EFFECTS OF MINIMUM WAGE INCREASES ON EMPLOYMENT IN LITHUANIA[1]

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Abstract. *From the advent of minimum wage it was subject to controversy: economists did not agree on its effects on the state of the economy, the welfare of both firms and workers. Empirical academic literature usually investigates employment reaction to the minimum wage fluctuations. Regrettably, such papers do not exist for Lithuania, so the literature of similar scope and topic of the US and UK (along with several other countries) is explored in this paper.*

The effect of the Lithuanian real minimum wage on aggregate employment is estimated by using time series models. Dependant on the specification, the real minimum wage elasticity is estimated to be –0.03–0.03 yet statically insignificant in all of the models. The result is in line with the reviewed literature; more precisely most of papers published in mid-1990s and beyond do not register any significant minimum wage effects on employment. The phenomenon is attributed to the fact that firms can exploit other channels (raising prices, hiring more productive employees, etc.) to make adjustments to new, higher wages. The paper does not explore what channels were used by the firms; however, a possible channel of productivity is investigated. Moreover, the temperate minimum wage policy is one of the factors that could have led to the insignificance of minimum wage to employment conclusion: the nominal minimum wage was only raised during the period of economic growth, and during economic downturns and recoveries it was frozen. The claim is further supported by the share of minimum wage earners in respect to total employed and the minimum wage to average wage ratio: the variables were relatively constant from 2005 onwards.

Key words: *minimum wage, employment, wage policy, Lithuania*

1. Introduction

The minimum wage (henceforth MW) has been first implemented some 120 years ago. Today, in forms of legislated MW or a collective agreement, MW exists in 90% of ILO (International Labour Organization) countries (ILO Global Wage Report 2008/09, 2008). Although most of the countries have a minimum wage, it is still controversial as it is an intervention in the labour market. For example, a collection of such regulations (along with an MW requirement) known as the National Industrial Recovery Act were deemed unconstitutional by the USA Supreme Court in 1935 (295 U.S. 495).

[1] The paper is an individual piece of work of the author and does not represent the views or work methods of the Euromonitor International in any way.

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Economists (along with journalists and politicians) are divided into MW advocates and abolishers (Fuchs, Krueger, Poterba, 1998). The latter cite that the intervention in the wage setting mechanisms has negative effects on employment and will leave a portion of employees with no income rather than raising it. The advocates of the MW, however, reject the neoclassical treatment of the labour market and argue that the MW could be accommodated without a negative impact on employment (Card, Krueger, 1995). The general consensus on the effect of the MW on employment does not exist to this day, although a shift towards non-adverse effects on employment has been in progress since the mid-1990s.

A disclaimer has to be made while studying the effects of the MW: the effects are manifold and do not register only in the labour market, they also extend to the wage distribution in general, decisions to acquire education, work skills, enter the labour force; prices and profits of the firm (Neumark, Wascher, 2006). Despite the caveat, employment is the most common measure for evaluating the outcomes of the MW policy, and it will be employed in this paper.

The motivation for this paper is a lack of research on the MW-related effects in Lithuania and a high share of the employed that are getting the MW in Lithuania (Fig. 1). Due to the poor availability of data on the topic, this paper uses aggregated data to estimate the effect of the MW change. However, the percentage of MW recipients as a share of the total labour force in Lithuania is one of the highest in the EU, so the MW effect can still be identified and will not get lost in the data. A time series model will be used to estimate the effects of MW hikes.

The paper is organized as follows: the next section briefly reviews the existing literature on MW effects on employment, section 3 layouts the data used for modeling which is discussed in section 4, and finally section 5 concludes the paper.

2. Literature review

2.1. Theoretical approaches to the labour market

The view that employment must fall after an increase of MW (or any wage increase for that matter) originates from the neoclassical (competitive) approach to the labour market. Although the competitive labour market model is still engraved in the minds of many economists today, even the most basic treatment of the labour market allows different channels of adjustment. More concretely, there are more costs related to a workplace than the payroll itself such as employment benefits: paid vacation, insurance plans or on-the-job training.

Another treatment of the labour market is the institutional model which allows for even more channels to make adjustments in the labour market, most importantly

productivity and efficiency wages. A MW hike acts like a catalyst for firm managers to pursue "productivity-enhancing activities, including the reorganization of work, setting higher performance standards, or demanding greater work intensity" (Schmitt, 2013). At the same time, workers have more incentives to keep their job by adhering to work requirements like not being truant.

The third theoretical approach is known as the dynamic monopsony model. It incorporates search frictions in the model framework, which lead to extended hiring costs (Manning, 2003). While in a competitive market firms hire at the market determined wage, under dynamic monopsony employers and employees face more costs related to the hiring process. Employees must put in additional financial and time resources to find a job and are constrained by their geographical location and scheduling. The costs lead to employers paid more than the market prevailing wage or extend the search period and forfeit output instead. Firms are more likely to lose output because raising the wage for a vacancy would often mean an increase in wages for the existing employees also. As a consequence, the economy suffers from underemployment and underproduction which could be adjusted by a higher MW.

There is little consensus on how the labour market should be treated as empirical studies have shown that the effect can be adverse, non-existent or (in rare cases) even positive which is (or was) in particular frowned upon by the academia (Card, Krueger, 1995) and even the general media (Walters, 1998). The theoretical approaches offer more tangible metrics of adjustment, called channels, which can be measured by statistical methods.

The three theoretical views have different implications on the effects on employment; however, they all agree that a MW increase cannot proceed without repercussions to economic variables. Employment is the economic variable of choice in the MW studies because it is measurable and universal: employment represents both sides (the supply and the demand) of the labour market, and ultimately a slump in employment leads to a contraction in GDP. Hardly any economist can find a positive side in employment and GDP contraction, so a negative estimate of the MW elasticity is a stringent evidence that the MW policy has gone wrong and negatively impacted the economy as a whole.

From the 1980s until the mid-1990s, studying employment as an effect was sufficient due to several factors. First of all, the research was successful in confirming a negative MW effect on employment almost exclusively (Brown, 1982). Secondly, it did not challenge the neoclassical view. However, the "new minimum wage" research challenged the existing view with a new evidence of no significant effect on employment and brought other adjustment channels into consideration. The next section provides a list of other possible channels of adjustment.

2.2. Channels of labour market adjustment after a MW increase

D. Metcalf (2007) and J. Schmitt (2013) provide a hefty list of explanations why employment effects might not exist:

1. Reduction in hours worked. As already mentioned, the reduction in employment might be achieved through the intensive margin (hours per employee). However, this type of reduction is more favorable towards employees since they might still keep the job. Also, if the hours are reduced by the same magnitude as the MW increased, workers will still be better off by having more hours of leisure.
2. Increases in productivity. This channel has a few explanations:
   a) demanding adequate skills for the job. Employers might become more demanding in the hiring process, so only individuals with higher skills would take up a more "expensive" position. For example, Sabia, Burkhauser, and Hansen (2012) find that teenagers and young adults (aged 20–24) with no high school diploma are influenced more by a MW hike than their peers with a high school diploma. However, this effect should be captured by the employment variables due to a prolonged search for employment time of lower skilled workers;
   b) efficiency wages. A worker will exert an extra effort after a MW hike according to the Shapiro and Stiglitz (1984) efficiency wage model, thus justifying the increase in the cost of labour. Although this theory had its empirical testing on wages in general (Raff, Summers, 1987), according to J. Schmitt (2013) it has yet to be tested on MW.
3. Increases in prices. A natural response for a competitive firm after a cost increase would be a price increase to offset the effect and to return to the equilibrium once again. The fields of study of price increases are the fast-food restaurants and other food parlors. D. Aaronson (2001) employed several datasets of restaurant price data and found a statistically significant price adjustment in the quarter prior or after the MW increase. For a more exhaustive study on the topic S. Lemos (2008) finds that the food price elasticity is 0.4 (and only 0.04 for all items) to the MW, meaning that prices in fact absorb a part of the adjustment.
4. Compression in a wage distribution. Often a firm does not employ MW workers only, so efforts can be made to keep the wage pool constant while cutting or freezing the wages of higher-paid workers. Machin, Manning, and Rahman (2002) study the effect of the New Minimum Wage (NMW) on nursing homes. They state that nursing homes serve as a good object to study MW effects, since almost 30% of workers were paid below the NMW introduced in 1999. Along with coming to the conclusion that the NMW had not effected the closure of nursing homes, they also found a negative relationship between the initial wage and the subsequent wage increases, which may

lead to believe that higher earners' wages were put on hold or increased less over the period. A survey-based approach used by Hirsch, Kaufman, and Zelenska (2013) found that a half of employers would pursue the aforementioned cost-saving tactic to ameliorate the effects of MW uplift.

5. Reduction in profits. Regrettably, there is a lack of studies (due to confidentiality concerns) on this particular effect of MW increase, although profit deterioration is most likely to happen if a firm does not adjust employment, wages or prices after a MW upraise.
6. Non-compliance with the MW. Some of the firms that are covered by the MW will move to the uncovered (shadow) sector. Not a lot of data exists on the topic due to its subtle nature; however, firms can reduce inflated costs by avoiding taxation. Metcalf (2007) describes HM Revenue and Customs action against non-compliance practices in the years 2005–06. A staggering noncompliance was found in 1582 (32% of all investigated cases) visits to businesses.
7. Decreased turnover (of employees). This channel is related with the dynamic monopsony model which introduces labour market frictions: scheduling the cost of transportation, limited and asymmetric information. By raising the MW, employers are enabled to reduce the time they can fill a vacancy and prolong the length of employee tenure. J. Schmitt (2013) suggests that firms might not pay a wage higher than the MW themselves because two profit equilibria might exist: low wage – high turnover and high wage – low turnover.

2.3. Empirical studies of the minimum wage effect on employment

The empirical MW research had numerous studies based on data on the United States especially. American economists were polled in 1978, and the majority (90%) replied that a hike in the MW would lead to a decrease of employment for unskilled workers (Kearl et al., 1979). Furthermore, series of pre-1980 studies were summarized, and it was concluded that a 10% increase of a MW would lead to a 1–3% decrease of teenage (a common age group of study in MW research) employment. For some time, the MW in the United States came to halt due to the absence of federal MW increases, and the general consensus was that the MW had adverse effects on employment.

In the 1990s, however, another series of studies, known as the "new minimum wage research", began to emerge. The authors relied on "natural experiments" to estimate the effects of MW hikes. The "natural experiment" framework relies on analyzing MW hikes with both a control and an experimental group rather than with just the latter. The United States state level MW differences provide an excellent ground for this type of research.

In an early summary of such studies *Myth and Measurement* (Card, Krueger, 1997) and *Time-Series Minimum-wage Studies A Meta-analysis* (Card, Krueger, 1995), authors find that the negative effects of the MW on employment seem to be diminishing because studies find lower coefficient estimates and higher standard errors. They also argue that journals were biased against publicizing studies which did not find a significant negative relationship between the MW and an employment variable. This claim is furthered by H. Doucouliagos and T. D. Stanley (2009) who analyze more than 1000 studies on the MW and weigh them according to their statistical significance. What they find is that studies are clustered around zero elasticity and claim that the analysis "only confirms this view and Card and Krueger's (1995) results".

Most of the studies discussed in the previous section are based on survey-type data from companies which are employing MW workers. Another type of data used is Labour Force Surveys which poll individuals themselves, an approach popular in the United Kingdom. Admittedly, the UK had an entirely different background than the United States: the minimum wage was only enforced in April 1999. Therefore, the whole country could be subject to the "natural experiment" and, maybe more importantly, the actual effect of the MW introduction could be observed rather than just one incremental increase after a preceding one. M. Stewart (2004) used a difference-in-difference model to find that the introduction of neither the MW nor the subsequent increases in 2000 and 2001 had any significant effects on employment for males, females, youths (18–21-year-old inclusive) and adults alike. The surprising results have been put under scrutiny (Metcalf, 2007). Under many explanations (most of them unrelated to employment directly) Metcalf mentions that total employment (defined as employed population multiplied by hours worked) may have decreased instead. This means that total employment could have decreased through the intensive margin (hours per worker) rather than through the extensive margin (total employees). Stewart and Swaffield (2002) confirm that "employees who had their pay increased due to the NMW (New Minimum Wage) have a higher probability of having reductions in their basic hours as a direct result of the introduction of the NMW". The result was confirmed once again by the authors in 2006.

Two conclusions can be made from the New Minimum Wage introduction in the United Kingdom: an introduction of the MW may leave employment unchanged, but it might impact other labour market variables instead.

A lot of publications are published for the United States data alone on the MW topic, but the effects of the MW can quite differ in developing markets due to a larger shadow sector risk. Betcherman (2013) lists more studies from Brazil, Trinidad and Tobago, Costa Rica, Indonesia, and Hungary, which actually found negative effects on employment. The latter two studies are extreme cases of MW upraise because the MW in nominal terms was increased twofold. Both studies cite that the adverse effect on employment has been

mostly felt among small firms, while large firms actually increased employment. What is perhaps the most surprising, the effect on employment was rather small as compared to the magnitude of the wage increase: a 3% decrease of employment in Hungary and a 5% in Indonesia. There are far fewer studies which find no employment effects: L. Bell (1997) for Mexico and S. Lemos (2007) for Brazil.

Finally, the investigation of MW literature leads to Lithuania which, regrettably, has very limited academic literature about employment effects of MW, known to the author. A recent (LFMI, 2014) study by the Lithuanian Free Market Institute (LFMI) attempted to evaluate the effects of the 2012–13 period MW upraises by surveying 181 companies. The firms were asked a series of questions on how the two subsequent increases (from 800 to 850 litas in 2012 and to 1000 litas in 2013) in the national MW affected them. Also, the same companies were asked how they would be affected by a further 50 or 200 litas increase from 2015. The results of the study are summarized in Tables 1 and 2. Around a half (52%) of the surveyed firms stated that they were affected by the 2012-2013 increases. Only a small fraction (18%) of the firms perceived the MW increase as a positive development. Naturally, all negative effects stem from elevated labour costs, but the firm perception of the magnitude of the MW effect might be skewed. It is hard to believe that a 50 litas increase from 2015 can have both more negative (52% of the responses versus 48%) AND more positive (13% of the responses versus 7%) effects on firms than a cumulative increase of 150 in 2012–2013. More concretely, it is not possible that a 50-litas increase may elevate costs more than a 150-litas had. Furthermore, the lesser increase of the MW cannot upraise the purchasing power by a higher margin than a more significant increase (6% vs. 4%, see Table 2). The inconsistency could be attributed to a firm manager's inability to forecast correctly or to the interviewer's bias. Also, a MW hike might be viewed as more challenging (damaging) in the future period than it was in the past.

The LFMI study also lists the channels through which firm managers tried (86% of them did) to ameliorate the MW effects (Table 1).

TABLE 1. **Negative effects of minimum wage increases according to the LFMI study**

	2012–2013 increase (150 litas total)	50 litas increase from 2015	200 litas increase from 2015
Forfeit of expansion plans	35%	29%	48%
Reduction of other firm costs	35%	29%	44%
Reduction of payroll-related costs	28%	28%	42%
Increase of prices of goods and services	18%	14%	28%
Increase of revenue by other methods	7%	6%	10%
Deferment of tax payments	4%	2%	9%
Movement of business elsewhere	1%	1%	3%
Other	2%	1%	2%

Source: the LFMI study.

Authors state that firms are most likely to reduce costs and forgo expansion plans in order to mitigate the effects of the higher MW, meaning firms reduce hiring as a response to the minimum wage. This time, there seems to be no inconsistency in the monotonicity of the responses. However, under a closer examination of how "payroll-related costs" were reduced, another inconsistency is revealed (Table 2): the firms would react more to the 50 litas increase than did to the 150 litas one. Also, firm managers are reluctant to reveal their intentions to hire workers for a sub-minimum wage.

TABLE 2. **Negative effects for "payroll-related costs" of minimum wage increases according to the LFMI study**

	2012–2013 increase (150 litas total)	50 litas increase from 2015	200 litas increase from 2015
Reduction of staff working hours	15%	21%	30%
Firing of employees	17%	12%	29%
Reduction of wage for higher-earners	10%	13%	19%
Illegally hiring workers for a sub-MW	0%	0%	2%

Source: the LFMI study.

The LFMI study is the first of its kind in Lithuania and suggests that small and medium firms face difficulties when confronted with a MW hike. However, the study is flawed, as a lot of the responses are non-monotonic in terms of the magnitude of a MW hike. One does not need to dismiss the insights of the study due to the non-monotonicity; however, the inconsistency indicates that the respondents had a limited ability to quantify the effects of the MW hikes. Furthermore, the unrepresentative nature of the study fails to demonstrate the big picture of the MW increase effects on the Lithuanian economy. The study identifies that the reduction of employees as in "payroll-related costs" is in the top three channels of adjustment to the new MW level.

3. Data

All data from modelling purposes, with the exception of the MW in Lithuania which is taken from the Lithuanian Department of Statistics, are taken from the Eurostat database. The time scope is 2003Q1–2014Q1, the data are seasonally adjusted.

Figure 1 shows the nominal MW over the sampled years (at the fourth quarter of each) and the percentage of full-time workers earning the MW according to the LDS October survey. One of the signs that MW hikes could have reduced employment is a significant clustering of the wage distribution at the MW level. It is noticeable that the share of MW recipients jumped in 2013, and in other years; however, the effect cannot be attributed to nominal MW hikes. Conversely we are able to see that a share of MW workers fluctuates together with aggregate unemployment. In times of higher unemployment, firms have an

elevated bargaining power as compared with workers' bargaining power. Furthermore, a period of higher unemployment is related with a suppressed economic activity, so firms cannot offer higher wages due to lower prices and profits. These two effects together push the wage distribution towards its floor, namely to the MW level.

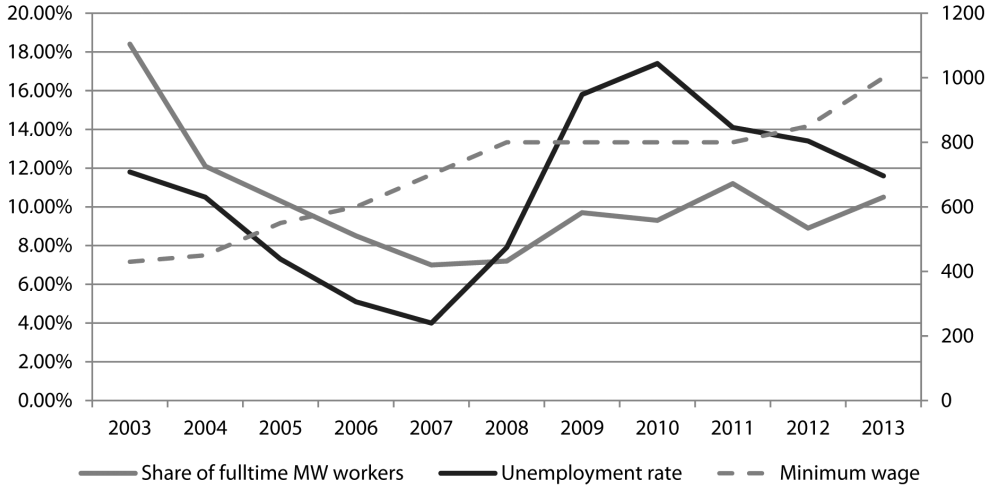

FIG. 1. **Minimum wage (right *y* axis), unemployment rate and the share of fulltime minimum wage workers (left *y* axis) dynamics**

Source: Eurostat.

Why has the MW growth not compressed the distribution? Figure 1 reveals that the nominal MW was put on hold from 2008 to July 2012. The reason for the MW freeze was the mentioned slowdown in economic activity: the MW was not increased again until unemployment had fallen to 14%. The share of MW earners was back to the 2005 levels while unemployment a as not, and the value of the MW was incomparable since it was not measured in real terms. The variables plotted in Fig. 2 put the MW in a comparative retrospect: the real MW (deflated by the Producer Price Index[2]) and the ratio between the MW and the average wage (AW). The two variables closely follow each other within the time period, still the real cost of hiring a MW worker has increased by 55% while the relative cost to a hypothetical average worker has increased by 13%. This evidence suggests that companies could have substituted (at least those able to make such a substitution) low-wage workers for more productive higher-wage workers, leaving the total employment lower.

[2] PPI was chosen to deflate MW as I am assuming than the main employment losses will occur due to a reduced demand of labour, not due to a leisure-work substitution of the employee. This might create a confusion due to calling the real MW the "earnings" of the workers; however, HICP and PPI are closely related variables.

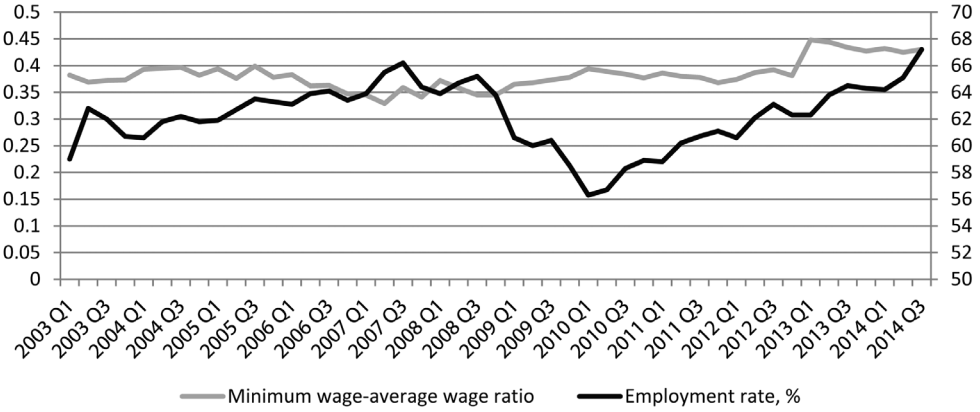

FIG. 2. **Minimum wage – average wage ratio (left *y* axis) and employment rate (right *y* axis) dynamics**
Source: author calculations, Eurostat.

Finally, I turn to a variable of interest, namely employment itself. In Fig. 3, the employment rate[3] is plotted together with the real MW. The graph can be divided into four periods:

1. The first one starting in 2003 and ending in mid-2008. During this period, the real MW was increasing along with employment. It stopped when Lithuania was hit by the 2008 economic crisis. The period was characterized by a high economic growth.
2. The second period lasted until 2010Q1 when employment hit its lowest point, while the real MW kept expanding solely because of the PPI deflation.
3. The third period, spanning from 2010Q1 through 2012Q2. Employment finally started to peak up while the real MW started to fall due to the PPI inflation.
4. The last period lasting until 2014Q1 saw increases both in employment and the real MW. The Lithuanian economy finally went through a job market recovery, and the MW (in nominal terms) was increased again.

The two variables in Fig. 3 shared their growth during times of economic expansion and had opposite trends during the period of contraction. Until recently, economic growth has always been accompanied by inflation; consequently, the real MW kept making advancement thanks to legislated nominal increases. However, during the crisis period, the real MW kept expanding without the help of government officials and reached a peak in 2009 Q4. Has the real MW appreciated and impacted employment in a negative manner? Would have employment benefited from MW decrease? Looking back at Fig. 1, the share of MW recipients increased in 2011, but it had not reached its historic maximum. Also, by inspecting Fig. 2, we are able to see that the MW–AW ratio was not anywhere near its heights. Actually, the MW–AW ratio and the real MW saw a

[3] Employment rate is plotted in order to account for the decreasing population of Lithuania.

substantial increase in 2012–2013. If any, the 2012–2013 period shows signs of negative MW effects. However, the data do not point to the same direction this time: while the share of MW workers has increased back to its 2005 level (but still not to its maximum), the employment kept increasing (Fig. 3).

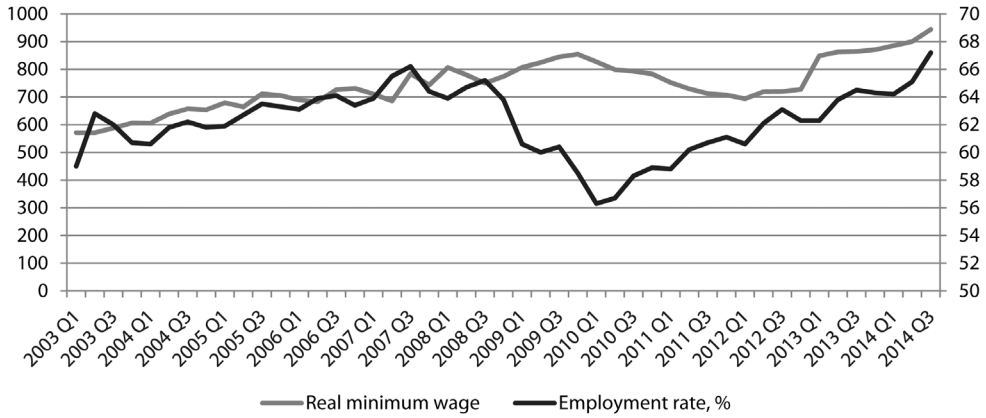

FIG. 3. **Real minimum wage (left *y* axis) and employment rate (right *y* axis) dynamics. Base year = 2010**
Source: author's calculations, Eurostat.

Stylized facts and eyeballing the data do not immediately point out that employment was affected by MW hikes. However, the MW–AW ratio has grown over the period, and the share of full-time MW workers is higher than the post-2005 historical average. In the next section, I quantify the MW effects on the aggregate employment in Lithuania.

4. Models and results

The reviewed literature underscores collecting data on individuals before and after a scheduled MW hike as the main modeling approach to estimate the MW effects. The data can be collected by the study authors themselves, by sourcing Labour Market Surveys or Social Security data. Due to the costs involved in the first method and the unavailability of the second, this paper employs a different approach. The effect on total employment is estimated over a period of 2003Q1–2014Q1 which involved five MW hikes.

A simple time series modeling framework will be used (Brown, 1982; Wellington, 1991):

$$E_t = \alpha MW_t + R_t \beta + \varepsilon_t, \quad (1)$$

where E_t is a variable that represents employment (the employment rate or total population employed). The MW_t is the minimum wage variable – the real (deflated by the PPI) MW. Finally, R_t is a set of control variables which allow estimation under varying economic and demographic conditions.

The added benefit of using a longer period of data is that it allows for dynamic relationships among the variables to be estimated as it is not easy to figure out when firms would start downsizing employment. A new MW law is usually enacted by the Parliament only a few weeks[4] before it comes into effect, leaving the businesses little time to make the adjustment. Literature suggests that firms can make adjustments in order to accommodate the MW increase through many channels, and firing workers is one of the more costly ways to make the required adjustment due to firing costs. This means that employment adjustments might be made over an extended period of time to minimize total costs. To take this factor into account, a lagged structure of independent variables is used:

$$E_t = \Sigma^{n}_{i=0} \alpha_i MW_{t-i} + \Sigma^{m}_{j=0} R_{t-j} \beta_j + \varepsilon_t. \quad (2)$$

Following the framework unemployment rate, population and the real average wage are used as control variables. To avoid endogeneity of the unemployment rate and the real average wage, their lags and real lagged productivity (defined as the real GDP divided by total employed) are used as instruments. Modeling exercise results are reported in Table 5. Note that all variables are in logged first differences, with the exception of rate variables.

All specifications differing in the lag structure in Table 5 include population, unemployment rate and real average wage variables as controls. The population impact on the employed did not statistically differ from 1, meaning that a decrease in population has a 1-to-1 correspondence to a decrease in employment. Meanwhile the unemployment rate had an effect of similar magnitude but in the opposite direction. In the many specifications that differ in terms of the real MW (RMW variable), the MW variables show no signs of an even remote significance. The contemporaneous effect of the MW by itself (Model 7) is positive at 0.03 yet insignificant. It fails to change the magnitude or the sign in all the specifications used. Moreover, lagged or lead MW variables had no significance in models, although their signs were negative. The lagged RW variable (RMW_lag1) has an (insignificant) estimate of negative 0.03–0.04 in the specifications, which is in line with studies of Hungary, Indonesia, and Greece among many others (see Neumark, Wascher, 2006 for an extensive list of post-1990 studies on the MW).

As mentioned earlier, it is not self-evident that firms make employment adjustments in the same quarter that the MW hike was made, so the positive effect of the contemporaneous MW is unsurprising. The negative sign of the lagged MW variable seems to gauge the belated response of employment reductions, while introducing the lead variable was rather an experiment as it is unreasonable to believe that an average firm can anticipate a MW hike, let alone make employment decisions in the preceding quarter.

[4] The 2015 upraise was an exception as it was announced half a year prior to coming into power.

TABLE 5. **Modeling results**

Model 1	Ind. variable	Estimate	Std. error	t value	p value	Metric	value
	(Intercept)	0.002	0.002	0.985	0.331	Rsq	0.776
	RMW*	0.027	0.042	0.641	0.526	JB	0.836
	RMW_lag1	-0.03	0.046	-0.655	0.516	Nobs	42
	Population	0.992	0.272	3.645	0.001	DW	1.936
	Unemployment rate	-1.195	0.235	-5.081	0		
	RAW**_lag1	-0.174	0.09	-1.922	0.063		
Model 2	**Ind. variable**	**Estimate**	**Std. error**	**t value**	**p value**	**Metric**	**value**
	(Intercept)	0.002	0.002	0.99	0.329	Rsq	0.794
	RMWLead	-0.02	0.037	-0.531	0.599	JB	0.836
	RMW	0.019	0.041	0.458	0.65	Nobs	41
	RMW_lag1	-0.034	0.045	-0.763	0.451	DW	1.965
	Population	1.041	0.271	3.833	0.001		
	Unemployment rate	-1.152	0.221	-5.208	0		
	RAW_lag1	-0.164	0.088	-1.878	0.069		
Model 3	**Ind. variable**	**Estimate**	**Std. error**	**t value**	**p value**	**Metric**	**value**
	(Intercept)	0.002	0.002	1.333	0.191	Rsq	0.781
	RMW_lag1	-0.039	0.042	-0.933	0.357	JB	0.836
	Population	1.051	0.244	4.301	0	Nobs	42
	Unemployment rate	-1.183	0.229	-5.165	0	DW	1.961
	RAW_lag1	-0.159	0.084	-1.89	0.067		
Model 4	**Ind. variable**	**Estimate**	**Std. error**	**t value**	**p value**	**Metric**	**value**
	(Intercept)	0.002	0.002	0.797	0.431	Rsq	0.789
	RMWLead	-0.019	0.037	-0.502	0.619	JB	0.838
	RMW	0.025	0.039	0.642	0.525	Nobs	41
	Population	1.003	0.261	3.837	0	DW	2.000
	Unemployment rate	-1.149	0.222	-5.168	0		
	RAW_lag1	-0.166	0.097	-1.718	0.095		
Model 5	**Ind. variable**	**Estimate**	**Std. error**	**t value**	**p value**	**Metric**	**value**
	(Intercept)	0.002	0.002	1.052	0.3	Rsq	0.788
	RMWLead	-0.023	0.036	-0.624	0.537	JB	0.837
	Population	1.052	0.241	4.356	0	Nobs	41
	Unemployment rate	-1.146	0.22	-5.204	0	DW	2.049
	RAW_lag1	-0.157	0.093	-1.692	0.099		
Model 6	**Ind. variable**	**Estimate**	**Std. error**	**t value**	**p value**	**Metric**	**value**
	(Intercept)	0.002	0.002	1.274	0.211	Rsq	0.795
	RMWLead	-0.023	0.036	-0.629	0.533	JB	0.836
	RMW_lag1	-0.039	0.042	-0.939	0.354	Nobs	41
	Population	1.08	0.245	4.405	0	DW	1.967
	Unemployment rate	-1.151	0.219	-5.261	0		
	RAW_lag1	-0.158	0.084	-1.888	0.067		
Model 7	**Ind. variable**	**Estimate**	**Std. error**	**t value**	**p value**	**Metric**	**value**
	(Intercept)	0.002	0.002	0.826	0.414	Rsq	0.771
	RMW	0.032	0.04	0.813	0.421	JB	0.837
	Population	0.96	0.261	3.681	0.001	Nobs	42
	Unemployment rate	-1.196	0.236	-5.069	0	DW	1.957
	RAW_lag1	-0.176	0.099	-1.772	0.085		

Source: author's calculations.

* Real Minimum Wage

** Real Average Wage

Rsq – R squared; JB – Jarque–Bera test *p* value; Nobs – number of observations; DW – Durbin–Watson test statistics.

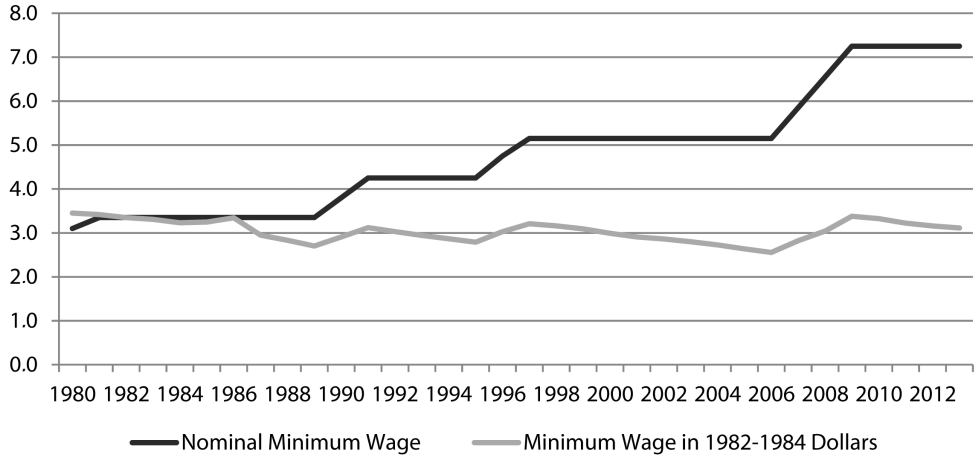

FIG. 4. **The US nominal and real minimum wage dynamics**
Source: the USA BLS.

What are the causes of absence of the MW effects on employment? We can turn back to the United States for an illustration in Fig. 4. The MW research which began in the 1980s on the United States data found mainly negative effects on employment. The real MW dropped since that period and was lower when the NMW research started, which could not find negative effects with the former certainty. Furthermore, the recent increases in the MW towards its 1980 level do not mean that studies will find a negative relationship between employment and the MW. Another factor that determines the wage–employment relation is productivity. An increase in productivity would mean that employers can afford to pay higher wages, but they not necessarily will. However, it is hard to gauge the productivity of a MW worker, so we must turn to proxy measures such as total productivity in the food services and drinking places industry where 21.9% (as of 2014) of employees are paid the MW or less. This industry experienced a 10.9% increase in productivity. On the one hand, there is no evidence that the MW earners in fact were part of this productivity increase; on the other hand, it so very unlikely that is has deteriorated in this relatively long period of time. As a result, employers are left with more productive workers and paying them less. Lithuania does not have an extensive list of MW studies, nevertheless, a similar pattern can be observed in Lithuanian labour data for the Accommodation and Food Service Activities sector where MW employees comprised 27% of the total employees in 2013. The sector saw a 65.6% increase in productivity, while the real MW appreciated by 41.5%.

Productivity is one of the reasons why MW can keep increasing without negatively affecting employment, while it would be hard to prove that productivity growth is actually supported by MW hikes *a la* Stiglitz, it is regardless of how productivity growth

was attained. Furthermore, if MW workers were not part of the productivity increase, it would be hard to justify their employment instead of more productive individuals. Turning one more time to Fig. 1, it is evident that the share of MW workers has been stable through the post-2005 period and underwent only a small increase.

5. Conclusions

The paper explores the Lithuanian minimum wage effects on aggregate employment by estimating a time series model. The estimates of minimum wage and its dynamic components were found to be small, mainly negative and insignificant, ranging within–0.03–0.03. The existing literature is limited to the LFMI study, however, the insignificance of the minimum wage variable is in line with the most recent trend in MW studies in the United States (Schmitt, 2013).

The lack of the minimum wage effects on employment can be attributed to a temperate minimum wage setting in the period: the nominal minimum wage was frozen from 2008 to 2012, the minimum wage to the average wage ratio increased by 3.8%, and the total share of MW employees remained relatively stable from 2005 to 2013 (at 7% to 10%).

The paper uses 11-year data to gauge the relation between two large-scale variables and sets the ground for the further investigation using a survey, the Social Security database-based or more demographically segmented data to evaluate the methods and rationale used for obtaining the results of this study.

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