects produce a good specification test. First, we expect that the effect of minimum wages, if significant, is positive for the bottom of the distribution. Significantly negative marginal effects imply that an increase in the minimum wage leads to widening of lower half of the wage distribution, which is clearly counterintuitive. Second, we can be reasonably confident that the effects of the minimum wage are limited to the lower tail of the distribution and the minimum wage has no effects on the upper half of distribution. Taken at face value, these results indicate a systematic relationship between the effective minimum and upper wage percentiles of the distributions. This implies that a *decline* in the effective minimum wage leads to wage *compression at the top* of the distribution. Therefore, specifications that give significantly negative marginal effects for the bottom part of the distribution or significant marginal effects of any sign for the top-tail wage differentials are suspected of misspecification.

Table 7. Marginal effects: Division bias corrections

Log-wage differential	All			Males			Females		
	ME	SE	Adj.R^2	ME	SE	Adj.R^2	ME	SE	Adj.R^2
Specification 4									
5-50	0.125*	0.025	0.72	0.099*	0.028	0.58	0.136*	0.016	0.77
10-50	0.063*	0.019	0.61	0.021	0.021	0.47	0.076*	0.014	0.64
20-50	0.019	0.012	0.48	-0.005	0.013	0.42	0.024*	0.010	0.54
30-50	0.008	0.008	0.41	-0.005	0.007	0.35	0.009†	0.006	0.42
40-50	0.005	0.004	0.34	-0.003	0.003	0.29	0.005	0.004	0.29
75-50	0.000	0.008	0.29	0.011†	0.006	0.37	-0.003	0.008	0.25
90-50	0.000	0.014	0.28	0.006	0.012	0.39	-0.018	0.014	0.23
Specification 5									
5-50	0.079*	0.031	0.74	0.063†	0.035	0.59	0.124*	0.019	0.78
10-50	0.039†	0.022	0.62	0.015	0.026	0.48	0.081*	0.018	0.64
20-50	0.009	0.014	0.48	0.005	0.017	0.44	0.033*	0.013	0.55
30-50	0.002	0.009	0.41	0.010	0.010	0.39	0.013†	0.008	0.42
40-50	0.003	0.005	0.34	0.010†	0.005	0.37	0.005	0.004	0.29
75-50	-0.001	0.012	0.29	-0.015	0.012	0.46	-0.008	0.009	0.29
90-50	-0.014	0.021	0.30	-0.048*	0.024	0.49	-0.021	0.015	0.29
Specification 6									
5-50	0.131†	0.077	0.67	0.032	0.105	0.54	0.177*	0.051	0.71
10-50	0.022	0.046	0.57	-0.099	0.066	0.51	0.066†	0.034	0.58
20-50	-0.031	0.027	0.46	-0.115*	0.035	0.49	-0.003	0.020	0.51
30-50	-0.025	0.017	0.40	-0.075*	0.018	0.42	-0.011	0.012	0.41
40-50	-0.013	0.009	0.31	-0.032*	0.009	0.34	-0.009	0.007	0.29
75-50	0.050*	0.017	0.33	0.064*	0.016	0.41	0.028	0.020	0.23
90-50	0.084*	0.026	0.32	0.072*	0.034	0.42	0.032	0.030	0.21
Specification 7									
5-50	-0.044	0.063	0.72	-0.110	0.092	0.58	0.093†	0.053	0.74
10-50	-0.086*	0.036	0.63	-0.142*	0.064	0.52	0.028	0.038	0.59
20-50	-0.083*	0.024	0.50	-0.115*	0.039	0.50	-0.007	0.023	0.52
30-50	-0.057*	0.015	0.44	-0.067*	0.020	0.44	-0.011	0.016	0.41
40-50	-0.026*	0.009	0.34	-0.019†	0.010	0.37	-0.014	0.008	0.30
75-50	0.068*	0.019	0.34	0.032†	0.017	0.46	0.016	0.021	0.28
90-50	0.091*	0.032	0.33	0.011	0.034	0.47	0.022	0.032	0.27

Note: Estimated at the 2009 mean. Specifications are described in Table 5 in the text. ME = marginal effect, SE = standard error, Adj.R^2 = adjusted R^2. * - p-value <0.05, † - p-value<0.1.

Specifications 6 and 7, which measure the bindingness of the minimum wage as the gap between the minimum wage and the median tariff wage, are highly problematic in this respect. Specification 6 yields significantly positive effects for the 75-50 and 90-50 log-wage differentials for the pooled sample and the sample of males. For males it also predicts negative marginal effects for the 20-50, 30-50, and 40-50 wage differentials. Specification 7 produces significantly negative effects for most of the considered percentiles in the bottom part of the pooled and male distributions and significantly positive effects for upper part of those distributions. My conclusion is that the approach based on tariff wages is misspecified and the

relative minimum wage based on the tariff wage is a weak proxy for the bindingness of the minimum wage. Thus I reject these specifications and exclude them from further analysis.

Significantly positive marginal effects, albeit at the 10% confidence level, are estimated for the males' 75-50 log-wage differential in Specifications 2 and 4. There are also significant, but negative coefficients for the 90-50 log-wage differential in Specifications 3 and 5 for males and in Specifications 2 and 3 for females. Negative coefficients, if correct, would mean that a decline in the effective minimum wage widens the upper half of the distribution. There is no good theory to explain negative marginal effects in the upper part of wage distribution. In fact, they violate the expectation that the effect of the minimum wage fades away for higher wage levels and does so at a decreasing rate.

In Specification 5, there are also positive effects for the 40-50 log-wage differential of the male distribution. This result is questionable because the lower wage differentials in this specification are insignificant for males.

Note that except for Specifications 6 and 7 there are no any peculiarities in marginal effects estimated for the pooled sample of males and females. Thus, we can be more confident in results for the entire sample than for gender sub-samples. The results for males should be interpreted with considerable caution. Lee (1999) comes to the same conclusion and proposes using coefficients of pooled models in estimating counterfactuals. It means that the validity of these counterfactuals rests upon the assumption that the minimum wage affects both genders (as well worker types distinguished by other characteristics) equally, conditional on the worker's wage level[6].

For the lower tail of the distribution, all specifications agree in showing the positive effect, which diminishes while moving along the wage distribution. Thus we can choose the most appropriate among these five specifications to be the base for the simulation exercises.

Specifications 1-3 may suffer from the division bias that emerges from the inclusion of the regional median wage variable in both the dependent and independent variables. The division bias is likely to drive up the marginal effects of effective minimum wage. Comparison between Specifications 2 and 4 shows the importance of these issues. Both specifications contain the same sets of control variables and differ only in how the effective minimum wage is constructed. They have very similar explanatory power. However, the magnitude of marginal effects is two times larger in Specification 2 than in Specification 4. The division bias, in fact, has significant effect on the estimates. Specifications that do not account for the division bias should be rejected.

[6] Autor et al. (2010) fit separate models for males and females.

So at this point we have to choose between Specifications 4 and 5. Crisis-related variables in Specification 5 do not add much additional explanatory power in equations for the entire sample and for females in comparison with Specification 4. For males, including crisis-related variables increases the explanatory power but produces oddly significant marginal effects for the 40-50 and 90-50 log-wage differentials. Therefore, Specification 4 seems mostly appropriate for the purpose of inference. It suggests that the effect of the minimum wage is much stronger for females.

In the preferred specification the minimum wage is hardly binding for males, as the effect is already insignificant for the 10-50 log-wage differential. For females it persists up to at least the 30th percentile of the female distribution. In the pooled distribution the effect of the minimum wage still survives at the 10th percentile. This happens because females with lower wages prevail in the lower part of the pooled distribution. The minimum wage model explains 41-72% of the regional variation in the lower tail percentile differentials, 35-58% of the variation for males, and 42-77% of the variation for females.

7. Estimating the counterfactual change in inequality

How much of the compression of wage inequality in 2005-2009 was due to the minimum wage hikes? Following Lee (1999) and Autor et al. (2010), I present counterfactual estimates of the change in latent wage inequality absent the increase in the minimum wage—that is, the change in wage inequality that would have been observed had the real minimum wage been held at the 2005 level. These counterfactuals are constructed using the estimates for how the minimum wage affects every percentile of the wage distribution, as described in the previous section (Specification 4).

To estimate changes in latent wage inequality, Lee (1999) proposes the following simulation procedure. For each individual in the dataset, he calculates her percentile position in the regional (state) wage distribution for the final year of the period. Then, he adjusts each wage by the magnitude:

$$\Delta w_{reg}^{p} = \beta_1^p \; m_{reg,\tau 0} - m_{reg,\tau 1} \; + \beta_2^p \; m_{reg,\tau 0}^2 - m_{reg,\tau 1}^2 \qquad (4)$$

Where $\tau 0$ is the initial year of the period, $\tau 1$ is the final year of the period, $m_{reg,\tau 1}$ is the observed effective minima in region *reg* in period $\tau 1$, $m_{reg,\tau 0}$ is the hypothetical relative level of the minimum wage for region *reg* in period $\tau 0$, and β_1^p and β_2^p are point estimates of corresponding coefficients from Equation (1). $m_{reg,\tau 0}$ is calculated by correcting $m_{reg,\tau 1}$ for changes in the minimum wage and the national median wage ($\Delta w\ 50$): $m_{reg,\tau 0} = m_{reg,\tau 1} - (w_{reg,\tau 1}^{m} - w_{reg,\tau 0}^{m} - \Delta w\ 50\ )$. I follow the recommendation of Autor et al. (2010) and use

regional observed median wages when calculating $m_{reg,\tau 0}$ rather than the national median deflated by the price index. Equation (4) is applied to all percentiles between 1 and 49.

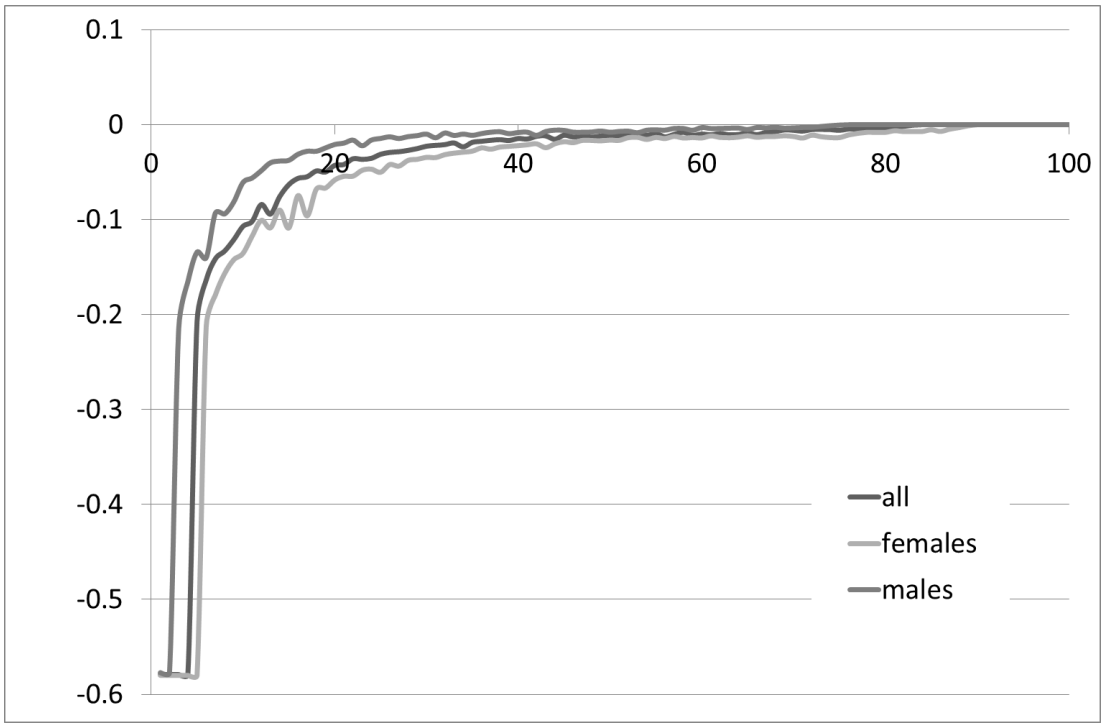

Fig. 7. Difference between counterfactual and actual wages by percentiles of the wage distribution

Fig. 7 provides a visual comparison between observed and counterfactual wages in 2009 depicting the difference between percentiles of counterfactual and actual wage distributions. As explained in the previous section, effects for males and females were calculated using the coefficients for the pooled sample. For both samples, the bulk of the effect is concentrated in the lowest quintile, especially in the bottom decile. For females the minimum wage is more binding than for males.

Table 8 reports changes in wage inequality. The top panel of Table 8 shows that that between 2005 and 2009, the 90-10 log-wage differential declined by 18 log points. Applying the marginal effect estimates obtained using Equation (4) I find that had the real minimum wage been constant at its real 2005 level throughout this period, 90-10 log-wage differential would counterfactually have decreased by only 9 log points. It implies that the rise in the real minimum wage can account for half (9 of 18 log points) of the compression of overall wage inequality in this period. Similarly, the minimum wages increase is 'responsible' for about 50% of the decline in lower tail wage inequality measured by the 50-10 log wage differential.

Table 8. Changes in wage inequality

Log-wage differential	Actual 2005	Actual 2009	Counterfactual 2009	Difference 2009
		A. All		
90-10	2.03	1.85	1.94	-0.09
75-25	1.05	0.98	1.00	-0.02
90-50	0.97	0.93	0.94	-0.01
50-10	1.06	0.91	0.99	-0.08
		B. Females		
90-10	1.89	1.73	1.85	-0.12
75-25	0.97	0.92	0.95	-0.03
90-50	0.91	0.91	0.93	-0.01
50-10	0.98	0.82	0.92	-0.11
		C. Males		
90-10	1.98	1.82	1.87	-0.05
75-25	1.00	0.93	0.94	-0.01
90-50	0.90	0.86	0.87	-0.01
50-10	1.08	0.96	1.00	-0.04

Most of the reduction in overall wage inequality happened because of substantial narrowing of the female distribution. Panels B and C of Table 8 show that the additional decline in the 90-10 log-wage differential, caused by the increase in the real minimum wage, is equal to 12 log points for females and to 5 log points for males. It amounts to 75% of the overall decline in 90-10 wage inequality for females and 30% for males. These effects are large for females and non-trivial for males, and they confirm that the rising minimum wage contributed meaningfully to falling lower-tail inequality over 2005-2009. Wages of high-paid worker groups such as university graduates, those employed in mining and quarrying or in foreign-owned firms, are moderately attenuated by an adjustment for the minimum wage.

Tables 9 and 10 reveal which worker groups benefited the most from the rise of the minimum wage. The last columns of these tables report differences between actual and counterfactual average wages for each group. Applying Equation (4), I find that 4 percentage points of increase in average wages between 2005 and 2009 can be attributed to the minimum wage hikes. The additional increase in average wages was greater for groups that are more significantly affected by the minimum wage legislation – females, teenage and elderly workers, workers with low education, and public sector employees.

Table 9. Effects of minimum wage increase by population sub-groups

	Average wages		Difference
	Actual 2009	Counterfactual	
All workers	9.12	9.09	0.04
Gender			

	Males	9.31	9.28	0.02
	Females	8.96	8.91	0.05
Age				
	Below 19	8.71	8.62	0.09
	20-29	9.12	9.09	0.03
	30-39	9.20	9.17	0.03
	40-49	9.14	9.11	0.03
	50-59	9.09	9.05	0.04
	60+	8.98	8.92	0.06
Education				
	University	9.42	9.41	0.01
	Some university	8.99	8.95	0.04
	College	9.01	8.97	0.04
	Vocational	9.01	8.96	0.04
	Secondary	8.94	8.88	0.06
	Low secondary and less	8.79	8.71	0.08

Among predominantly private industries, hotels and restaurants experienced the largest increase in average wages compared to counterfactual estimates. There may be that even after the rise minimum wages still were not binding for the private sector in 2009. Another possible option is that low-wage workers were dismissed from the formal private sector and moved either to unemployment or to the informal sector. The data I use do not cover jobs small firms and informal jobs, so disemployment effects are beyond the scope of this paper. However, national statistics do not provide any evidence that mass dismissals of low-wage workers were an acute problem between 2005 and 2009.

Table 10. Effects of minimum wage increase by firm characteristics

	Average wages		Difference
	Actual 2009	Counterfactual	
Ownership type			
State or municipal	8.97	8.91	0.06
Domestic private	9.23	9.21	0.02
Foreign or joint venture	9.51	9.49	0.01
Domestic mixed (private-public)	9.28	9.27	0.02
Economic activity			
Recreation, arts and sporting activities	8.81	8.72	0.09
Mining and quarrying	9.61	9.60	0.01
Manufacturing	9.15	9.13	0.02
Electricity, gas and steam supply	9.28	9.26	0.01
Construction	9.38	9.37	0.02
Wholesale and retail trade	9.12	9.10	0.03
Hotels and restaurants	8.94	8.90	0.05
Transport and communications	9.34	9.32	0.02
Real estate, renting and business activities	9.32	9.29	0.03
Education	8.77	8.68	0.09
Health	8.85	8.79	0.06

As low-wage groups benefited disproportionally from the minimum wage increase, this increase led to a significant drop in between-group wage inequality. The gender wage gap in average wages declined by an extra 3 percentage points. The wage-age profile flattened but the change was sizable only for the margins – teenage and elderly workers. Changes in the minimum wage contributed to a reduction in returns to schooling. The university premium (compared to secondary education) would have been higher by 5 percentage points had the real minimum wage been constant at its real 2005 level. This is about one-tenth of the overall premium of university graduates. On the other side of the education spectrum, on average the gap between high school drop-outs and high school graduates declined by 2 percentage points. Minimum wage increases in 2005-2009 decreased the public-private gap by 4-5 percentage points mainly because of rising wages in education, health and other sectors that are funded from the government budget.

8. Concluding remarks

This paper investigates the impact of the minimum wage increases on the wage distribution between 2005 and 2009 by using payroll data on wages in the Russian corporate sector. I estimate that over this period, about 50% of the compression of lower tail inequality in the overall wage distribution, 75% of the decline in female lower tail inequality, and 30% of the decline in male lower tail inequality – as measured by the log-wage differential between the 50^{th} and 10^{th} percentile – is attributable to the increase in the real value of the minimum wage.

The compression effect was stronger for teenage and elderly workers, workers with low education, and public sector employees. The specific composition of the worker types who were affected most by recent minimum wage hikes caused a sizable reduction in between-group wage inequality and changes in returns to job and worker characteristics. The university wage premium in 2009 was approximately 10% lower that it would have been in the absence of the minimum wage increase. Other wage structure consequences include a decline in the public-private wage gap, inter-industry wage differentials and a small decrease in the gender wage gap.

Since a relatively small fraction of workers is directly affected by the minimum wage regulation in modern Russia (i.e., they receive wages at the level of the minimum wage), my findings suggest that spillover effects account for a significant part of the overall impact. Existence of high spillover effects in Russia may be a consequence of specific wage-setting framework in the budgetary sector that was still in place in most Russian regions on 2005-2009. Within this framework, the basic tariff part of the budgetary sector wage was defined on the basis of the Unified Tariff Scale (UTS) (Gimpelson and Lukiyanova, 2009). The first grade of the UTS was

directly linked to the level of the statutory minimum wage. Therefore, any increase in the minimum wage would trigger an increase in the tariff component of wages throughout the whole budgetary sector distribution. The coefficients of the UTS could even amplify the effect of such an increase for the higher deciles of the distribution.

The findings in this paper have a few implications for future research on wage inequality. First, while the minimum wage was certainly an important contributing factor to narrowing of lower tail inequality, especially for females, it was not the only one. The rapid growth of wages at the bottom of the distribution started in 2001 when minimum wages remained symbolic. Between 2005 and 2009, about 50% of the reduction in overall lower tail inequality and 70% of the reduction in male lower tail inequality cannot be attributed to minimum wages and still needs to be explained. Second, this paper concentrated on the impact of changes in the federal minimum wage and ignored regional minimum wages that were introduced since 2007. Third, because of data limitations I did not consider wages in the informal sector and at small firms where low-wage private sector workers are concentrated. Fourth, the paper overlooks disemployment effects and the possibility of crowding out workers to the informal sector. I believe that for the period under consideration these effects were small, but this should be proved with more scrutiny. The lack of evidence on employment effects of minimum wages in Russia limits the scope of policy implications. It has been shown that the minimum wage compresses inequality. However, greater knowledge of its impact on employment is needed to estimate the total welfare effects and advocate minimum wages as a poverty alleviation tool.

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Appendix

Table A1. Description of the sample (using sampling weights)

	2005	2007	2009
Average age, years	42.9	43.2	43.7
Average hours worked in October	169.2	180.3	173.6
Fraction of females, %	55.2	55.4	56.1
Education, %:			
Low secondary and less	5.9	5.1	3.9
Secondary	24.0	21.9	19.9
Vocational	11.1	11.7	12.0
College	28.8	28.3	27.3
Some university	2.5	2.8	3.5
University	27.7	30.2	33.4
Ownership type, %:			
State or municipal	56.9	54.6	57.7
Domestic private	27.5	31.3	29.0
Foreign or joint venture	5.5	6.1	7.0
Domestic mixed (private-public)	10.1	8.1	6.3
Branches of economic activity, %:			
Recreation, arts and sporting activities	3.4	3.5	3.7
Mining and quarrying	3.0	3.0	3.1
Manufacturing	21.5	20.2	18.1
Electricity, gas and steam supply	6.0	5.7	6.1
Construction	4.3	4.5	4.4
Wholesale and retail trade	5.7	7.0	6.6
Hotels and restaurants	1.0	1.1	0.9
Transport and communications	10.8	10.3	10.3
Real estate, renting and business activities	10.0	9.9	9.2
Education	20.6	21.1	22.6
Health	13.7	13.7	14.9
Number of observations	680,764	752,793	717,557

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Table A2.1. Non-linear estimation: 10-50 log-wage differential on minimum wage, all workers

	1		2		3		4		5		6		7	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Effective minimum variable	Effective minimum		Effective minimum		Effective minimum		Reduced-form effective minimum		Reduced-form effective minimum		Effective minimum based on the tariff wage		Effective minimum based on the tariff wage	
Effective minimum	0.167	0.111	0.199*	0.109	0.115	0.113	0.355	0.298	0.194	0.296	-0.020	0.085	-0.156**	0.075
Effective minimum^2	0.026	0.035	0.028	0.033	0.017	0.032	0.014	0.014	0.008	0.014	-0.033	0.041	-0.048	0.034
Year (2005)														
2007	0.050*	0.026	0.037	0.025	0.067**	0.034	0.077***	0.014	0.089***	0.028	0.056*	0.031	0.131***	0.034
2009	0.110***	0.038	0.088**	0.037	0.131***	0.041	0.153***	0.020	0.167***	0.024	0.142***	0.039	0.235***	0.033
Region (Central Russia)														
North-West			0.017	0.017	0.008	0.015	0.021	0.019	0.011	0.018	-0.003	0.019	0.001	0.015
South			-0.022	0.026	-0.022	0.027	-0.026	0.026	-0.023	0.027	-0.000	0.027	-0.010	0.026
Volga			-0.040**	0.018	-0.031**	0.015	-0.039**	0.018	-0.030*	0.016	-0.037**	0.015	-0.017	0.014
Ural			-0.063**	0.030	-0.058**	0.024	-0.064**	0.032	-0.057**	0.025	-0.102**	0.040	-0.060**	0.024
Siberia			-0.029	0.021	-0.043*	0.025	-0.026	0.022	-0.040	0.027	-0.048**	0.021	-0.045*	0.025
Far-East			0.000	0.029	-0.038	0.034	0.003	0.029	-0.034	0.035	-0.047**	0.020	-0.064***	0.024
Residing in Moscow or St-Pet			0.021	0.031	0.003	0.028	0.017	0.034	0.002	0.030	0.004	0.040	-0.039*	0.024
Average hours worked					-0.000	0.002			-0.000	0.002			-0.001	0.002
Unemployment rate					-0.037	0.252			-0.064	0.265			0.003	0.246
State & municipal employment					0.241*	0.134			0.236*	0.136			0.434***	0.134
Constant	-0.772***	0.097	-0.699***	0.098	-0.952**	0.383	1.203	1.568	0.096	1.644	-0.928***	0.068	-1.256***	0.391
p-value for F(all regional vars=0)			0.006		0.033		0.010		0.048		0.063		0.006	
p-value for F(all crisis vars=0)					0.146				0.214				0.000	
Adjusted R^2	0.55		0.60		0.61		0.60		0.61		0.55		0.61	

Note: N=238. Data are constructed from the Survey of Occupational Wages (Rosstat). Regional unemployment rates are taken from official Rosstat publications. Regressions are the 10-50 differential on the relative minimum wage. Weighted by observations per region-year. Standard errors are heteroskedasticity-consistent and clustered at the region level. * - p-value <0.05, † - p-value<0.1.

Table A2.2. Non-linear estimation: 10-50 log-wage differential on minimum wage, males

	1		2		3		4		5		6		7	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Effective minimum variable	Effective minimum		Effective minimum		Effective minimum		Reduced-form effective minimum		Reduced-form effective minimum		Effective minimum based on the tariff wage		Effective minimum based on the tariff wage	
Effective minimum	-0.017	0.121	-0.048	0.159	-0.083	0.171	0.011	0.315	-0.035	0.353	-0.326**	0.163	-0.371**	0.157
Effective minimum^2	-0.020	0.038	-0.024	0.039	-0.028	0.040	-0.001	0.014	-0.002	0.015	-0.133**	0.064	-0.131**	0.061
Year (2005)														
2007	0.060**	0.027	0.067***	0.020	0.122***	0.047	0.092***	0.019	0.135***	0.040	0.058*	0.032	0.135***	0.038
2009	0.112***	0.034	0.127***	0.038	0.162***	0.055	0.154***	0.031	0.173***	0.039	0.148***	0.040	0.211***	0.041
Region (Central Russia)														
North-West			0.032**	0.015	0.030*	0.016	0.033**	0.015	0.032*	0.018	0.020	0.017	0.026	0.018
South			-0.026	0.039	-0.034	0.039	-0.029	0.040	-0.037	0.040	-0.020	0.038	-0.031	0.039
Volga			-0.040	0.024	-0.044*	0.025	-0.040	0.025	-0.045*	0.025	-0.040	0.024	-0.038	0.026
Ural			0.029*	0.016	0.022	0.018	0.026	0.017	0.020	0.018	0.006	0.018	0.020	0.019
Siberia			-0.051**	0.025	-0.061**	0.024	-0.051**	0.025	-0.058**	0.025	-0.053*	0.030	-0.054*	0.028
Far-East			0.029	0.025	0.043	0.034	0.030	0.025	0.047	0.035	0.015	0.025	0.036	0.034
Residing in Moscow or St-Pet			-0.120***	0.017	-0.121***	0.020	-0.120***	0.017	-0.119***	0.022	-0.106***	0.033	-0.125***	0.028
Average hours worked					-0.003	0.002			-0.003	0.002			-0.003	0.002
Unemployment rate					0.352	0.307			0.329	0.335			0.349	0.285
State & municipal employment					-0.048	0.111			-0.070	0.106			0.051	0.120
Constant	-0.969***	0.101	-0.991***	0.170	-0.464	0.437	-0.820	1.795	-0.528	2.108	-1.164***	0.114	-0.714	0.443
p-value for F(all regional vars=0)			0.000		0.000		0.000		0.000		0.005		0.000	
p-value for F(all crisis vars=0)					0.419				0.459				0.048	
Adjusted R^2	0.35		0.46		0.46		0.45		0.45		0.49		0.50	

Note: N=238. Data are constructed from the Survey of Occupational Wages (Rosstat). Regional unemployment rates are taken from official Rosstat publications. Regressions are the 10-50 differential on the relative minimum wage. Weighted by observations per region-year. Standard errors are heteroskedasticity-consistent and clustered at the region level. * - p-value <0.05, † - p-value<0.1.

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Table A2.3. Non-linear estimation: 10-50 log-wage differential on minimum wage, females

	1		2		3		4		5		6		7	
	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE	Coef.	SE
Effective minimum variable	Effective minimum		Effective minimum		Effective minimum		Reduced-form effective minimum		Reduced-form effective minimum		Effective minimum based on the tariff wage		Effective minimum based on the tariff wage	
Effective minimum	0.313***	0.096	0.317***	0.099	0.295***	0.107	1.071***	0.239	1.140***	0.302	0.081	0.054	0.024	0.058
Effective minimum^2	0.084***	0.030	0.080**	0.033	0.077**	0.034	0.050***	0.012	0.053***	0.015	0.011	0.031	-0.001	0.030
Year (2005)														
2007	0.062***	0.015	0.053***	0.019	0.049**	0.021	0.076***	0.011	0.054***	0.019	0.054**	0.026	0.056*	0.033
2009	0.128***	0.024	0.115***	0.028	0.119***	0.030	0.163***	0.015	0.155***	0.017	0.140***	0.032	0.157***	0.038
Region (Central Russia)														
North-West			0.014	0.023	0.013	0.024	0.034	0.026	0.042	0.030	-0.011	0.029	-0.010	0.027
South			-0.021	0.017	-0.023	0.018	-0.027*	0.016	-0.024	0.018	-0.005	0.022	-0.018	0.020
Volga			-0.027*	0.014	-0.026*	0.014	-0.021	0.014	-0.019	0.014	-0.027*	0.015	-0.022	0.015
Ural			-0.055***	0.018	-0.054***	0.015	-0.053**	0.022	-0.048**	0.019	-0.081***	0.017	-0.068***	0.014
Siberia			-0.027	0.021	-0.034	0.025	-0.014	0.022	-0.012	0.027	-0.051**	0.023	-0.062**	0.024
Far-East			-0.030	0.026	-0.039	0.030	-0.024	0.027	-0.018	0.032	-0.072***	0.023	-0.088***	0.025
Residing in Moscow or St-Pet			0.008	0.027	0.006	0.027	-0.026	0.035	-0.033	0.035	0.010	0.039	0.007	0.034
Average hours worked					0.001	0.001			0.002	0.001			0.002	0.001
Unemployment rate					0.056	0.220			-0.055	0.234			0.051	0.245
State & municipal employment					0.076	0.118			0.022	0.124			0.280**	0.128
Constant	-0.627***	0.077	-0.590***	0.079	-0.880***	0.280	4.821***	1.206	4.833***	1.536	-0.792***	0.050	-1.370***	0.220
p-value for F(all regional vars=0)			0.000		0.000		0.138		0.101		0.001		0.000	
p-value for F(all crisis vars=0)					0.733				0.589				0.020	
Adjusted R^2	0.60		0.62		0.62		0.63		0.63		0.56		0.57	

Note: N=238. Data are constructed from the Survey of Occupational Wages (Rosstat). Regional unemployment rates are taken from official Rosstat publications. Regressions are the 10-50 differential on the relative minimum wage. Weighted by observations per region-year. Standard errors are heteroskedasticity-consistent and clustered at the region level. * - p-value <0.05, † - p-value<0.1.

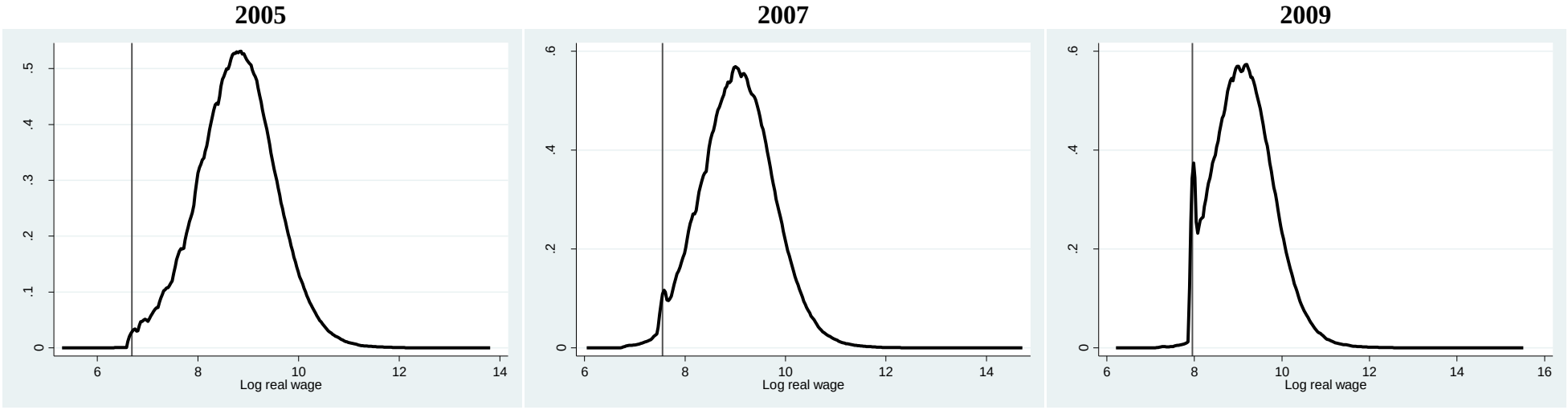

Fig. 5A. Kernel log real wage distributions

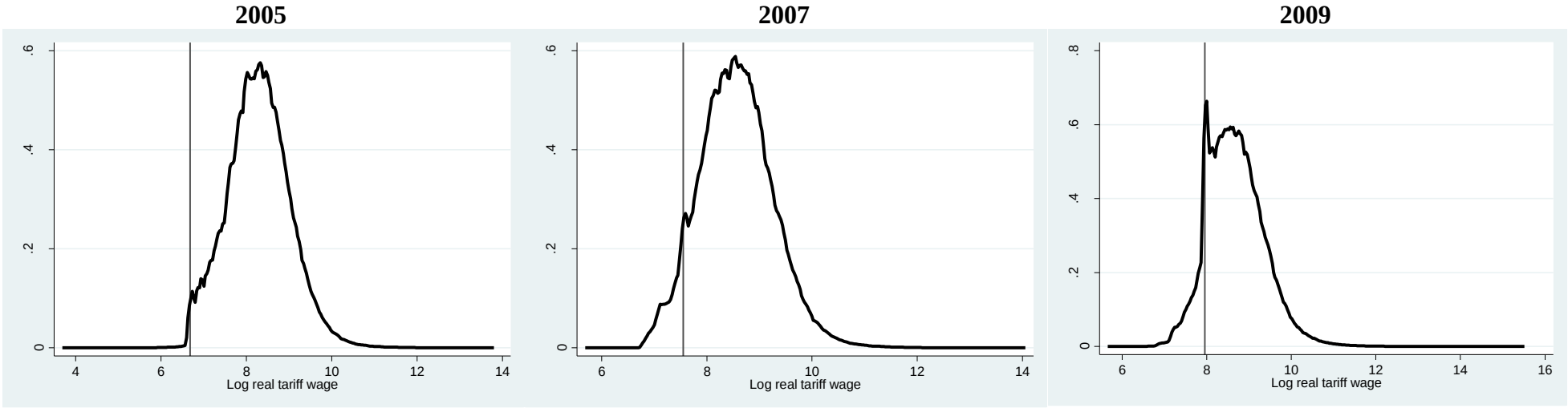

Fig. 5B. Kernel distributions for log real tariff wages