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This paper revisits the effect of minimum wages on employment by taking advantage of a unique institutional setting and data from Russia. The main strength of the paper is the use, for identification purposes, of the large variation in labor market outcomes as well as in the minimum wage across the 89 regions (states) over 10 years, from 2001 to 2010. The study relies on the standard methodology introduced by Neumark and Wascher, in which various labor market outcomes at the regional level are related to the relative minimum wage (captured by the Kaitz index) in the panel setting. We find adverse effects of the minimum wage on young workers in the form of higher unemployment among those aged 16-24. There are also signs that minimum wage hikes lead to higher unemployment in the general population, but the effect is small. Our analysis also suggests that higher minimum wages lead to an increase in the share of workers employed in the informal sector.

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1. Introduction

The minimum wage remains one of the most controversial issues in labor economics, economic policy, and politics. Introduced with the goal of promoting income equity and reducing poverty, the minimum wage has been criticized for its potential adverse effects on the labor market. Much of the criticism has been based on the standard labor supply and demand model, which suggests that the minimum wage raises unemployment, especially among low skilled workers (Stigler 1946). Rather than help low earners, in the competitive labor market the minimum wage does exactly the opposite.

It is well known, however, that the standard perfect competition model may not adequately describe labor markets, which invalidates its predictions regarding the minimum wage. For example, in the presence of monopsony on the labor market, which, as shown in Ashenfelter, Farber and Ransom (2010) and Manning (2011) is a widespread phenomenon, introducing minimum wages may not only increase wages of low-skilled workers, but also raise overall employment (see e.g., Boal and Ransom 1997). Recent theoretical extensions of the debate include Cahuc and Laroque (2009) and Danziger (2010), who question the benefits of the minimum wage in monopsonistic environments, Strobl and Walsh (2011), who stress the distinction between the intensive and extensive margins of labor market adjustment, and Lee and Saez (2012), who show that a binding minimum wage, despite negative effects on employment, may nevertheless be a viable policy option for governments that value redistribution towards low wage workers.

The empirical evidence of labor market effects of the minimum wage remains inconclusive. Although Neumark and Wascher (2008), the most comprehensive survey of the literature up to 2006, concludes that the minimum wage has a negative effect on employment opportunities of less-skilled workers with no effect on the overall employment, several recent contributions show that the debate is far from being over. For example, Dube, Lester and Reich (2010) find no disemployment effects in restaurants and other low-wage sectors in the US. Dolton, Rosazza-Bondibene and Wadsworth (2012) report no or small positive impact of the minimum wage on employment in the UK. However, Sen, Rybczynski and Van De Waal (2011) find significant disemployment effects among teens in Canada. The lack of accord is accompanied by the discussion regarding the appropriateness of different methodological approaches, such as time-series regressions, case studies, and state panel data regression analysis (see Bazen and Le Gallo 2009; Dube at al. 2010). An interesting recent contribution to this debate is Neumark, Salas and Wascher (2013).

The pros and cons of the minimum wage are subject to even greater controversy in the context of developing and emerging economies, which are characterized, as a rule, by greater

incidence of low wage work, widespread employment in the informal sector, and generally poor enforcement of laws and regulations. An aspect that draws particular attention of scholars is the effect of the minimum wage on informality on the labor market. The issue is also relevant, albeit often neglected, in the context of developed economies (Williams and Windebank 2012). Indeed, as noted by Schneider (2010), "shadow economies are a complex phenomenon present to a large extent in all type of economies (developing, transition, and highly developed)".

The standard dual economy models of labor market segmentation suggest that an increase in the minimum wage will drive least productive workers from the formal sector into the informal one, resulting in falling wages in the informal sector. Empirical evidence, however, is mixed. Regarding formal and informal employment, many studies find increasing informalization as a result of minimum wage hikes (e.g., Carniero 2004 for Brazil, Comolo and Mello for Indonesia and Amin 2009 for India), with ambiguous aggregate employment effects. Some studies, such as Lemos (2009), find no evidence of adverse employment effects for either formal or informal sector. In contrast, Magruder (2013) shows, on the example of Indonesia, that introducing minimum wages may have a big push effect on the economy, resulting in the expansion of formal employment and contraction of the informal sector. Regarding wages, most empirical studies document a theoretically counterintuitive increase of wages in the informal sector following minimum wage hikes, known as a lighthouse effect (e.g., Boeri et al. 2011; Khamis 2013).

This paper revisits the effect of the minimum wage on employment by taking advantage of a unique institutional setting and data from Russia. The main strength of the paper is the use, for identification purposes, of the large variation in labor market outcomes as well as in the minimum wage across the 89 regions (states) over 10 years, from 2001 to 2010. There were eight hikes of the federal minimum wage during this period, two of which (by about 100 percent) were almost unprecedented among not only developed, but also developing countries. The decentralization of the minimum wage setting in September 2007, which gave the regions the power to set their own regional minima above the federal floor, further increased the cross-sectional and time-series variation in the minimum wage. Given this background, it comes as a surprise that there are no thorough studies of labor market effects of the minimum wage in Russia.[4]

[4] The only exceptions are Kobzar (2009) and Lukiyanova (2011). The former study discusses changes in the minimum wage during the last decade and attempts to evaluate their effect on regional labor markets. The empirical analysis yields no statistically significant results, perhaps, due to some methodological limitations, such as the use of annual data, which is problematic in the rapidly changing and highly volatile economic environment of Russia. The second paper only deals with the distributional effects of the minimum wage among those employed. It suggests that minimum wage hikes can result in the decline in the lower tail inequality, particularly for females. Potential non-employment and unemployment effects of the minimum wage are not considered in the study.

Our study relies on the methodology introduced by Neumark and Wascher in 1992 which in subsequent years became standard in empirical studies of the minimum wage (e.g., Zavodny 2000; Lemos 2009). In our analysis, various labor market outcomes at the regional level are related to the relative minimum wage (captured by the Kaitz index) in the panel setting. The data on regional labor markets come from Russia's Labor Force Survey (LFS) and other sources available from the Russian Statistical Agency (Rosstat). These are complimented with detailed data on federal and regional minimum wages collected by us.

Our results suggest adverse effects of the minimum wage on young workers, most notably, in the form of higher unemployment among those aged 16-24. There are also signs that minimum wage hikes lead to higher unemployment in the general population, but the effect is small. These results are pretty much in line with the previous empirical literature that often suggests significant negative consequences of the minimum wage for vulnerable groups in the labor market, but insignificant effects for the working age population in general. Another result of our study is related to the effect of minimum wages on informal employment. Our analysis suggests that minimum wage hikes lead to an increase in the share of workers employed in the informal sector. This may imply relocation of workers from the formal sector to the informal one as a consequence of minimum wage hikes, which is consistent with the observed high inter-sectoral mobility (e.g., Bosh and Maloney, 2010; Lehmann et al., 2012). These findings, therefore, cast doubt on the effectiveness of minimum wages in promoting income equity and reducing poverty since informality, at least in the wage employment sector, is typically associated with higher insecurity of jobs, lower earnings, and the lack of social security protection.

The paper is organized as follows. Section 2 provides the institutional background of minimum wage setting in Russia. Section 3 describes the data. Section 4 outlines the methodology of our empirical analysis. Section 5 presents and discusses the empirical results. Section 6 concludes.

2. Institutional background

The minimum wage in Russia is not a new phenomenon as it existed already during the central planning era. In 1985, for example, the minimum wage amounted to 70 Rubles, which, given the average wage in the country (some 190 Rubles), implied a Kaitz ratio of about 37 percent.[5] The Kaitz ratio in the USSR was thus similar to what is now observed in many OECD economies. In the 1990s, a period of economic reforms accompanied by hyperinflation, there was a dramatic erosion of the real minimum wage in Russia, despite regular minimum wage

[5] The Kaitz ratio is the ratio of the minimum wage to the average wage.

hikes (see Chart 1). As a result, by the start of the new century, the minimum wage amounted to a mere 6-7 percent of the average wage. A number of more substantial hikes were introduced between 2001 and 2007 but, given double-digit inflation in the country, they only helped to keep the Kaitz ratio at about 10 percent. Starting in 2007, a number of dramatic increases in the minimum were legislated. For example, the nominal minimum wage was raised by 109 percent in September 2007 and 88 percent in January 2009. These hikes brought the Kaitz index well above 20 percent.[6]

The regulatory framework for the minimum wage is established in Russia's Labor Code. The country has a nationwide (federal) minimum wage as well as regional minimum wages (since 2007).[7] The federal minimum applies to all groups of workers, without any differences by age, occupation or industry. Since September 2007, regions have the right to define their own regional minima (which may be sector-specific) above the federal threshold. Many regions quickly took advantage of this opportunity (see Chart 2), which resulted in the substantial spatial differentiation of the nominal minimum wage already in 2008. Interestingly, apparent enthusiasm of the regional governments in setting own minimum wages was short-lived: after the 2008 financial crisis few regions legislated own minima and the 2009 increase of the federal minimum wage overshot most regional thresholds established in 2007-2008.

One additional aspect to studying minimum wages in Russia is related to the so-called Northern territories. Already in Soviet times, workers living in the North and Far East of the country were entitled (by law) to higher minimum wages (and also higher wages in the public sector), introduced via the so-called Northern multiplier, which varied from 1.15 to 2 depending on the severity of living conditions in respective territories. For example, in Chukotka, the region in the Russian North-East bordering Alaska of the US over the Bering strait, the multiplier is equal to 2; in the Murmansk region, which borders Finland and Norway to the West and has a much milder climate than Chukotka, the multiplier is equal to 1.4. The Northern multiplier is thus an important source of cross-regional variation in the nominal minimum wage in Russia. The Northern multiplier can also vary by districts within large regions. For example, while in most of the Republic of Karelia, which borders Finland to the West, the multiplier is equal to 1.15, in its Northern part is it set at the level of 1.4.[8]

[6] These hikes are almost unprecedented among not only developed, but also developing countries. We are aware of only two increases in the minimum wage which are similar in magnitude to Russia's. One took place in Hungary in 2001 (Kertesi and Kollo, 2003) and the other one occurred in Indonesia in 1990s (Rama, 2001). In the latter case the doubling of the minimum wage took four years.

[7] Russia is federation of 83 territories or "subjects of Federation". Before the wave of mergers, which was launched in 2005, the number was 89.

[8] Due to the lack of district-level data, we do not explore this inter-regional variation in the minimum wage in the analysis that follows, but adjust our regional-level data on minimum wages using the shares of the population living in districts with different wage multipliers.

Importantly, the 2007 decentralization eliminated the link between the minimum wage and the Northern multiplier, previously set in federal law. This change generated additional variation in the Kaitz ratio. In particular, while most regions of Central Russia saw in September 2007 an increase in the nominal minimum wage by 109 percent, from 1,100 Rubles to 2,300 Rubles, some Northern territories which did not legislate own regional minima saw only a tiny increase by 5 percent (from 2,200 Rubles, which is the federal minimum of 1,100 Rubles times the Northern miltiplier of 2, before September 2007 to 2,300 Rubles after September 2007).

So far we have focused on the variation in the nominal minimum wage. However, in the Russian context it is equally or even more important to consider the cross-sectional and time-series variation of the relative minimum wage, expressed as the Kaitz index. Substantial cross-regional variation in the Kaitz index existed in most parts of the country (those not covered by the Northern wage multiplier) even before the 2007 decentralization of the nominal minimum wage. This is due to the enormous differences in the average wage (and wage distribution in general) across the regions of Russia. For example, in November 2005, the lowest and highest average regional wages amounted to 5,100 and 30,324 Rubles, and the P90/10 decile ratio of the average regional wage was 3.87. As a result, the Kaitz index varied across the regions from below 5 percent to about 20 percent (see Table 1). Despite the trend of convergence among Russian regions over the last decade (Guriev and Vakulenko 2012), including in terms of wages and other labor market outcomes, substantial differences in relative minimum wages across the regions remained, due to the variation in both nominal minimum wages and average wages. For example, as shown on Chart 3, the maximum level of the Kaitz index was above 50 percent, and the minimum level was below 10 percent in 2009.

Several regions have specific regulations concerning coverage of the regional minimum wage. Regional minima, set above the federal floor, can apply to the private sector workers and/or to the public sector workers who are employed by regional governments. Most common, however, is the case when the regional minimum wage only covers the private sector, while the public sector is subject to the federal minimum wage. There are also instances when the regional minimum wage is linked to the regional subsistence level and is automatically reviewed several times per year. Because such instances are rare, we do not provide a detailed overview here. However, we document these cases in the data and control for them in the empirical analysis that follows.

One additional aspect that has implications for our analysis is that most hikes of the minimum wage at the federal level were introduced rather unexpectedly or, at least, following only a short discussion. In a high inflation environment, regular revisions of the minimum wage

become a norm.[9] For example, the increase on October 1, 2003 from 450 Rubles to 600 Rubles was passed by the State Duma (lower chamber of Russia's parliament) on September 17, 2003, approved by the Federation Council (upper chamber of the parliament) on September 24, 2003, and signed by President on October 1, 2003. Similarly, the hike on January 01, 2005 was passed by the State Duma on December 17, approved by the Federation Council on December 24, and signed by President on December 29, 2004.[10] The same was typical of regional laws on minimum wages. Here, the situation is even more extreme because of several instances of retroactive changes in the minimum wage. For example, in November 2007 the Vologda region raised the local minimum to 3,300 Rubles (43.5% above the level stipulated in federal law, which was 2,300 Rubles at the time), and this change was introduced retroactively from September 01, 2007. Similarly, the elevation of the minimum wage in St. Petersburg to 6,200 Rubles (43.2 percent above the federal minimum, which was 4,330 Rubles) from January 01, 2009 was introduced by the local government retroactively on February 13, 2009. An important implication is that firms were in most cases restricted in the opportunity to adjust employment levels in advance, before minimum wage hikes taking effect.

3. Data

The dataset used in this paper was assembled from several principal sources. Its key component is the data on nominal minimum wages. Because the minimum wage was set at the federal level up to September 2007, it was quite straightforward to collect the necessary time-series. The data were taken from the respective federal laws. We adjusted these data using the Northern wage multiplier that was in force in 2001-2007.[11] For regions with different multipliers applicable to different districts, we computed the average Northern multiplier using districts' population as weights.

Assembling data on regional minimum wages was less straightforward. The key source of data was information collected by the Federation of trade unions of Russia kindly provided to us by its Moscow office. This source, however, contains data with semi-annual frequency only. Moreover, it does not have all necessary details concerning the coverage of the regional minima. Therefore, in addition to the mentioned source we conducted our own study of regional legislation on minimum wages for each subject of the Federation. The information was taken from databases of national and regional laws, such as Konsultant Plus, as well as from web-sites

[9] During the period under study, Russia saw double digit inflation except for three years: 2006 (9.0%), 2009 and 2010 (8.8% each year).
[10] This is, however, not true of the two most substantial hikes in the federal minimum wage in September 2007 and January 2009. In the former case, the respective law was signed by President on April 20, 2007, and in the latter case – on June 28, 2008.
[11] List of Northern territories of November 10, 1967 adopted by the Council of Ministers of the USSR with numerous changes and adjustments since then.

of regional governments and other sources in the Internet. We paid particular attention to the coverage issue. We also marked all unclear or problematic cases, related, for example, to retroactive enactment of minimum wages or uncertainties arising when the regional minimum wage is linked to the subsistence minimum. All these instances were documented and marked in the database with dummy variables. Overall, we assembled complete tome series of minimum wages in all Russian regions over 10 years, from January 2001 to December 2010.

These data were supplemented with information from the Russian Statistical Agency (Rosstat) on the average wage, unemployment, non-employment, informal employment, as well as non-employment and unemployment among the youth in each region. Most of these data are available on the quarterly basis. In particular, we consulted the Labor Force Survey (LFS), which is conducted by Rosstat on February, May, August and November each year.[12] The LFS covers all regions of Russia and contains several hundred thousand observations. Importantly, the survey is representative on the regional level. It provides a wealth of information regarding the national and local labor markets. In particular, it allows classification of population into employed and unemployed based on ILO definitions, and contains a rich set of questions on informal employment.

With these data at hand, we were able to compute the following six dependent variables measuring, on the quarterly basis, labor market outcomes in Russian regions:

- Non-employment rate (NONEMPL), defined as the number of non-employed divided by the total population. The non-employed category consists of both unemployed and inactive. The variable is computed for the population aged 15-72, as conventionally done by Rosstat.
- Unemployment rate (UNEMPL), defined as the number of unemployed divided by the economically active population aged 15-72. As is standard in labor market statistics, the economically active population consists of employed and unemployed people.
- Informal employment rate (indicator 1, INFORM DEF1) is defined as the share of the employed whose main job is in the informal sector.[13]
- Informal employment rate (indicator 2, INFORM DEF2) is the share of the employed whose main or second job is in the informal sector.

[12] These are not open-access data, but they were made available to us through the Center for Labor Market Studies at the HSE Moscow. The official link to the survey on the Rosstat's web-site: http://www.gks.ru/wps/wcm/connect/rosstat_main/rosstat/ru/statistics/publications/catalog/doc_1140097038766.

[13] Our definition of informal work follows the Rosstat approach. It considers all workers whose job is not within a firm to be informal. An important advantage of such a general definition of informality is that it is not sensitive to mistakes and non-responses of respondents when questions about the size of the firm, its official status (registered vs. unregistered), contributions to the social security funds, etc. are asked. But the advantage can also turn out to be a deficiency. In particular, it is possible that the definition omits some other important manifestations of informal employment, especially informal employment within the formal sector. The available evidence from Rosstat, however, suggests that such employment constitutes only about 1% of all informal employment. We therefore believe that the measure of informal employment available to us is reasonably accurate and captures most essential aspects of this phenomenon in Russia.

- Youth unemployment rate (YOUTH UNEMPL), same as the general unemployment rate, but calculated for those aged 15-24.
- Youth non-employment rate (YOUTH NONEMPL), same as the general non-employment rate, but for those aged 15-24.

One difficulty in our empirical analysis stems from the lack of wage data in the Russian LFS. Because of that, we took information on average wages across the regions of Russia from the annual yearbook by Rosstat "Socio-economic situation of Russia" (Rosstat, various years). This information, combined with our hand-collected data on minimum wages, makes it possible to compute regional Kaitz indices for February, May, August and November of each year between 2001 and 2010. From Rosstat we also obtained additional information, such as changes in industrial production on the regional level.[14]

The descriptive statistics of the data are shown in Table 2. Panel A provides details for the entire sample, spanning 2001-2010 while Panel B shows the statistics for the 2007-2010 sub-sample. During the entire period under study, the Kaitz index varied from below one percent to above 50 percent, with the average value being about 17 percent. In the 2007-2010 sub-sample, the average Kaitz is substantially higher, above 25 percent. The data also show considerable variation, both over time and across space, in key labor market variables. The unemployment rate, while averaging nine percent across all regions and all quarters (unweighted data), varies from one percent to 54 percent. Youth unemployment averages 17 percent, but varies a great deal across the regions and over time. The share of informal workers is 17 or 20 percent, depending on the definition used.

4. Methodology

Our empirical approach draws on the methodology developed by Neumark and Wascher (1992) for state-level panel data analysis of the minimum wage.[15] In this methodology, the dependent variable, most often the unemployment rate among the youth, is regressed on either the level of the (regional) minimum wage or the respective Kaitz index. Variations of these two approaches include controlling for the average wage (in the first type of specifications) and introducing regional price levels (see Neumark and Washer 2008 for a review).

[14] The change in industrial production over the previous four quarters is captured by variable OUTPUT_CH. Additional variables used in the analysis include: SUBS_MIN, a dummy for regional minimum wages being linked to respective subsistence minima, COVERAGE, a dummy for incomplete coverage of the regional minimum wage, DATA_DISC, a dummy for discrepancies among different data sources on regional minimum wages, and ADV, a dummy for early announcement of the minimum wage hike (at least, one quarter in advance).

[15] Other approaches include time-series analysis (Brown Gilroy and Kohen 1982) and a case study (Katz and Krueger 1992; Card and Krueger 1994).

Given the relatively high inflation in Russia during the period under study as well as potential issues with reliability of regional price data, we opt for the approach based on the Kaitz index.[16] For the purpose of this analysis we introduce a slight adjustment to the classical definition of the Kaitz index. Specifically, we use a lagged value of the average wage in the denominator of the usual formula:

$$Kaitz_t = MW_t/AW_{t-1}, \quad (1)$$

where *MW* stands for the minimum wage, *AW* denotes the average wage, and *t* denotes quarters. The use of the lagged value in the denominator excludes the effect of minimum wage hikes on the average wage. Indeed, the contemporaneous average wage incorporates the effect of a minimum wage hike: some low wage earners get fired and the wages of those remaining employed get adjusted. This, ceteris paribus, underestimates the true change in the Kaitz index between the time of the minimum wage hike and the preceding period. However, the results with the standard Kaitz index, which is based on using the contemporaneous average wage in the denominator, $Kaitz_t = MW_t/AW_t$, turn out to be similar to our benchmark results with $Kaitz_t = MW_t/AW_{t-1}$.

Our baseline specification takes the following form:

$$LMO_{it} = \alpha_i + \beta_1 Kaitz_{it} + \boldsymbol{X}_{it}\boldsymbol{\gamma} + \delta_t + \varepsilon_{it}, \quad (2)$$

where subscripts *i* and *t* index regions and time respectively, LMO_{it} is a labor market outcome, such as general or youth unemployment rate, α_i is a regional fixed effect capturing time invariant unobserved characteristics of regions, $Kaitz_{it}$ is the Kaitz index as defined above, $\boldsymbol{X}_{it}$ is a vector of control variables (which includes variables characterizing the coverage of the minimum wage, its connection to the subsistence minimum, etc.), δ_t is a time effect capturing macroeconomic shocks common to all regions, and ε_{it} is a random disturbance. Index *i* varies from 1 to 89 (the number of regions in Russia in the early 2000s). Index *t* spans 10 years and four quarters.[17] The parameter of interest is β_1, which shows the effect of the minimum wage on labor market outcomes.

As already noted in Section 2, many hikes of the minimum wage at the federal level were introduced rather unexpectedly. On the regional level, there were instances of retroactive changes in the minimum wage. Such unexpected nature of minimum wage hikes virtually rules out advance reaction of employers on (anticipated) changes in minimum wage laws. In addition, as

[16] In Russia, this index is highly correlated with another common measure of the effectiveness of the minimum wage, the so-called "fraction affected" (the share of workers with wages above the current minimum wage, but below the future minimum wage), which in our data can be computed for some years. The cross-regional correlations between the fraction affected and monthly Kaitz index are high, ranging from 0.7 to 0.9. Due to the irregular nature of the data on wage distribution (which are collected by Rosstat in April only, and not in all years) we do not use the "fraction affected" in the analysis that follows.

[17] Thus, we control for the year and quarter of each observation using nine annual and three quarterly dummies. This addresses seasonality issues. The alternative approach with interactions of annual and quarterly dummies gives similar results. The first approach is preferred as leading to a more parsimonious model, with fewer parameters being estimated.

the notification period for non-disciplinary firings in Russia is two months (and three months for collective dismissals), the labor market may not react to changes in minimum wages instantaneously, in the quarter of the minimum wage hike. Rather, the adjustment may come with a delay of several months. From the modeling viewpoint, this calls for using lagged values of the minimum wage or Kaitz index on the right hand side of the regression, in the form of a distributed lag model.

In this context, the optimal number of lags becomes an issue. There are a number of reasons to believe that this number should not be too large. The key factor is the relatively high inflation in Russia, which fairly quickly erodes real minimum wages. The implication is that, several quarters after a hike, the relative minimum wage effectively returns to the pre-hike level, reducing employers' incentives to adjust the level of employment. Based on these considerations, we extend our baseline model by adding one to four lags of the Kaitz index. In the case of two lags, the model transforms into:

$$LMO_{it} = \alpha_i + \beta_1 Kaitz_{it} + \beta_2 Kaitz_{it-1} + \beta_3 Kaitz_{it-2} + \boldsymbol{X}_{it}\boldsymbol{\gamma} + \delta_t + \varepsilon_{it.} \quad (3)$$

We test for the optimal number of lags using the standard AIC and BIC criteria.[18]

In addition, we formally test for the importance of advance adjustment of the labor market by considering a lead-and-lag structure of the model (with one leading regressor). This is done in two steps. First, we add a simple leading regressor to the baseline specification. Second, we interact the leading regressor with a dummy variable for early announcement (at least one quarter before the actual change) of the minimum wage hike. The leading regressor is thus set to zero in the case of sudden enactment of a new minimum wage.

We also consider a battery of additional regressions that help test the robustness of our results. In particular, we conduct separate analysis for the period spanning 2007-2010, which is characterized by a considerably higher variation in the nominal minimum wage and in the Kaitz ratio. We also drop regions with very strong labor markets (Moscow city, Moscow region, and St. Petersburg city) as well as with very weak ones (the republics of Daghestan, Ingushetia, and Tyva). In addition, we exclude regions where the Northern wage coefficients applied. We experiment with additional controls, the change in industrial production being the most prominent example. We also re-estimate the regressions using the population weights (given the huge variation in the size of the regions, this approach estimates the effect of the minimum wage on the economy at large).

As indicated in equations (2) and (3), our models contain region and time effects. We estimate their parameters using the fixed-effects estimator. As regards inference, we rely on the cluster robust estimator of variance with clustering by regions. This takes care of potential

[18] Looking ahead, the optimal number of lags is equal to one in most specifications.

violations of the assumption that standard errors ε_{it} are independently and identically distributed. In particular, it ensures that the standard errors are correct when observations are independent across regions, but not necessarily within regions.

5. Empirical results

5.1. Choosing the lead-and lag structure

We start with the baseline specification estimated using full data but with different numbers of lags. Table 3 shows the results. The columns of the table correspond to the dependent variable chosen. The rows correspond to five different sets of regressions. On the top of the table, we report the first set of results for regressions with no lag structure. Beneath these results, we provide estimates for regressions with one lag. Proceeding in the same fashion, we end up with regressions containing four lags. Note that for space reasons the table only shows the key coefficients of interest (on the relative minimum wage variable measured by the Kaitz index and its lags) as well as R-squared. The extensive set of time dummies as well as other controls, which are included in the regressions, are not reported in the table. In order to be able to compare models with different number of lags using the conventional information criteria AIC and BIC, the number of observations is set the same in all regressions, 2686 as in the model with four lags.

Since the main purpose of the regressions in Table 3 is to provide evidence on the appropriate number of lags in the estimation, we discuss the table by blocks of results (horizontally) rather than by dependent variables (vertically). The first set of results shows no effect of the contemporaneous relative minimum wage on all labor market outcomes chosen. The coefficients are insignificant both economically and statistically. The second block of results, for the regressions with one lag of the Kaitz index, shows considerably larger coefficients on the lagged value in the regressions with unemployment rate and youth unemployment rate as dependent variables (columns 2 and 4). In the former regression, the coefficient on the lagged Kaitz is statistically significant at the five percent level. In the latter regression, the coefficient is statistically significant at the one percent level. The sign and magnitude of the estimated coefficients are plausible. Higher relative minimum wages result in disemployment effects. In particular, an increase in the Kaitz ratio by one percentage point leads to the increase in the unemployment rate by 0.047 percentage points and in the youth unemployment rate by 0.14 percentage points. In two regressions (with nonemployment rate and youth unemployment rate, columns 1 and 4), the negative coefficients on the contemporaneous Kaitz ratio become

statistically significant, but only at the 10 percent level. As will be shown later, these later results are not robust.

The next set of results, which is based on the regressions with two lags, suggests a similar picture. A higher Kaitz index is associated with higher unemployment and higher youth unemployment, with the effects appearing one quarter after the minimum wage hike (columns 2 and 4). In addition, there is a positive and statistically significant coefficient on the first lag of the Kaitz ration in the model with informal employment as the dependent variable (column 5). This is largely consistent with the discussion of the Russian labor market and minimum wage laws in Section 2, which hinted on possible delays in the reaction of employers on minimum wage hikes.

The last two sets of results, for the regressions with three and four lags, support the idea that the delay does not exceed one quarter. In particular, the 3rd and 4th lags are insignificant in the overwhelming majority of specifications (and also for different sub-samples; these results are not reported here for space reasons). At the foot of the table, we summarize the results of testing for the number of lags using the AIC and BIC. The former criterion suggests zero to three lags, while the latter one suggests either one lag or no lags at all. The two criteria are in accord in only two out of six cases (for two dependent variables only).

We repeat the same analysis using the 2007-2010 sub-sample, which is characterized by much larger variation in the key explanatory variable. The results are shown in Appendix, Table A1. They are qualitatively the same as those reported in Table 3, except for much stronger evidence that minimum wage hikes increase informal employment. As in the full sample, most effects appear with a delay of one quarter. As in the full sample, the AIC suggests zero to three lags, and the BIC suggests either one lag or no lags at all. In three out of six cases the two criteria are in accord with each other indicating the same optimal number of lags (in two out of three cases, both criteria suggest one lag).

Table 4 contains the results of estimating the lead-and-lag specifications using the full sample, 2001-2010. The first block of results in Table 4 is the baseline specification with the Kaitz ratio and its single lag. The number of observations is the same in all models and equals to 2,923. As before, we observe positive and statistically significant coefficients on the first lag of the Kaitz ratio in the regressions with unemployment rate and youth unemployment rate as the dependent variables (columns 2 and 4). In the second block, we show regression results for specifications containing the leading Kaitz ratio. The coefficients on the leading variable turn out to be statistically and economically insignificant in all regressions, confirming our priors that an advance adjustment was hardly possible due to the sudden character of changes in the minimum wage in most cases. The third block contains the results of estimating the specification in which

the leading variable is interacted with a dummy for advance announcement of changes in the minimum wage policy. Interestingly, in this case we do see a positive and statistically significant coefficient on the interaction term in the regression with unemployment rate as the dependent variable (column 2). This suggests advance adjustment of employers when changes in the minimum wage are announced at least one quarter before becoming effective.

We repeat the same analysis using the 2007-2010 sub-sample. The results are shown in Appendix, Table A2. Similarly to the above findings, the coefficients on the leading Kaitz index are statistically insignificant. When the interaction term is used instead, we find advance adjustment of the labor market in three out of six cases, for unemployment rate and two measures of informality.

Overall, we interpret these results as preliminary evidence that minimum wages matter on the Russian labor market and that the adjustment occurs fairly quickly, within one quarter after the quarter of the minimum wage hike. This is consistent with our priors that the constant and quick erosion of the nominal minimum wage (due to double-digit inflation) reduces employers' incentives to adjust the level of employment in the medium-term. We also find evidence of the advance adjustment of the labor market to changes in the minimum wage in the cases when such changes are announced early. These findings motivate us to focus, in what follows, on the model that includes a single lag of the Kaitz ratio and the leading Kaitz ratio interacted with a dummy for advance announcement of minimum wage hikes.

5.2. Robustness tests

In this section, we investigate whether the main results reported above hold for various sub-samples and are robust to the inclusion of additional variables as well as to using weights that account for different sizes of Russian regions. Table 5 shows estimation results for the preferred specification estimated using the 2001-2010 data for the full sample and three particular sub-samples. Specifically, we sequentially exclude from the data the so-called Northern regions, regions with strong labor markets ("low unemployment regions"), and regions with weak labor markets ("high unemployment regions") that were defined in section 4. As before, the columns of the table correspond to the dependent variable chosen. The rows correspond to the particular sub-samples.

The first block shows positive and statistically significant coefficients in the regressions with unemployment rate and youth unemployment. There is also evidence of advance adjustment of the labor market in the former regression. In the second block that contains estimation results for the sub-sample without Northern regions, the results are largely the same, but the coefficient on the lagged Kaitz ratio loses significance in the regression with unemployment rate. The

results in the third block (sub-sample without low unemployment regions) are very similar to those for the full sample. The final set of regressions (regions with persistently high unemployment are dropped) suggests an extra way of advance reaction of the labor market to minimum wage hikes – via higher nonemployment. All in all, our key findings appear to be insensitive to dropping particular groups of Russian regions (regions-outliers).

We redo the same analysis using the 2007-2010 data (see Table 6). As already noted, in this period we have strong evidence of that minimum wages affect informality on the labor market. In contrast, the evidence that minimum wages affect unemployment, including among young workers, is weaker as compared with the results for the entire period, 2001-2010. The results for 2007-2010 appear to be quite stable to the removal of "regions-outliers" from the sample. In particular, the effect on informal employment stays very stable. The evidence of advance adjustment of the labor market is also quite robust in the equation with unemployment rate.

As a further step, we test for sensitivity of our key results to introducing weights capturing different sizes of Russian regions in terms of population. While several regions have over 5 million inhabitants, some have less than 0.25 million people. The regression results from this robustness check are shown in Appendix Table A3. In brief, our main finding that minimum wage hikes are associated with increased youth unemployment and higher informality are confirmed.

Finally, we add to the regressions an extra control variable measuring change in industrial production one year before the minimum wage hike (variable OUTPUT_CH). Because this variable is only available from 2006 onwards, we use the 2007-2010 sub-sample for the estimation. The results are shown in Appendix Table A4. As might be expected, positive changes in industrial production are associated with smaller non-employment and youth unemployment, at least in some specifications. As to the key coefficients of interest, they are similar to those reported in Table 6. As before, the strongest result is the positive correlation between the minimum wage and informal employment and, to a lesser extent, youth unemployment.

6. Conclusions

The minimum wage is a controversial issue in labor economics, economic policy, and politics. Its effects on overall employment as well as employment among low-skilled workers remain ambiguous, both theoretically and empirically. In this paper we extend the available international literature on the minimum wage, in particular, its part that makes use of state-level panel data, using new rich data from Russia. The Russian case is interesting due to unusually high magnitudes of minimum wage hikes, approaching 100 percent in several cases. The dataset

at our disposal, collected by us from various official sources, contains observations of minimum wages and labor market outcomes in 89 regions of Russia over 10 years, 2001 to 2010.

Based on fixed-effects regressions, we find some evidence of adverse effects of the minimum wage on the Russian labor market. In particular, minimum wage hikes are associated with increased youth unemployment and increased informality. We also find some evidence that minimum wage hikes increase unemployment in the general population, but the effect is small. Adjustment of the Russian labor market to minimum wage hikes seems to occur rather quickly, within a quarter following the hikes. When a minimum wage increase is announced early, at least one quarter before its taking effect, there is advance reaction of employers.

Overall, the minimum wage appears to be a problematic policy instrument in Russia. Instead of promoting greater income equality and reducing poverty, it seems to create unemployment and force people to take informal jobs, which are typically associated with higher insecurity, lower earnings, and the lack of social security protection.

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Chart 1. Dynamics of the Kaitz index, in % (based on the federal minimum wage), 1985-2010.

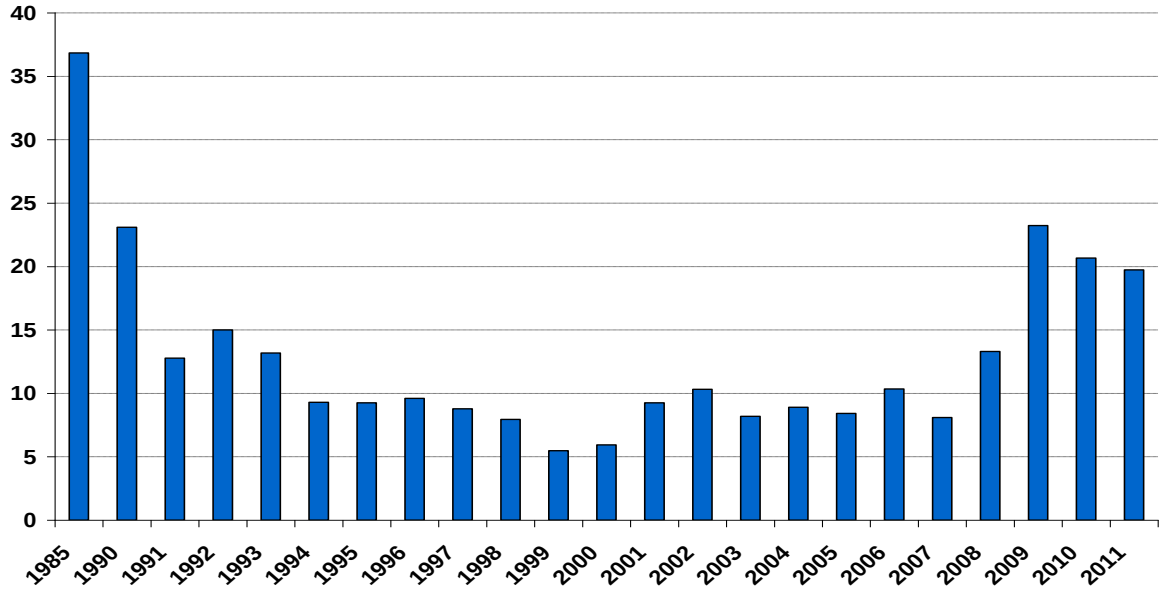


Chart 2. Percent of regions with own MW (above the federal level).

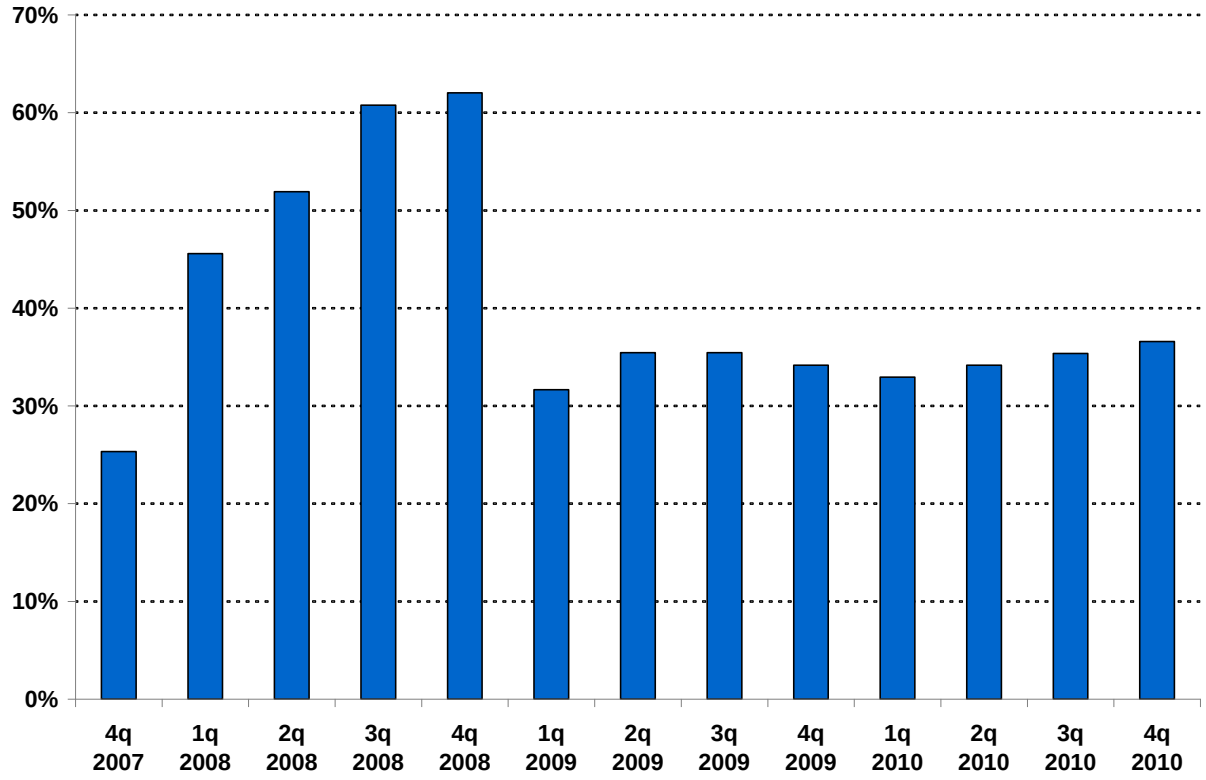
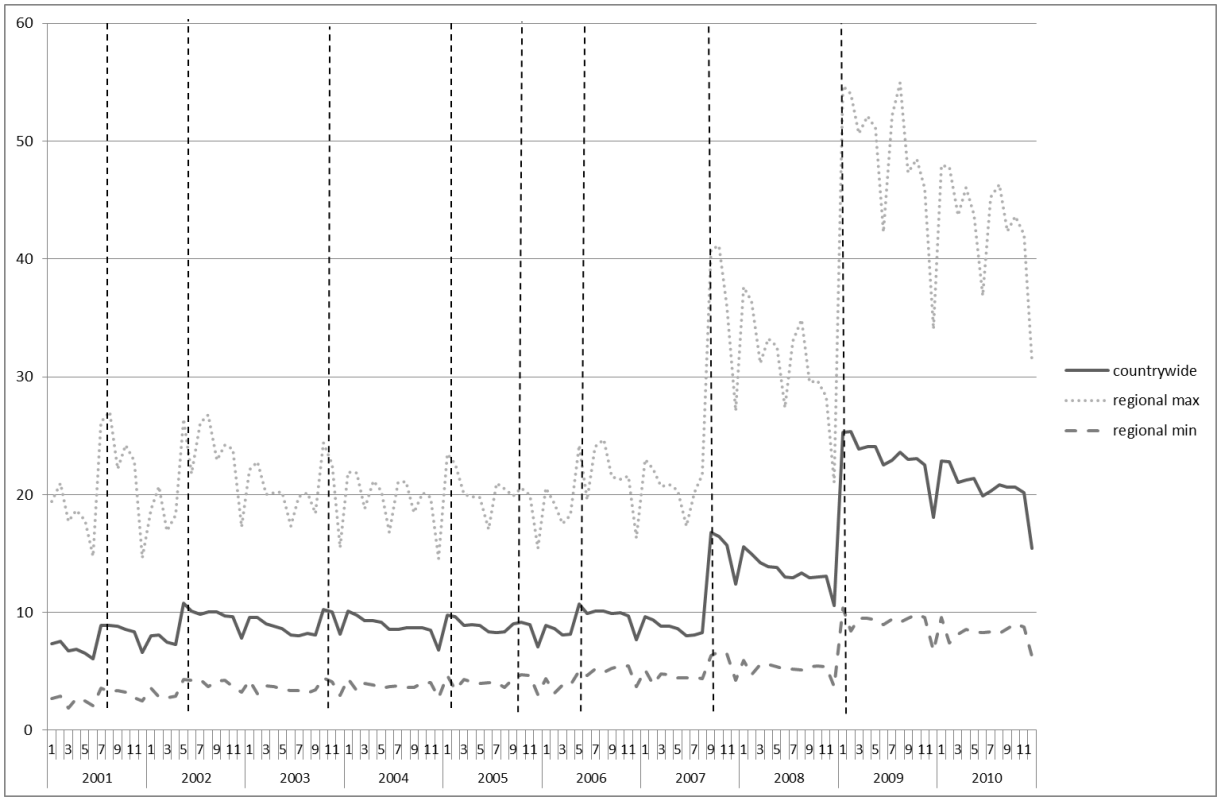


Chart 3. Monthly dynamics of the Kaitz index, in % of the average wage, 2001-2010.



Note: moments of the federal minimum wage rises marked by vertical lines.

Table 1. Federal minimum wage hikes in Russia, 2001-2009.

	1 Jul 2001	1 May 2002	1 Oct 2003	1 Jan 2005	1 Sep 2005	1 May 2006	1 Sep 2007	1 Jan 2009
Min wage hikes								
From, Rubles	200	300	450	600	720	800	1100	2300
To, Rubles	300	450	600	720	800	1100	2300	4330
% increase	50	50	33	20	11	38	109	88
Kaitz index								
National	0.09	0.11	0.1	0.1	0.09	0.11	0.17	0.25
Max. regional	0.26	0.26	0.24	0.23	0.20	0.24	0.46	0.55
Min. regional	0.04	0.04	0.04	0.05	0.04	0.05	0.08	0.14

Table 2. Descriptive statistics of the data.

Panel A. Full sample, 2001-2010.

	MEAN	SD	MIN	P50	MAX
KAITZ	17.33	10.17	0.40	14.17	54.93
NONEMPL	39.92	6.95	19.17	39.37	81.60
UNEMPL	9.06	6.10	0.89	7.86	54.29
YOUTH NONEMPL	68.51	9.80	48.13	66.98	97.71
YOUTH UNEMPL	17.46	9.15	2.22	16.02	51.93
INFORM DEF1	16.51	8.22	0.31	15.28	47.71
INFORM DEF2	19.56	9.45	0.41	18.44	64.26
ADV	0.13	0.33	0	0	1
SUBS_MIN	0.06	0.23	0	0	1
COVERAGE	0.06	0.23	0	0	1
DATA_DISCR	0.03	0.17	0	0	1
OUTPUT_CH	105.29	21.20	53	104.80	560

Max. number of observations is 3319.

Panel B. Sub-sample 2007-2010.

	MEAN	SD	MIN	P50	MAX
KAITZ	25.82	10.86	5.12	26.06	54.93
NONEMPL	38.47	6.27	19.17	37.99	74.25
UNEMPL	8.38	5.68	0.89	7.47	50.11
YOUTH NONEMPL	71.24	12.40	51.23	68.01	97.71
YOUTH UNEMPL	16.76	8.32	2.22	15.58	43.25
INFORM DEF1	18.21	8.19	1.88	17.26	47.29
INFORM DEF2	20.82	9.14	2.42	19.96	50.37
ADV	0.13	0.33	0	0	1
SUBS_MIN	0.15	0.35	0	0	1
COVERAGE	0.15	0.36	0	0	1
DATA_DISCR	0.08	0.26	0	0	1
OUTPUT_CH	104.11	22.46	53.50	104.40	560

Max. number of observations is 1279.

Table 3. Baseline regression results with tests for the number of lags, 2001-2010.

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			No lags			
KAITZ	-0.044	-0.026	-0.028	-0.052	0.034	0.025
	(0.028)	(0.031)	(0.037)	(0.057)	(0.044)	(0.050)
R2	0.22	0.13	0.63	0.07	0.16	0.12
			1lag			
KAITZ	-0.055*	-0.047	-0.037	-0.114*	0.010	0.004
	(0.030)	(0.031)	(0.035)	(0.060)	(0.038)	(0.043)
KAITZ_lag1	0.024	0.047**	0.021	0.140***	0.054	0.049
	(0.025)	(0.018)	(0.035)	(0.051)	(0.037)	(0.045)
R2	0.22	0.14	0.63	0.07	0.16	0.12
			2lags			
KAITZ	-0.055*	-0.046	-0.039	-0.110*	0.009	0.002
	(0.030)	(0.032)	(0.035)	(0.060)	(0.038)	(0.043)
KAITZ_lag1	0.029	0.036**	0.042	0.099**	0.062**	0.066
	(0.025)	(0.017)	(0.033)	(0.047)	(0.031)	(0.040)
KAITZ_lag2	-0.007	0.018	-0.032	0.061	-0.013	-0.026
	(0.018)	(0.020)	(0.027)	(0.042)	(0.022)	(0.026)
R2	0.22	0.14	0.63	0.07	0.16	0.12
			3lags			
KAITZ	-0.055*	-0.045	-0.039	-0.109*	0.009	0.002
	(0.030)	(0.031)	(0.035)	(0.060)	(0.038)	(0.043)
KAITZ_lag1	0.027	0.034**	0.043	0.097**	0.062**	0.066
	(0.025)	(0.016)	(0.033)	(0.047)	(0.031)	(0.041)
KAITZ_lag2	-0.034	-0.003	-0.025	0.037	-0.012	-0.025
	(0.021)	(0.022)	(0.027)	(0.042)	(0.025)	(0.031)
KAITZ_lag3	0.044**	0.035	-0.011	0.041	-0.000	-0.001
	(0.018)	(0.022)	(0.032)	(0.046)	(0.031)	(0.037)
R2	0.23	0.14	0.63	0.07	0.16	0.12
			4lags			
KAITZ	-0.055*	-0.045	-0.039	-0.109*	0.009	0.002
	(0.030)	(0.032)	(0.036)	(0.060)	(0.038)	(0.043)
KAITZ_lag1	0.026	0.032*	0.048	0.095**	0.059*	0.063
	(0.025)	(0.017)	(0.033)	(0.047)	(0.031)	(0.041)
KAITZ_lag2	-0.033	-0.002	-0.027	0.037	-0.011	-0.024
	(0.021)	(0.022)	(0.027)	(0.043)	(0.025)	(0.031)
KAITZ_lag3	0.041**	0.025	0.013	0.035	-0.019	-0.013
	(0.020)	(0.027)	(0.032)	(0.051)	(0.035)	(0.040)
KAITZ_lag4	0.007	0.020	-0.049	0.012	0.037	0.025
	(0.020)	(0.019)	(0.036)	(0.042)	(0.027)	(0.031)
R2	0.23	0.14	0.63	0.07	0.16	0.12
Number of lags:						
AIC	3	3	0	2	1	0
BIC	0	0	0	1	0	0

Note: The number of observations is 2,686 in all regressions. The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 4. Baseline regression results with tests for the lead-and-lag specification, 2001-2010.

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			1 lag			
KAITZ	-0.041	-0.032	-0.021	-0.085	-0.001	-0.008
	(0.027)	(0.029)	(0.033)	(0.055)	(0.038)	(0.043)
KAITZ_lag1	0.021	0.046**	0.016	0.130***	0.054	0.044
	(0.023)	(0.019)	(0.034)	(0.048)	(0.036)	(0.043)
R2	0.23	0.13	0.62	0.07	0.20	0.15
			1 lag + 1 lead			
KAITZ_lead1	0.007	0.010	-0.044	-0.001	-0.014	-0.003
	(0.016)	(0.015)	(0.027)	(0.032)	(0.027)	(0.032)
KAITZ	-0.045*	-0.038	0.007	-0.085	0.008	-0.006
	(0.025)	(0.027)	(0.033)	(0.056)	(0.039)	(0.044)
KAITZ_lag1	0.021	0.046**	0.016	0.130***	0.054	0.044
	(0.023)	(0.019)	(0.034)	(0.048)	(0.036)	(0.044)
R2	0.23	0.13	0.62	0.07	0.20	0.15
LRchi2(1)	0.17	0.34	2.37	0.00	0.28	0.01
Prob>chi2	0.6766	0.5589	0.1238	0.9848	0.5951	0.9178
			1 lag + 1lead*ADV			
KAITZ_lead1*ADV	0.015	0.021***	-0.003	0.021	0.016	0.019
	(0.009)	(0.007)	(0.012)	(0.016)	(0.012)	(0.014)
KAITZ	-0.034	-0.023	-0.023	-0.076	0.006	0.001
	(0.029)	(0.030)	(0.035)	(0.056)	(0.040)	(0.045)
KAITZ_lag1	0.020	0.045**	0.017	0.128***	0.053	0.043
	(0.023)	(0.019)	(0.034)	(0.048)	(0.035)	(0.043)
R2	0.23	0.13	0.62	0.07	0.20	0.15
LRchi2(1)	2.89*	6.04**	0.06	1.17	1.48	1.39
Prob>chi2	0.089	0.014	0.8097	0.280	0.224	0.238

Note: The number of observations is 2,923 in all regressions. The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for year*quarter). The likelihood ratio tests (LR) compare a model with lead and a model without lead. Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 5. Baseline regression results for the 2001-2010 data excluding territories-"outliers".

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			All regions			
KAITZ_lead1*ADV	0.012	0.020***	-0.010	0.015	0.019	0.023
	(0.009)	(0.007)	(0.011)	(0.016)	(0.013)	(0.016)
KAITZ	-0.035	-0.022	-0.026	-0.073	0.005	0.002
	(0.028)	(0.029)	(0.035)	(0.054)	(0.041)	(0.046)
KAITZ_lag1	0.031	0.049**	0.035	0.139***	0.046	0.035
	(0.022)	(0.021)	(0.030)	(0.044)	(0.030)	(0.039)
R2	0.23	0.13	0.61	0.06	0.20	0.15
N	2997	2997	2997	2997	2997	2997
			Northern territories excluded			
KAITZ_lead1*ADV	0.010	0.021***	-0.010	0.020	0.012	0.014
	(0.009)	(0.007)	(0.012)	(0.017)	(0.013)	(0.016)
KAITZ	-0.036	-0.023	-0.031	-0.061	-0.030	-0.025
	(0.026)	(0.030)	(0.040)	(0.058)	(0.042)	(0.048)
KAITZ_lag1	0.026	0.036	0.015	0.109**	0.034	0.032
	(0.025)	(0.022)	(0.034)	(0.050)	(0.034)	(0.046)
R2	0.25	0.13	0.62	0.08	0.20	0.14
N	2200	2200	2200	2200	2200	2200
			Low unemployment regions excluded			
KAITZ_lead1*ADV	0.011	0.020***	-0.011	0.016	0.019	0.022
	(0.009)	(0.007)	(0.011)	(0.016)	(0.013)	(0.016)
KAITZ	-0.037	-0.022	-0.025	-0.070	-0.000	-0.004
	(0.029)	(0.030)	(0.036)	(0.056)	(0.042)	(0.048)
KAITZ_lag1	0.029	0.050**	0.035	0.140***	0.042	0.031
	(0.023)	(0.022)	(0.031)	(0.044)	(0.030)	(0.040)
R2	0.23	0.13	0.60	0.07	0.21	0.15
N	2921	2921	2921	2921	2921	2921
			High unemployment regions excluded			
KAITZ_lead1*ADV	0.017**	0.023***	-0.008	0.016	0.015	0.019
	(0.009)	(0.006)	(0.011)	(0.016)	(0.012)	(0.016)
KAITZ	-0.013	0.003	-0.024	-0.035	0.000	-0.002
	(0.027)	(0.027)	(0.038)	(0.054)	(0.041)	(0.047)
KAITZ_lag1	0.034	0.036**	0.043	0.128***	0.046	0.032
	(0.023)	(0.016)	(0.031)	(0.044)	(0.032)	(0.042)
R2	0.25	0.15	0.63	0.07	0.20	0.14
N	2883	2883	2883	2883	2883	2883

Note: The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table 6. Baseline regression results for the 2007-2010 sub-sample excluding territories-"outliers".

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
	All regions					
KAITZ_lead1*ADV	0.016	0.020**	0.006	0.025	0.025*	0.033**
	(0.010)	(0.010)	(0.017)	(0.022)	(0.013)	(0.014)
KAITZ	-0.041	-0.018	-0.015	-0.110*	0.036	0.044
	(0.032)	(0.026)	(0.049)	(0.065)	(0.040)	(0.050)
KAITZ_lag1	0.008	0.026	-0.001	0.133**	0.095***	0.100**
	(0.025)	(0.017)	(0.038)	(0.059)	(0.033)	(0.040)
R2	0.14	0.24	0.79	0.13	0.11	0.13
N	1106	1106	1106	1106	1106	1106
	Northern territories excluded					
KAITZ_lead1*ADV	0.013	0.020*	-0.003	0.003	0.021	0.030*
	(0.010)	(0.011)	(0.019)	(0.024)	(0.013)	(0.015)
KAITZ	-0.044	-0.020	-0.044	-0.143**	0.031	0.047
	(0.034)	(0.028)	(0.053)	(0.069)	(0.042)	(0.053)
KAITZ_lag1	-0.003	0.017	-0.025	0.106	0.090**	0.103**
	(0.026)	(0.019)	(0.040)	(0.065)	(0.037)	(0.045)
R2	0.15	0.26	0.80	0.16	0.11	0.14
N	812	812	812	812	812	812
	Low unemployment regions excluded					
KAITZ_lead1*ADV	0.016	0.020**	0.008	0.027	0.025*	0.033**
	(0.010)	(0.010)	(0.017)	(0.022)	(0.013)	(0.014)
KAITZ	-0.039	-0.018	-0.005	-0.107	0.035	0.043
	(0.032)	(0.027)	(0.049)	(0.066)	(0.041)	(0.051)
KAITZ_lag1	0.008	0.026	0.003	0.128**	0.095***	0.100**
	(0.025)	(0.017)	(0.038)	(0.060)	(0.034)	(0.041)
R2	0.14	0.24	0.79	0.14	0.11	0.13
N	1078	1078	1078	1078	1078	1078
	High unemployment regions excluded					
KAITZ_lead1*ADV	0.021**	0.020*	0.005	0.020	0.024*	0.032**
	(0.010)	(0.010)	(0.018)	(0.023)	(0.013)	(0.015)
KAITZ	-0.026	-0.005	-0.036	-0.100	0.024	0.031
	(0.033)	(0.027)	(0.048)	(0.069)	(0.043)	(0.053)
KAITZ_lag1	-0.004	0.013	-0.010	0.119*	0.102***	0.103**
	(0.025)	(0.016)	(0.040)	(0.061)	(0.034)	(0.043)
R2	0.16	0.28	0.82	0.14	0.11	0.13
N	1064	1064	1064	1064	1064	1064

Note: The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

APPENDIX

Table A1. Baseline regression results with tests for the number of lags, 2007-2010.

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			No lags			
KAITZ	-0.053*	-0.033	-0.034	-0.081	0.029	0.023
	(0.030)	(0.031)	(0.043)	(0.056)	(0.038)	(0.049)
R2	0.14	0.19	0.77	0.11	0.09	0.11
			1lag			
KAITZ	-0.058*	-0.046	-0.047	-0.132**	-0.005	-0.012
	(0.031)	(0.031)	(0.040)	(0.059)	(0.036)	(0.045)
KAITZ_lag1	0.016	0.037**	0.037	0.148**	0.098***	0.102**
	(0.025)	(0.017)	(0.039)	(0.057)	(0.033)	(0.042)
R2	0.14	0.19	0.77	0.12	0.09	0.11
			2lags			
KAITZ	-0.062*	-0.045	-0.054	-0.125**	-0.007	-0.015
	(0.032)	(0.032)	(0.041)	(0.060)	(0.037)	(0.045)
KAITZ_lag1	0.029	0.036*	0.065*	0.121**	0.103***	0.114***
	(0.027)	(0.018)	(0.037)	(0.053)	(0.031)	(0.039)
KAITZ_lag2	-0.021	0.001	-0.044	0.044	-0.007	-0.020
	(0.020)	(0.021)	(0.033)	(0.046)	(0.023)	(0.026)
R2	0.14	0.19	0.77	0.12	0.09	0.11
			3lags			
KAITZ	-0.053	-0.037	-0.056	-0.111*	-0.005	-0.014
	(0.032)	(0.032)	(0.042)	(0.059)	(0.038)	(0.046)
KAITZ_lag1	0.024	0.031*	0.066*	0.113**	0.102***	0.114***
	(0.027)	(0.018)	(0.036)	(0.053)	(0.031)	(0.039)
KAITZ_lag2	-0.047*	-0.025	-0.039	0.003	-0.012	-0.023
	(0.023)	(0.022)	(0.036)	(0.048)	(0.023)	(0.029)
KAITZ_lag3	0.047**	0.048**	-0.010	0.074	0.009	0.005
	(0.022)	(0.021)	(0.040)	(0.050)	(0.032)	(0.037)
R2	0.14	0.20	0.77	0.12	0.09	0.11
			4lags			
KAITZ	-0.053	-0.036	-0.059	-0.111*	-0.003	-0.013
	(0.033)	(0.032)	(0.044)	(0.060)	(0.039)	(0.047)
KAITZ_lag1	0.024	0.031	0.068*	0.113**	0.101***	0.113***
	(0.027)	(0.019)	(0.036)	(0.053)	(0.031)	(0.040)
KAITZ_lag2	-0.046*	-0.025	-0.042	0.003	-0.010	-0.021
	(0.024)	(0.022)	(0.036)	(0.049)	(0.024)	(0.029)
KAITZ_lag3	0.043*	0.040*	0.027	0.071	-0.013	-0.014
	(0.023)	(0.024)	(0.039)	(0.053)	(0.036)	(0.040)
KAITZ_lag4	0.008	0.016	-0.075*	0.006	0.046	0.040
	(0.021)	(0.017)	(0.042)	(0.045)	(0.031)	(0.034)
R2	0.14	0.20	0.77	0.12	0.09	0.11
Number of lags:						
AIC	3	3	0	3	1	1
BIC	0	0	0	1	1	1

Note: The number of observations is 1,264 in all regressions. The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table A2. Baseline regression results with tests for the lead-and-lag specification, 2007-2010.

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			1 lag			
KAITZ	-0.055*	-0.035	-0.020	-0.132**	0.015	0.015
	(0.029)	(0.025)	(0.043)	(0.057)	(0.039)	(0.049)
KAITZ_lag1	0.009	0.027	-0.001	0.134**	0.096***	0.102**
	(0.025)	(0.017)	(0.038)	(0.059)	(0.033)	(0.040)
R2	0.14	0.24	0.79	0.13	0.10	0.13
			1 lag + 1 lead			
KAITZ_lead1	0.013	0.011	0.004	0.038	-0.005	0.008
	(0.018)	(0.018)	(0.035)	(0.045)	(0.026)	(0.029)
KAITZ	-0.060**	-0.040	-0.022	-0.148**	0.017	0.012
	(0.030)	(0.026)	(0.043)	(0.057)	(0.040)	(0.049)
KAITZ_lag1	0.010	0.028	-0.000	0.138**	0.096***	0.103**
	(0.025)	(0.017)	(0.038)	(0.060)	(0.034)	(0.041)
R2	0.14	0.24	0.79	0.13	0.10	0.13
LRchi2(1)	0.43	0.45	0.01	0.77	0.03	0.06
Prob>chi2	0.5107	0.5046	0.9180	0.3799	0.8690	0.8090
			1 lag + 1 lead*ADV			
KAITZ_lead1*ADV	0.016	0.020**	0.006	0.025	0.025*	0.033**
	(0.010)	(0.010)	(0.017)	(0.022)	(0.013)	(0.014)
KAITZ	-0.041	-0.018	-0.015	-0.110*	0.036	0.044
	(0.032)	(0.026)	(0.049)	(0.065)	(0.040)	(0.050)
KAITZ_lag1	0.008	0.026	-0.001	0.133**	0.095***	0.100**
	(0.025)	(0.017)	(0.038)	(0.059)	(0.033)	(0.040)
R2	0.14	0.24	0.79	0.13	0.11	0.13
LRchi2(1)	2.65	5.66**	0.11	1.24	2.69	3.47*
Prob>chi2	0.1033	0.0174	0.7363	0.2655	0.1008	0.0625

Note: The number of observations is 1,106 in all regressions. The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). The likelihood ratio tests (LR) compare a model with lead and a model without lead. Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table A3. Baseline regression results for the 2001-2010 sample with population weights.

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			All regions			
KAITZ_lead1*ADV	0.006	0.015***	-0.001	0.015	0.022	0.027
	(0.008)	(0.006)	(0.011)	(0.016)	(0.013)	(0.017)
KAITZ	-0.012	-0.007	-0.004	-0.030	0.013	0.012
	(0.022)	(0.030)	(0.029)	(0.050)	(0.043)	(0.051)
KAITZ_lag1	0.014	0.019	0.033	0.108**	0.066**	0.055
	(0.019)	(0.018)	(0.029)	(0.043)	(0.033)	(0.039)
R2	0.33	0.18	0.70	0.08	0.24	0.17
N	2997	2997	2997	2997	2997	2997
			Northern territories excluded			
KAITZ_lead1*ADV	0.005	0.014**	-0.004	0.012	0.011	0.013
	(0.008)	(0.005)	(0.011)	(0.017)	(0.010)	(0.012)
KAITZ	-0.010	-0.011	-0.013	-0.034	-0.018	-0.022
	(0.023)	(0.031)	(0.031)	(0.050)	(0.039)	(0.042)
KAITZ_lag1	0.018	0.015	0.013	0.088*	0.046	0.041
	(0.021)	(0.018)	(0.032)	(0.047)	(0.033)	(0.039)
R2	0.35	0.18	0.70	0.09	0.25	0.18
N	2200	2200	2200	2200	2200	2200
			Low unemployment regions excluded			
KAITZ_lead1*ADV	0.004	0.015**	-0.001	0.022	0.020	0.025
	(0.008)	(0.006)	(0.011)	(0.016)	(0.015)	(0.019)
KAITZ	-0.013	-0.014	0.005	-0.020	-0.007	-0.011
	(0.027)	(0.036)	(0.032)	(0.059)	(0.050)	(0.058)
KAITZ_lag1	0.009	0.021	0.033	0.104**	0.050	0.041
	(0.019)	(0.019)	(0.032)	(0.044)	(0.034)	(0.042)
R2	0.31	0.18	0.68	0.10	0.25	0.19
N	2921	2921	2921	2921	2921	2921
			High unemployment regions excluded			
KAITZ_lead1*ADV	0.011	0.018***	0.001	0.010	0.023*	0.028
	(0.007)	(0.005)	(0.011)	(0.016)	(0.014)	(0.017)
KAITZ	0.007	0.021	-0.000	0.007	0.014	0.014
	(0.019)	(0.016)	(0.032)	(0.043)	(0.045)	(0.053)
KAITZ_lag1	0.021	0.026*	0.047	0.118***	0.070**	0.059
	(0.018)	(0.014)	(0.029)	(0.044)	(0.034)	(0.042)
R2	0.34	0.21	0.71	0.09	0.24	0.18
N	2883	2883	2883	2883	2883	2883

Note: The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

Table A4. Baseline regression results for the 2007-2010 sub-sample with control variable "change in industrial production".

	1 NONEMPL	2 UNEMPL	3 YOUTH NONEMPL	4 YOUTH UNEMPL	5 INFORM DEF1	6 INFORM DEF2
			All regions			
KAITZ_lead1*ADV	0.016	0.020**	0.006	0.025	0.025*	0.033**
	(0.010)	(0.010)	(0.017)	(0.022)	(0.013)	(0.014)
KAITZ	-0.042	-0.018	-0.017	-0.113*	0.037	0.045
	(0.031)	(0.026)	(0.048)	(0.065)	(0.041)	(0.050)
KAITZ_lag1	0.006	0.025	-0.003	0.130**	0.096***	0.101**
	(0.025)	(0.017)	(0.038)	(0.059)	(0.034)	(0.041)
OUTPUT_CH	-0.008	-0.004	-0.010	-0.012	0.006	0.007
	(0.006)	(0.006)	(0.006)	(0.010)	(0.009)	(0.010)
R2	0.14	0.24	0.79	0.14	0.11	0.13
N	1106	1106	1106	1106	1106	1106
			Northern territories excluded			
KAITZ_lead1*ADV	0.013	0.020*	-0.003	0.002	0.021	0.030**
	(0.010)	(0.010)	(0.019)	(0.025)	(0.013)	(0.015)
KAITZ	-0.041	-0.019	-0.043	-0.140**	0.029	0.045
	(0.034)	(0.028)	(0.054)	(0.070)	(0.042)	(0.054)
KAITZ_lag1	-0.006	0.016	-0.026	0.102	0.093**	0.106**
	(0.025)	(0.019)	(0.040)	(0.063)	(0.037)	(0.046)
OUTPUT_CH	-0.027**	-0.011	-0.014	-0.038**	0.028	0.029
	(0.011)	(0.013)	(0.018)	(0.018)	(0.019)	(0.020)
R2	0.17	0.26	0.80	0.17	0.11	0.14
N	812	812	812	812	812	812
			Low unemployment regions excluded			
KAITZ_lead1*ADV	0.016*	0.020**	0.008	0.027	0.025*	0.033**
	(0.010)	(0.010)	(0.017)	(0.022)	(0.013)	(0.014)
KAITZ	-0.041	-0.019	-0.007	-0.110*	0.036	0.044
	(0.032)	(0.027)	(0.049)	(0.066)	(0.041)	(0.051)
KAITZ_lag1	0.007	0.025	0.001	0.125**	0.096***	0.102**
	(0.025)	(0.017)	(0.038)	(0.060)	(0.034)	(0.041)
OUTPUT_CH	-0.008	-0.004	-0.009	-0.013	0.006	0.006
	(0.006)	(0.006)	(0.006)	(0.010)	(0.009)	(0.010)
R2	0.14	0.24	0.79	0.14	0.11	0.13
N	1078	1078	1078	1078	1078	1078
			High unemployment regions excluded			
KAITZ_lead1*ADV	0.021**	0.020*	0.005	0.020	0.024*	0.032**
	(0.010)	(0.010)	(0.018)	(0.023)	(0.013)	(0.015)
KAITZ	-0.026	-0.006	-0.038	-0.102	0.024	0.032
	(0.032)	(0.027)	(0.048)	(0.068)	(0.042)	(0.053)
KAITZ_lag1	-0.005	0.012	-0.012	0.117*	0.103***	0.104**
	(0.024)	(0.016)	(0.039)	(0.062)	(0.035)	(0.043)
OUTPUT_CH	-0.004	-0.006	-0.006	-0.009	0.002	0.003
	(0.004)	(0.006)	(0.006)	(0.009)	(0.007)	(0.008)
R2	0.16	0.28	0.82	0.15	0.11	0.13
N	1064	1064	1064	1064	1064	1064

Note: The results are obtained using the fixed-effects estimator. The table only reports the key variables of interest. Control variables that are not shown include: a dummy for partial coverage of the regional minimum wage, a dummy for the regional minimum wage being linked to the regional subsistence minimum, a dummy for discrepancies among different data sources regarding the regional minimum wage, and time effects (set of dummies for years and quarters). Cluster-robust standard errors with clustering on regions are reported in parentheses. Asterisks ***, **, * denote significance at the 1%, 5%, and 10% levels, respectively.

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