



# CROSS-COUNTRY REPORT ON MINIMUM WAGES

## SELECTED ISSUES

June 2016

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# CROSS-COUNTRY REPORT ON MINIMUM WAGES

April 25, 2016

## SELECTED ISSUES FOR THE 2016 ARTICLE IV CONSULTATIONS WITH THE REPUBLIC OF LATVIA, THE REPUBLIC OF LITHUANIA, POLAND, AND ROMANIA

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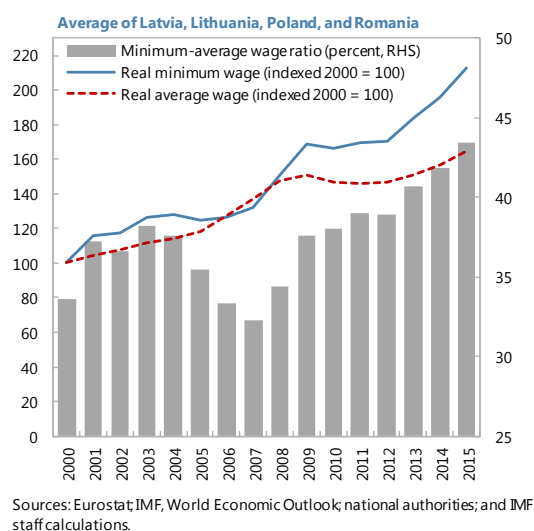
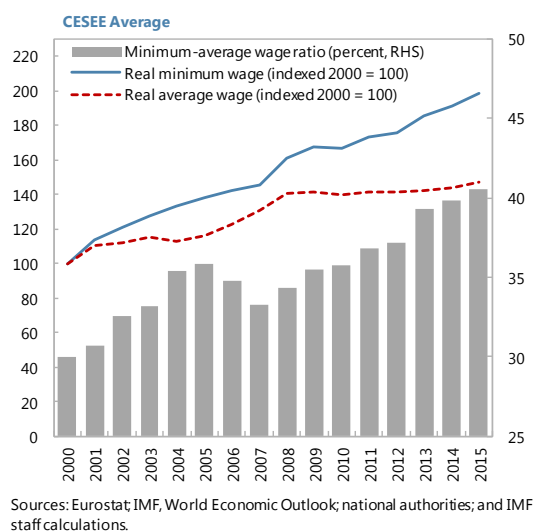
# GETTING MINIMUM WAGES RIGHT IN CENTRAL EASTERN AND SOUTHEASTERN EUROPE

## A. Introduction

**1. In the past few years, many countries in Central Eastern and South Eastern Europe (CESEE) have increasingly turned to minimum wage policies.** Throughout the region, statutory minimum wages had been in place at least since the early 1990s, but they were typically set at relatively moderate levels and affected relatively few workers. In the boom period from the mid-2000s to 2007/8, wages rose rapidly in general, including for low-wage earners without requiring recourse to active minimum wage policies. In the context of economic adjustment programs after the 2008/09 crisis, wages stagnated or were cut while minimum wages remained unchanged in most countries. With the economic recovery, wages are growing again but more slowly, raising particular concerns about the wellbeing of low-wage earners. In response, many governments in the region have started use minimum wage policies more prominently to support those on low incomes and address income inequality.

**2. Consequently, minimum wages have risen sharply relative to both average wages and labor productivity.** During 2011-15, real minimum wages grew by some 3 percent annually, considerably exceeding real labor productivity gains of around 1 percent for CESEE on average. Disparities are starker for the group Latvia, Lithuania, Poland, and Romania with minimum wage growth of some 6 percent against productivity growth of around 2½ percent. In several countries, further minimum wage hikes for later this year and beyond have already been agreed. While CESEE

Minimum and Average Wages, 2000-15

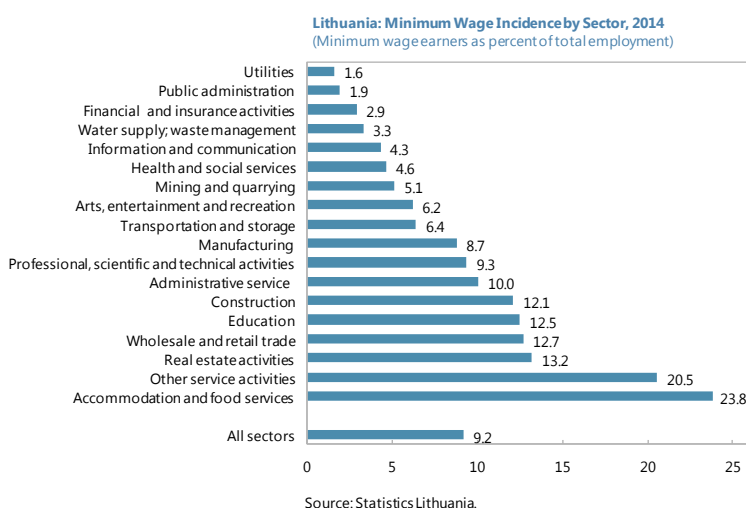


minimum wages remain around one third the level of Western Europe in absolute terms, the region is already at par with Western Europe in terms of minimum wages relative to average wages at some 40 percent (Figure 1). Lithuania and Slovenia rival the highest western minimum wage ratio of over 50 percent reported for France. Relative to labor productivity, minimum wages in CESEE are still

somewhat lower than in Western Europe—17 against 22 percent—because wage underreporting is more widespread and the labor share of income tends to be lower in less affluent economies (IMF, 2014a).

### 3. Minimum wages often affect relatively more workers in CESEE than in Western Europe.

Incidence varies widely across the region ranging from 6 percent of total employment in Estonia to 35 percent in Turkey in 2014. Lithuania and Poland (9 percent), Latvia (15 percent), and Romania (22 percent) are in between. Moreover, minimum wage hikes since 2014 are set to increase sharply the share of workers on minimum wage, for example to an estimated 20 and 60 percent for Lithuania and Turkey, respectively. This compares to incidence rates of less than 5 percent for the U.K. or the U.S. and around 10 percent for France and Germany. Incidence also depends on the type of economic activity, the level of workers' education, and enterprise size. Lithuania's pattern is typical for CESEE and Western Europe alike. Minimum wage workers are most prevalent in accommodation and food services, as well as wholesale and retail trade. A study for Estonia finds that minimum wage incidence was four times the average for workers with only primary education and twice the average in small firms with up to 10 employees (Bank of Estonia, 2015).



**4. Governments are the key players in minimum wage determination in CESEE countries** (Annex I, Table A1.1). In four countries government sets the minimum wage rate outright and in nine others government fixes it after consultations with social partners. In Turkey and Serbia, the decision is outsourced to specialized bodies in which the government is represented, but in practice minimum wages tend to follow political guidance. Government is perhaps least involved in Bosnia-Herzegovina and Estonia, where the minimum wage is negotiated between social partners and then given legal force by government decree. But even here, governments express strong views as to what the minimum wage should be. None of the CESEE country gives expert opinion a formal role. Differentiation of minimum wages according to age, contract, or sector is rare and, where it exists, quite limited.

**5. In Western Europe, governments also play a dominant role in minimum wage setting, but reliance on expert opinion and formula-driven adjustment are more common** (Annex I, Table A1.2). The U.K. goes perhaps the furthest, with the government acting upon recommendations by the independent Low Pay Commission. While the commissioners come from a mix of employee, employer, and academic backgrounds, they act in their individual capacities. Similar commissions in France and Germany also comprise experts, but they act alongside union and employer representatives, and have no voting rights in the case of Germany. Governments can also take a bit

of a backseat by indexing minimum wages, relying on a formula as the default adjustment. Belgium links minimum wage hikes to price developments and the Netherlands to average wages in collective wage agreements. In the Dutch system, an escape clause suspends the indexation if the number of welfare recipients exceeds a certain proportion of the population. In France, government essentially decides about additional minimum wage hikes on top of formula driven increases according to price and real wage developments.

**6. Many considerations come into play when setting minimum wages, but governments need to be aware of some key tradeoffs.** Decisions will depend on how problematic income inequality is to begin with, how strongly society feels about equity, and how effective minimum wages are compared to alternative policy tools. They will also be driven by the intensity of possible tradeoffs with other objectives, such as maximizing employment or external competitiveness. But in any event, governments need answers to two key questions forming their views:

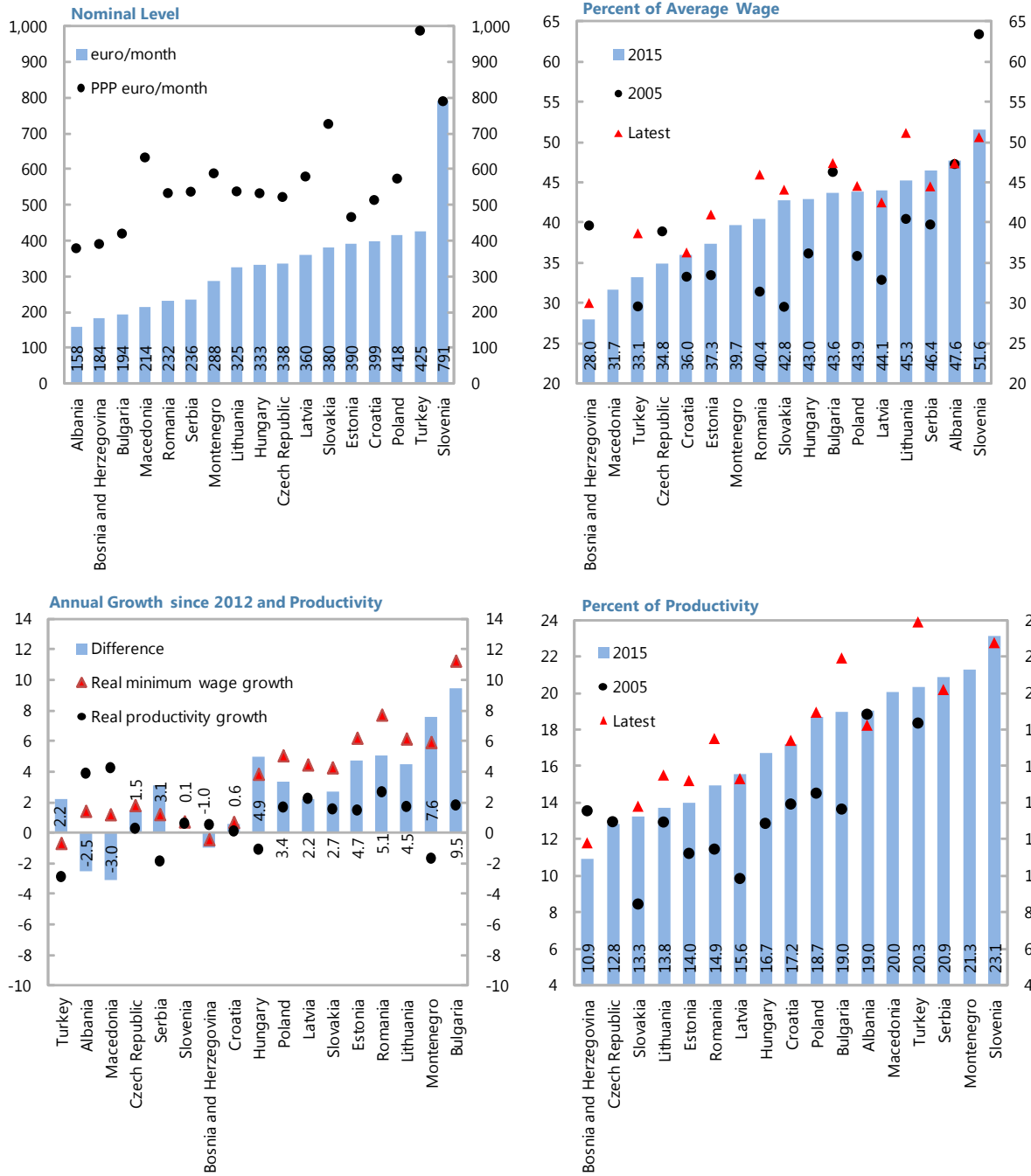
- What is an appropriate range for minimum wage levels? Here possible tradeoffs between equity and efficiency are key considerations. To what extent do minimum wage hikes further equity goals and how efficient are they relative to other policy tools? Do minimum wage hikes improve efficiency, by for example inducing firms to become more productive and workers to put in more effort without affecting employment? Or do they increase unemployment as firms struggling to remain competitive lay off workers and scale back hiring? If tradeoffs become sharper as the minimum wage rises, what level strikes an appropriate balance between the pros and the cons?
- What is the appropriate pace for minimum wage growth? To what extent do minimum wage hikes fuel overall wage growth, either directly by affecting the wages of workers earning the minimum or indirectly through ripple effects up the wage scale and signaling effects? Given productivity developments and competitiveness positions of CESEE countries, how much additional wage push is prudent at the current juncture?

**7.** This paper seeks to shed some light on these questions, drawing on the literature and empirical evidence for seventeen CESEE countries.<sup>1</sup> Section B first lays out the potential economic ramifications of minimum wage hikes for efficiency and income distribution. It goes on to drill down into the effects on actual worker remuneration, general wage growth, employment, income distribution, and competitiveness. It draws on existing literature, presents stylized facts, and offers original analysis. Coming back to the key questions about the appropriate level and growth rate of minimum wages, Section C pulls the findings together and draws policy conclusions.

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<sup>1</sup> The focus is on the experience in Latvia, Lithuania, Poland, and Romania, but Albania, Bosnia, Bulgaria, Croatia, the Czech Republic, Estonia, Hungary, FYR Macedonia, Montenegro, Serbia, Slovenia, Slovakia, and Turkey are also covered.

Figure 1. Minimum Wages in CESEE



Sources: Eurostat; IMF, World Economic Outlook; national authorities; and IMF staff calculations.

## B. The Economics of Minimum Wages

**8. Minimum wage policy aims to improve the income distribution but may also have important implications for economic efficiency.** Putting a floor under the earnings of those on low wages tends to make them better off and to reduce the gap to high-wage earners. But interfering with market mechanisms and fixing the price of labor is likely to entail efficiency losses, but it could also give rise to efficiency gains if it corrects preexisting distortions.

**9. In analyzing the effects of minimum wages, the first step is to check whether they are actually binding and implemented.** If nobody is on the minimum wage, it is irrelevant and hiking it has no further consequences. More importantly, in countries with large shadow economies there is a risk that they are adhered to mostly on paper: (i) if workers receive under-the-table wage supplements, or “envelope payments,” minimum wage hikes could result in a mere reshuffling between official wage and “envelope payments” without affecting actual labor costs; (ii) employers could reduce the reported but not the actual number of hours worked per employee, leaving total pay unchanged despite higher hourly wages; and (iii) economic activity could be pushed into the shadow economy altogether where minimum wage regulation is disregarded. These evasion schemes stop many economic consequences of minimum wage policies in their tracks, but a retreat of activity into the shadow economy could seriously undermine productivity growth (Farrell, 2004) and growing disrespect for the law would also be problematic.

**10. Minimum wage policies can help improve the income distribution, making low-wage earners better off through redistribution from other parts of society.** Abstracting from efficiency effects for the moment, total income available in the economy remains the same, meaning that if low-wage earners are better off someone else must be worse off. If firms fully pass through higher wage costs to prices, it is consumers, rich and poor, who will pay for the minimum wage increase. If firms are not able to do so, their owners earn less profit and are worse off. Minimum wage hikes tend to improve the wage distribution to at least some extent, but the carryover to a better income distribution is typically muted. Those at the very bottom of the income distribution typically do not work at all and minimum wage recipients are often second-income earners in reasonably well-to-do households (Low Pay Commission, 2014, p. 55).

**11. Minimum wages come with efficiency losses when labor markets are competitive, but they can also have beneficial effects if they correct preexisting market imperfections.** With competitive labor markets, fixing wages above market-clearing levels necessarily hurts job creation, growth, and investment as competitiveness suffers and jobs are automated. Labor intensive industries competing in international markets are likely the most affected. While employment effects could be mitigated if workers increase effort and firms spur productivity enhancements, they remain negative: firms already pay efficiency wages out of self interest and pushing wages above this level would increase involuntary unemployment further; similarly, firms choose productivity so as to maximize profits—minimum wage hikes will hence lower them and likely induce firms to substitute capital and high-skilled labor for low-skilled labor. If minimum wages overly compressed the wage scale, it could blunt financial incentives for career development, effort, and investing in education, thereby hurting growth. However, minimum wage hikes can raise efficiency if labor markets are

distorted. For example, employment could increase if there are only few firms, giving them the monopsony power to hold wages down by hiring too few workers. Another possibility is that firms are better informed about prevailing wages than workers, or that workers incur substantial job search cost. Firms could exploit the situation and pay artificially low wages in the absence of minimum wage regulation.

**12. The many possible effects of minimum wages make the assessment of their pros and cons essentially an empirical and country-specific matter.** As summarized in Figure 2, there are many ways in which equity and efficiency could ultimately be affected, but which channels are relevant and how strongly do they play? Are there significant differences between the countries of the region, or the region and other parts of the world? These are essentially empirical questions, which the rest of this section tries to address. Finding statistically compelling answers is a challenging task, considering the many other factors besides minimum wages that drive economic outcomes, the relatively few historical episodes where minimum wages were as high as currently in CESEE, and possible lags in the economic repercussions from minimum wage changes.

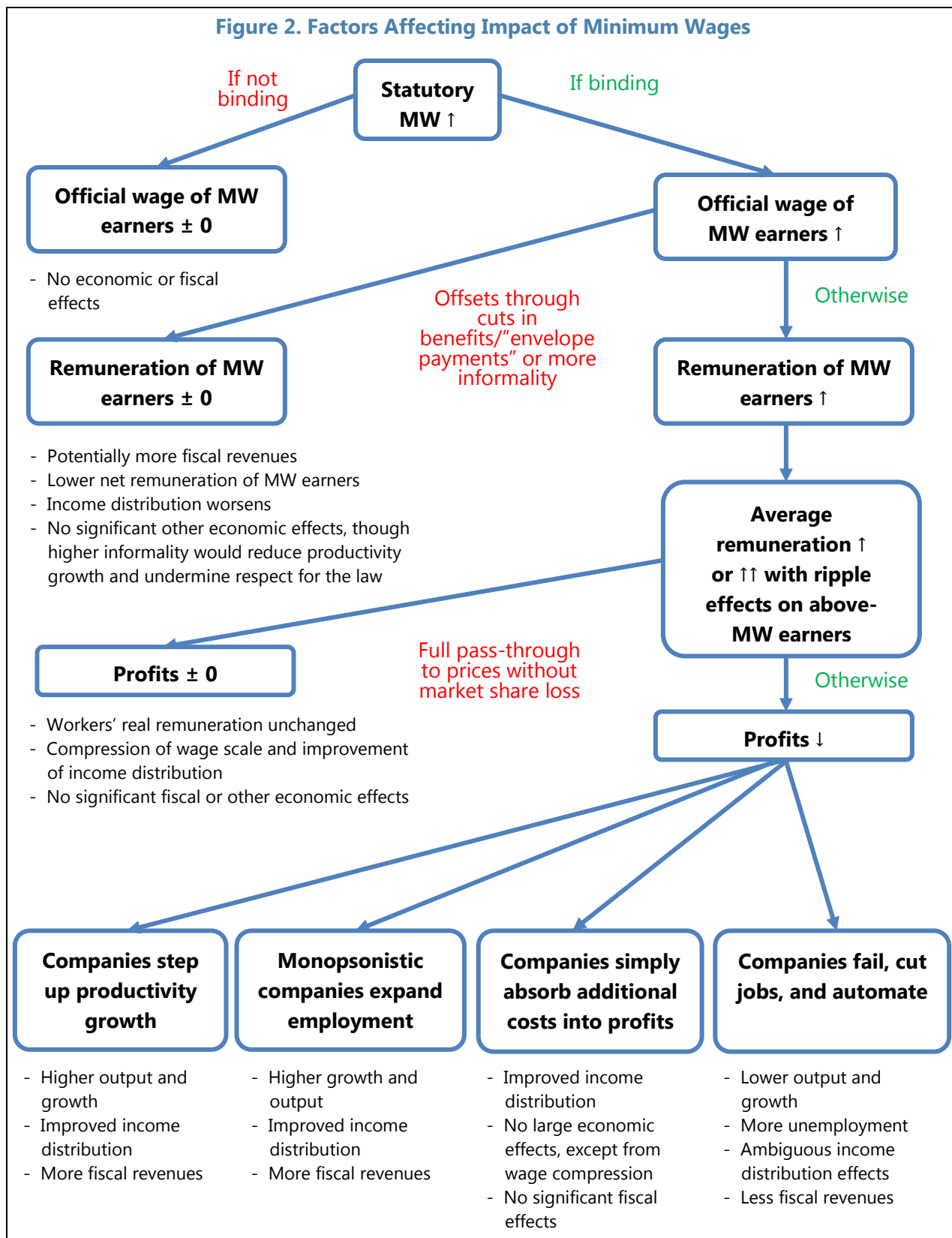
### Minimum Wages and Remuneration

**13. Much of the debate on minimum wage takes it for granted that minimum wage hikes translate into higher worker remuneration, but for a variety of reasons this may actually not be the case.** First, compliance with minimum wage regulation is less than perfect in practice, especially in CESEE countries with their sizable shadow economies. Second, employers may offset higher minimum wages by lowering non-wage benefits, hours, or “envelope payments.” Third, even where minimum wage regulation is fully respected, additional earnings face steep social security and labor taxes, reducing the impact on take-home pay.

**14. The literature suggests that non-compliance is indeed widespread in both advanced and emerging economies.** While direct evidence on the magnitude of non-compliance is scarce, various studies combine survey data from the employer and employee side to shed light on the issue. The seminal work by Ashenfelter and Smith (1979) estimated non-compliance with federal minimum wage in the U.S. in 1973 to be around 35 percent. Surveys of the low-wage garment sector in California revealed non-compliance in two-thirds of factories (Milkman et. al., 2010). In the U.K., 11 percent of workers in the social care sector were found to be paid less than the minimum wage they were entitled to (Low Pay Commission, 2014). There is also evidence of non-compliance in developing countries, including for Brazil (Lemos, 2004), for Peru (Baanante, 2005), for Indonesia (Harrison and Scorse, 2004), and for Mexico (Bell, 1997).



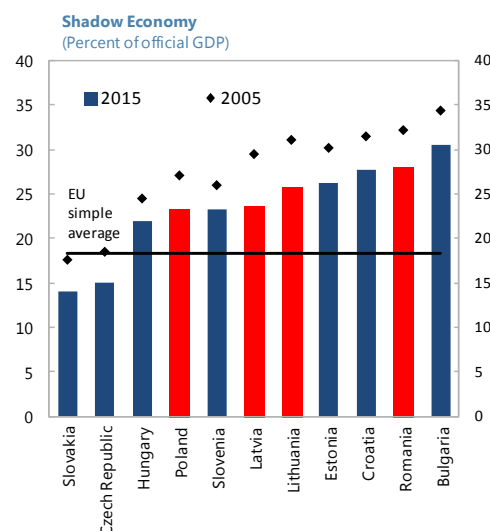
**Figure 2. Factors Affecting Impact of Minimum Wages**



**15. The large size of the shadow economy in CESEE offers ample scope for circumventing minimum wage regulation, limiting their benefits in terms of workers' actual remuneration.**

While estimates vary, 10-30 percent of economic activity in CESEE is thought to take place in the shadow economy in order to avoid taxes and regulations (Schneider, 2015; Putniņš and Sauka 2015; and Žukauskas, 2015).<sup>2</sup> Over the past decade, the relative size of the shadow economy has decline somewhat across the region as income convergence advanced, but it remains large. Minimum wage violations principally take three forms. First, “envelope payments” are quite common in the region, affecting an estimated 11 percent of workers and accounting for two fifth of their total pay in Central and Eastern Europe (Williams, 2009) and between 12 and 20 percent in the Baltics (SEE Riga, 2015). Minimum wage hikes may result in a reshuffling between official and unofficial pay, without affecting actual remuneration. Indeed, regularization of “envelope payments” could even reduce net pay as tax and social security deductions rise.

Second, underreporting of hours worked is also widespread, possibly by as much as 13–20 percent in the Baltic countries (Žukauskas, 2015). Again, minimum wage hikes could be effectively offset by commensurately reducing official hours worked. Third, minimum wage hikes could prompt firms to entirely move from the formal sector to the shadow economy.

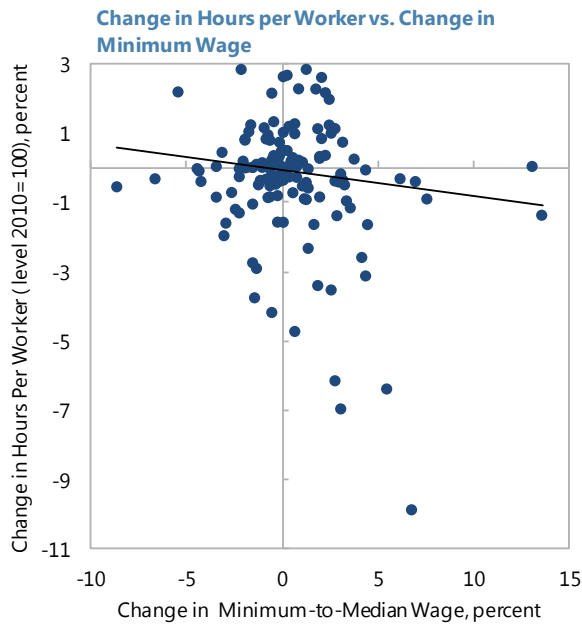


Source: Schneider (2015).

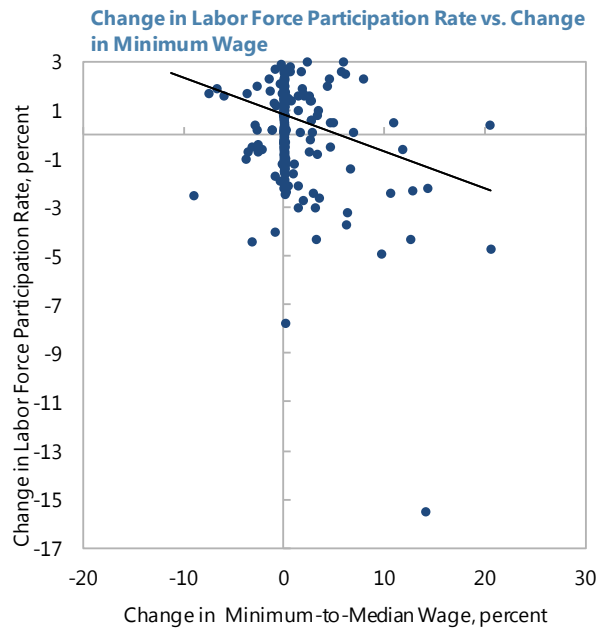
**16. Evidence for CESEE suggests that minimum wage increases exacerbate non-compliance.** Non-compliance is hard to measure directly, which is why the literature has focused on proxies, such as labor market participation rates, hours worked, incidence of part-time work, and the use for cash. For CESEE countries during 2000–14, changes in the minimum-to-median wage ratio exhibits correlations with changes in these proxies consistent with the hypothesis that minimum wage hikes increase shadow economy activity (Figure 3). Higher minimum wages go together with more part time work, lower labor force participation, more cash use, and less hours worked per employee. While none of these individual relationships controls for other influences or is statistically robust, jointly they are nonetheless suggestive of increased informality undermining the effectiveness of minimum wage policy to some extent.

<sup>2</sup> Putniņš and Sauka (2015) and Žukauskas (2015) estimate the shadow economy to be around 10-15 percent of official GDP in the Baltics, which is smaller than the estimates by Schneider (2015).

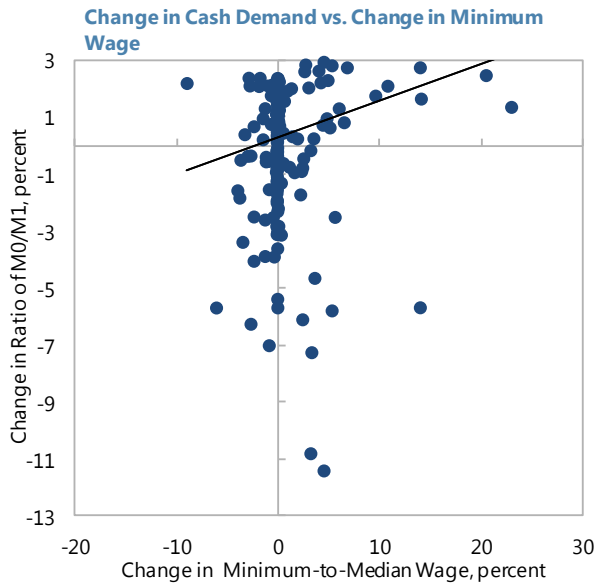
**Figure 3. CESEE: Minimum Wage Policy and Indicators of Non-Compliance**



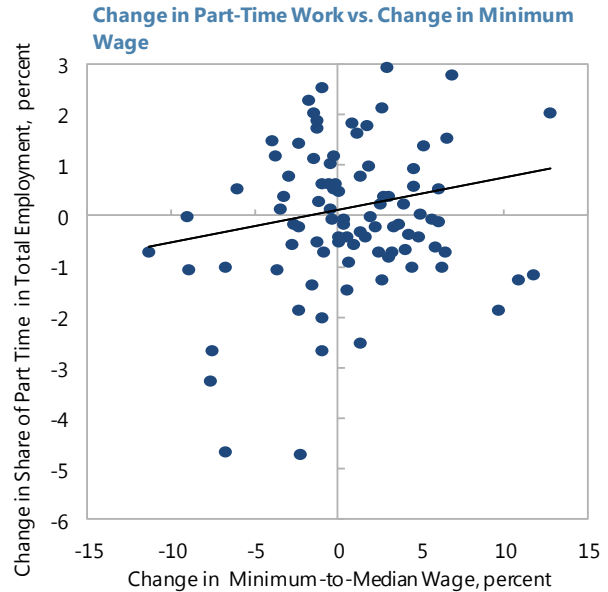
Sources: Eurostat; and IMF staff calculations.



Sources: Eurostat; and IMF staff calculations.



Sources: Eurostat; IMF, IFS; and IMF staff calculations. M0/M1 represents the ratio of cash in circulation outside depository institutions to the sum of cash and deposits.



Sources: Eurostat; and IMF staff calculations.

Note: Dots correspond to data for CESEE countries and years 2000-14.

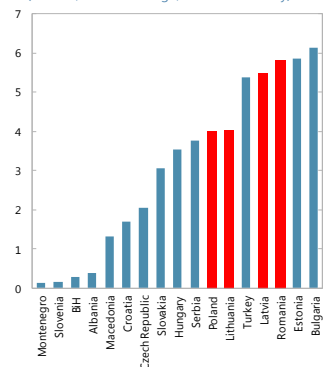
## Minimum Wages and General Wage Growth

**17. Minimum wages can be expected to directly and indirectly affect the general wage level in the economy.** Labor demand and supply determine wages first and foremost, but labor market institutions, including minimum wages, also play a role. Clearly, if hikes are complied with, the pay of all workers below the new minimum wage rises. This direct effect on general wages is likely roughly proportional to the share of minimum-wage earners in the economy. But there are also indirect effects: in order to maintain reasonable wage differentials, pay for workers above the minimum wage may also go up. And, minimum wage hikes may have signaling effects for the pace of wage increases in general.

**18. The literature confirms that minimum wage increases typically push up the general wage level, but quantifications vary widely** (Table 1). There is evidence of both direct effects and ripple effects. Elasticities of general wages increases with respect to minimum wage hikes range from slight negative to some 0.8. Individual wage data for the U.S. point to a pass-through of 0.8 for workers at or just above the minimum wage and 0.25-0.4 for workers further up the wage scale (Neumark, Schweitzer, and Wascher, 2000). The introduction of a minimum wage in the U.K. in 1999 had a direct estimated effect on general wages of 5 percent, with the total impact rising to 7.2 percent when ripple effects are included (Dickens and Manning, 2004). Few studies cover CESEE and those that do report very small effects. Firm-level data for Hungary suggests that a one percent minimum wage increase pushed general wages up by only 0.04 percent (Kertesi and Kollo, 2003). For Romania a slightly negative pass-through is identified, but results may have been distorted by the study covering the years around the 2008/09 crisis (Andreica et al., 2010). Differences in estimates likely reflect not only different methodologies, but more importantly specific circumstances, such as minimum wage coverages and business cycle positions.

**19. Wage growth has been quite fast in CESEE in recent years, with the sharp increases in minimum wages a possible contributing factor.** In the low inflation environment it translated into sizable gains of real incomes. While higher incomes for workers are clearly desirable, wage growth that goes beyond what the economy can support could backfire. Many factors likely contributed, including falling unemployment, fewer labor market entries for demographic reasons, and competition with wages in Western Europe in the face of labor mobility, but minimum wages could also have played a role.

CESEE: Nominal Wage Growth 2012-15  
(Percent, annual average, national currency)



Sources: National authorities; and IMF staff calculations.

**20. In response to minimum wage hikes, firms in CESEE typically raise wages for workers beyond those directly affected, according to surveys.** The Wage Dynamic Network (WDN) of the European System of Central Banks (ESCB) is conducting a survey of firms in the region on their response to minimum wage hikes. Partial results already available show that around a fifth of firms increased wages of employees earning above the minimum wage level when minimum wage were hiked (Table 2). This is particularly prevalent in small enterprises or sectors with a higher share of minimum wage workers.

**Table 1. Estimated Pass-through of Minimum Wage Hikes on General Wages**

Literature	Country	Period	Data	Methodology	Estimated pass-through of a 1 percent change in the minimum wage 1/
Neumark, Schweitzer, Wascher (2000)	US	1979-1997	Individuals matched monthly CPS	Panel regression on point estimates around the minimum wage change	0.8 percent on gross wages for workers at or just above the minimum wage 0.25-0.40 percent on gross wages for those above the minimum wage
Rama (2001)	Indonesia	1993	Provincial data from labor force survey	Cross-sectional regression	0.025-0.075 percent on the average wage
Kertesi and Kollo (2003)	Hungary	1986-1996	Firm-level data	Calculated from firms' or occupations' exposures to minimum wage hikes	0.04 percent immediate impact on the average wage
Dickens and Manning (2004)	UK	1998-1999	Labor force survey	Latent log wage distribution	The introduction of the minimum wage in April 1999 had direct effect on average log wage of 5.1 percent, rising to 7.2 percent if ripple effects are included
Maloney and Mendez (2004)	Columbia	1997-1999	National household survey	Panel regression on point estimates around the minimum wage change	0.59-0.87 percent on hourly salaries for workers at or just above the minimum wage; 0.28-0.38 percent on hourly salaries for those above the minimum wage
Andreica et al. (2010)	Romania	1999-2009	Time series, aggregate-level data	System equation, VAR	0.0144 percent decrease of the growth rate of the average wage

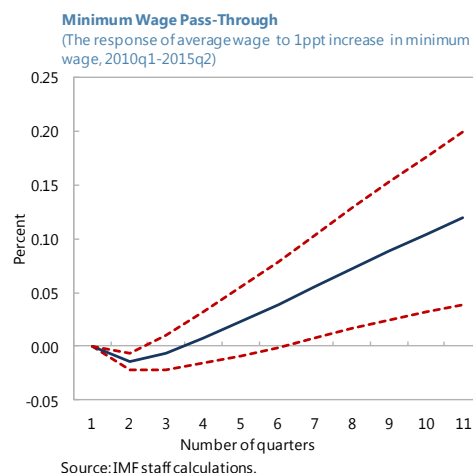
1/ The estimated pass-through is standardized in response to a 1 percent increase in minimum wage for comparability.

**Table 2. Impact of Minimum Wage Increases on General Wages  
Evidence from Firm-level Wage Dynamics Network Survey**

Country	Period of minimum wage increase	Share of minimum wage earners	Pass-through from minimum wage hikes to average gross wages
Latvia	January 2014	20.7 percent	20.6 percent of firms had to increase the wages of employees earning above the minimum wage level
Lithuania	January 2013	17.8 percent	A substantial increase in minimum wage in January 2013 of about 17 percent would increase total labor costs by approximately 11.1 percent  Small enterprises experienced higher labor cost increase of about 12.7 percent, given their higher share of minimum wage workers  Larger cost increases were reported in manufacturing (14.5 percent), construction (18 percent), and business services (11.1 percent)
Romania	January 2014- January 2015	11.3 percent	Minimum wage increases in Jan. 2014, Jul. 2014, and Jan. 2015 directly contributed about 0.5 percent to the month-on-month growth of average gross wages in the private sector
Slovenia	February 2010	7.1 percent	20.4 percent of firms had to increase the wages of employees earning above the minimum wage level

Sources: Schnattinger et al. (2015); Fadejeva and Krasnopjorovs (2015); National Bank of Romania (2015); and Bank of Lithuania (2015).

**21. Analysis carried out for this paper finds positive and significant pass-through of minimum wage hikes to general wages for CESEE countries.** The approach uses a panel VAR technique for reduced-form estimation of a traditional wage-setting model à la Blanchard and Katz (1999) and Goretta (2008) (Annex II). Based on quarterly data from 2010 onward, the general wage level in the economy, covering minimum-wage earners and all other workers, is estimated to rise by between 0.01–0.15 percent following a one percent increase in the real minimum wage over two years. Hence, a minimum wage shock has long-lasting effects. Pass-through is now likely to be at the upper end of the estimated range, considering that minimum wage incidence is currently higher than ever and the ratio of minimum to average wages has been on the rise. However, results need to be interpreted with caution due to technical challenges inherent in VAR estimates and because statistical significance cannot be established when covering a longer period that includes the boom-bust cycle.



**22. Firm-level analysis corroborates the role of minimum wages as an important push factor for general wages.** Drawing on observations from some 200,000 firms throughout CESEE, indicates that firms' overall wages increase by 0.12 percent for one-percent minimum wage hike.

Firms in the tradable sector seem more affected, with pass-through rising to 0.17 percent. Results are statistically significant (Annex III).

**23. Country-specific estimates further help build the case for the presence of wage pass-through in CESEE.** Pass-through estimated on the basis of sector-level data for Lithuania and Romania is found to be larger. For a one percent rise of the minimum wage, general wages increase by between 0.30 and 0.45 percent. Because of sectoral differences in minimum wage incidence, pass-through is almost 60 percent in Lithuania’s construction sector, but only around 10 percent in its financial sector, where very few workers are on minimum wage.

### Minimum Wages and Employment

**24. The potential impact of the minimum wage on employment is at the core of the debate on minimum wage policy and remains a contentious subject.** Critics contend that minimum wages raise wages above market clearing levels, thereby reducing labor demand and employment among low-income earners. Proponents invoke alternative economic models, such as monopsonistic labor market structures where moderate minimum wage hikes actually raise employment. Extensive empirical research spanning several decades has not settled the debate. Findings range from significant disemployment effects to positive impacts on employment, with many studies in between yielding insignificant results.<sup>3</sup> Moreover, none of the available studies allows for small effects when minimum wages are low and larger effects when they are already high, although sizable disemployment effects have been documented for cases where the minimum wage is very high relative to the average wage.<sup>4</sup> Available studies are therefore not suitable to get a sense about where a tipping point may lay—a level from which onward further minimum wage hikes start having unduly onerous side effects and a key issue from a policy perspective.

**25. However, there appears to be a growing consensus that the impact of the minimum wage on employment of low-income earners, and a fortiori general employment, is modest.** Research focuses mostly on the experience in the U.S. and other advanced economies. Early studies have consistently found employment elasticities with respect to the minimum wage in the range of negative 0.1-0.3, but the time-series methodologies used in deriving these results have been called into question (Brown et al., 1982). More recent work generally concludes that elasticities are clustered around zero, although the specific impact on more vulnerable groups, such as the low-skilled or the young, are typically found to be negative and larger.<sup>5</sup> A plausible general explanation for moderate employment effects is that in most cases minimum wages have been low, accounting

<sup>3</sup> See for example Neumark, Salas, and Washer (2013) and Betcherman (2013) for contrasting reviews of the literature.

<sup>4</sup> See for instance, Kertesi and Kollo (2003), Maloney and Mendez (2004) in the case of Columbia, and Abowd et al. (2009) for France. On the other hand, in a cross-country analysis, OECD (1998) finds a small statistically significant negative elasticity of employment with respect to the minimum wage, but no significant difference between countries with high and low minimum-to-average wage ratios.

<sup>5</sup> See for instance Doucouliagos and Stanley (2009) for a meta-analysis of 64 US studies.

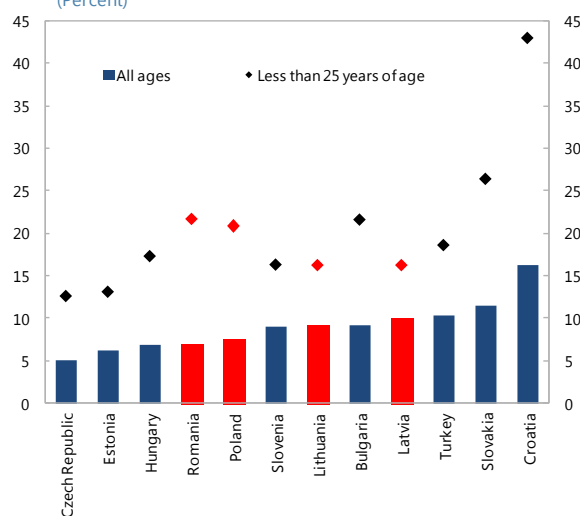
for a small share of total costs and therefore allowing firms to absorb hikes through a variety of measures other than employment (Schmitt, 2013).

**26. Minimum wage studies on CESEE countries generally find disemployment effects, but due to their limited number it would be premature to draw strong conclusions.** A growing body of research on emerging market economies generally confirms the mixed result for advanced economy cases.<sup>6</sup> But there is only a handful of studies focused on CESEE countries: (i) in Estonia a 10 percent minimum wage hike reduces employment by 0.4-0.66 percent for those directly affected, while the impact on other wage groups remains insignificant (Hinnosaar and Room, 2003); (ii) in Hungary, the large minimum wage increase in 2001 of 57 percent reduced employment in small firms by almost 4 percent, and particularly strongly in remote regions (Kertesi and Kollo, 2003);<sup>7</sup> and (iii) in Poland the probability of remaining employed for a worker newly bound by the minimum wage declines by 11.5 percentage points (Baranowska-Rataj and Magda, 2014). In Lithuania, labor force participation rates were found to have risen following hikes in net real minimum wages, which may reflect the increased attractiveness of wages (Hazans, 2007).<sup>8</sup>

**27. Survey results also point to negative employment effects in the wake of minimum wage hikes, but employment does not seem to be the number one adjustment channel.**

According to the partially available results of the WDN study, almost half the employers in Romania stated that they would cut back hiring because of minimum wage hikes. In Slovenia 20 percent said so. In Latvia 16 percent reported layoffs or reduced hiring. In Lithuania it was only 10 percent. The results for Lithuania also seem to indicate that employment adjustment is not the main response to higher minimum wages: 18 percent of firms resorted to reducing non-labor costs and 25 percent said that they increased productivity.

**CESEE: Unemployment Rates, 2015**  
(Percent)



Source: Eurostat.

**28. Unemployment remains a challenge in the region, despite steep declines during the recovery from the 2008/09 crisis.** In 2015, unemployment still averaged 9 percent in CESEE, with rates for the young more than twice as high. While these numbers are not dissimilar from those

<sup>6</sup> See for example Broecke et al. (2015) for a review of the literature in ten major emerging economies.

<sup>7</sup> The authors interpret the stronger effect in remote regions as evidence against the monopsony view taken by minimum wage proponents. Single employers are much more common in remote regions, which may give rise to monopsonistic labor demand. Consequently, minimum wage hikes should increase rather than decrease employment, but empirically the opposite is the case.

<sup>8</sup> See also Vaughan-Whitehead (2010) for interesting case studies, and Eriksson and Pytlikova (2004) for a study on the Czech Republic and Slovakia.



reported for Western Europe, unemployment at such levels remains a social challenge, as well as a waste of resources that could be used productively.

**29. This paper estimates the impact of the minimum wage on employment with data for 17 CESEE countries during 2000-15 as a linear relationship first** (Annex IV). Following the now common approach in the literature by OECD (1998) and Neumark and Wascher (2004), the youth employment-to-population ratio is first regressed on the minimum-to-average wage ratio in a pooled linear regression across countries and time while controlling for other influences. Youth employment is used as a proxy for low-income employment more generally. Statistically, effects on youth employment are easier to recover than those on broader employment amid the noise from the many other influences and challenges related to short data series and lagged effects.<sup>9</sup>

**30. Alternative specifications are then considered to test for non-linearities in the relationship between youth employment and the minimum wage ratio.** In particular, the equation is re-estimated with a squared term of the minimum wage ratio added. In an attempt to fill a gap in the literature, this specification allows for rising disemployment effects as the minimum wage increasingly develops bite, thereby giving a sense of the tipping point where further minimum wage hikes become unduly onerous. Finally, both the linear and the quadratic specifications are also run with minimum wages as a ratio to labor productivity rather than average wages. This gets around the problem that average wages tend to be underreported in CESEE due to pervasive “envelope payments.” However, using productivity has the drawback that the data is noisier and that the business cycle could give rise to co-movements of employment and the minimum wage ratio. To reduce the risk of distorted results, the estimations introduce other control variables, such as GDP growth, and robustness is checked by also considering alternative specifications, which are broadly found to not materially alter the results.

**31. In the linear specification, minimum wages are negatively associated with employment, but statistical significance can only be established when they are expressed as a ratio of productivity** (Table A4.1 columns 1–3 and Table A4.3 columns 1–4). The preferred specification, with a lagged dependent variable and the lagged GDP growth rate as controls, finds a negative but statistically insignificant impact of 0.04 ppts on the youth employment ratio for a 1 ppt increase in the minimum-to-average wage ratio. However, if minimum wages are expressed as a ratio to labor productivity, the coefficient becomes significant at a negative 0.19.<sup>10</sup> It implies that youth employment declines by 1½ percent in response to a minimum wage increase of 10 percent at an initial minimum-wage-to-productivity ratio of 20 percent. Note that the linear relationship between employment and minimum wage ratios already translates into employment elasticities that become larger as minimum wage ratios rise. At a ratio of 10 percent the elasticity is -0.08 but at a ratio of 20 percent it is double.

<sup>9</sup> IMF (2014b) provides an in-depth discussion of youth unemployment, including the role of minimum wages.

<sup>10</sup> Equal to the coefficient (2.27) in Table A4.3 divided by twelve.

**32. The quadratic specification suggests stronger and rising disemployment effects as minimum wage ratios go up and results are significant for minimum wages in relation to labor productivity** (Tables A4. 1 and A4.3 columns 5). At a ratio of 45 percent of average wages, a 10 percent minimum wage hike is now associated with a youth employment reduction of 2 percent, compared to only 0.7 percent in the linear specification. The squared minimum wage ratio has the expected negative sign, but the coefficients of the minimum wage terms are jointly insignificant. Statistical significance can be established when minimum wages are expressed as a ratio to labor productivity. The youth employment elasticity is -0.2 when minimum wages stand at 17 percent of labor productivity—the current average level in CESEE—and rises to -0.5 percent when minimum wages reach 24 percent of labor productivity, as they do in some CESEE countries.

Impact of Minimum Wage Hikes on Youth Employment, in Percent								
Initial MW/LP level 1/	7	10	12	14	17	19	22	24
MW increase, in pct	Linear specification 2/							
5	-0.28	-0.38	-0.47	-0.56	-0.66	-0.75	-0.84	-0.94
10	-0.56	-0.75	-0.94	-1.13	-1.31	-1.50	-1.69	-1.88
20	-1.13	-1.50	-1.88	-2.25	-2.63	-3.00	-3.38	-3.75
	Quadratic Specification 3/							
5	0.03	-0.11	-0.32	-0.61	-0.96	-1.39	-1.90	-2.47
10	0.04	-0.25	-0.69	-1.28	-2.01	-2.90	-3.94	-5.13
20	0.01	-0.62	-1.56	-2.81	-4.38	-6.26	-8.45	-10.97

Source: IMF staff calculations.  
 1/ Underlying regressions use minimum wages (MW) relative to labor productivity (LP) as explanatory variable.  
 2/ Derived from regression results shown in Table A4.3 column 3.  
 3/ Derived from regression results shown in Table A4.3 column 5.

**33. Additional analysis based on firm-level data confirms the negative employment effect associated with minimum wages.** Drawing again on the extensive dataset for firms throughout CESEE shows that a 10 percent increase of minimum wages is associated with an employment reduction of 0.4 percent (Annex III, Table A3.3). Results are significant and relate to total firm employment, rather than youth employment as in the above exercise. The specification is linear. The disemployment effect is 50 percent higher for firms in the tradable sector, presumably because exporters are less able to compensate the hit of minimum wage hikes on profits by raising prices for customers than firms that just serve the domestic market.

### Minimum Wages and Income Distribution

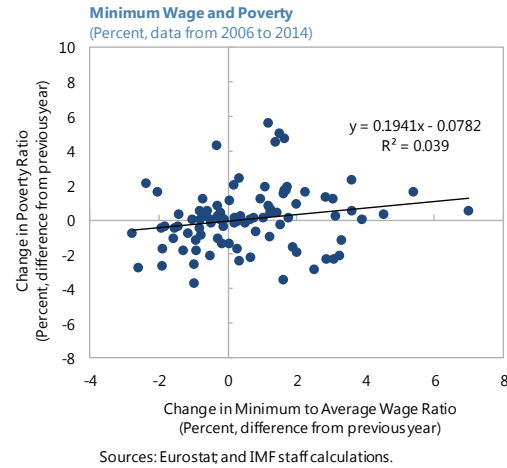
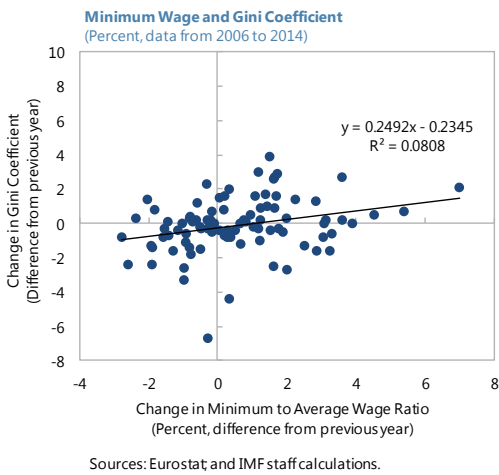
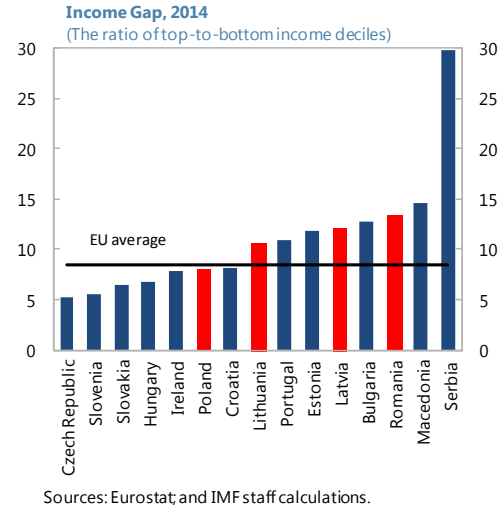
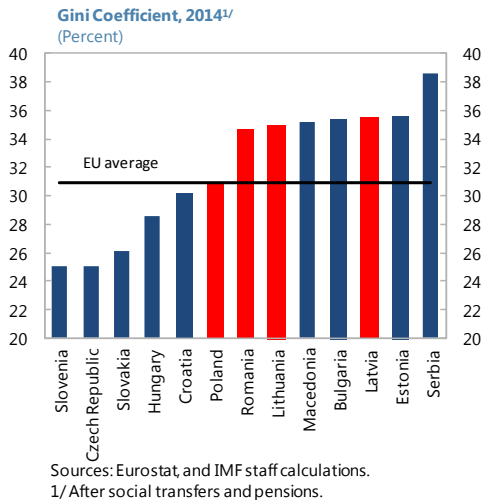
**34. A prime motivation for minimum wage policy is improving income distribution.** The goal is to make those at the bottom of the wage distribution better off, in absolute terms and relative to those commanding higher salaries. More equal wage distribution may then carry over to

a more equal distribution of household income. But there is much more to income inequality than just wages, notably income on capital and wealth, the progressivity of the tax system, and social protection spending. Accordingly, there are many other policy levers to address inequality, but in contrast to minimum wages, most of them have significant direct fiscal costs.

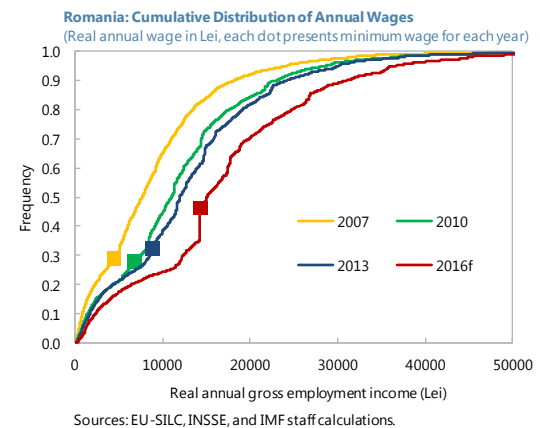
**35. The literature confirms that minimum wage hikes tend to mitigate wage disparities, though they need to be part of a broader policy thrust to achieve significant poverty alleviation.** Minimum wages are found to improve the distribution of total household income, primarily by influencing the lower tail of the wage distribution (Maloney and Mendez, 2004; and Autor et al., 2014). They also help guard against “social dumping” (Vaughan-Whitehead, 2010). A boost to the wages of low-income earners beyond those directly affected by the minimum wage is another advantage (OECD, 2015a). But it has been observed for the U.K. and the U.S. that the very poor often do not work at all, or belong to a non-poor household, thus blunting the link between wage and income distributions. Moreover, where minimum wage hikes lead to significant job losses, they might actually have perverse distributional effects. Finally, in-work poverty is often primarily the result of too few working hours, rather than low hourly pay. Hence, minimum wage hikes can go only so far in combating poverty and a more comprehensive policy approach is required to make larger inroads (IMF, 2014c and 2014d; OECD, 2015b; and Neumark, 2015).

**36. The evidence for CESEE is suggestive of minimum wages improving inequality measures, such as the Gini coefficient or the income gap, but largely failing to scale back poverty** (Figure 4). Income inequality in CESEE has been rising strongly over the transition process and is now high by European standards in most countries. The recent sharp increases in the minimum wage seem to be associated with improvements in equality in Poland, Romania, and the Slovakia, but not in other CESEE countries. Results are also mixed when examining income gap developments. In Latvia, for example, the ratio between incomes in the highest and the lowest deciles fell from 14.6 times in 2006 to 12.1 times in 2014—a period when the minimum-to-average wage ratio rose from 30.1 to 41.8 percent. Hungary, Poland, Croatia, and Lithuania display similar, but less pronounced patterns. Regarding poverty developments, however, the ratio of people at risk of poverty in most CESEE countries barely budged despite sharply rising minimum wages. For the region overall, the pooled unconditional correlation between annual changes of minimum-to-average wage ratios and poverty incidence is positive, but small and statistically insignificant.

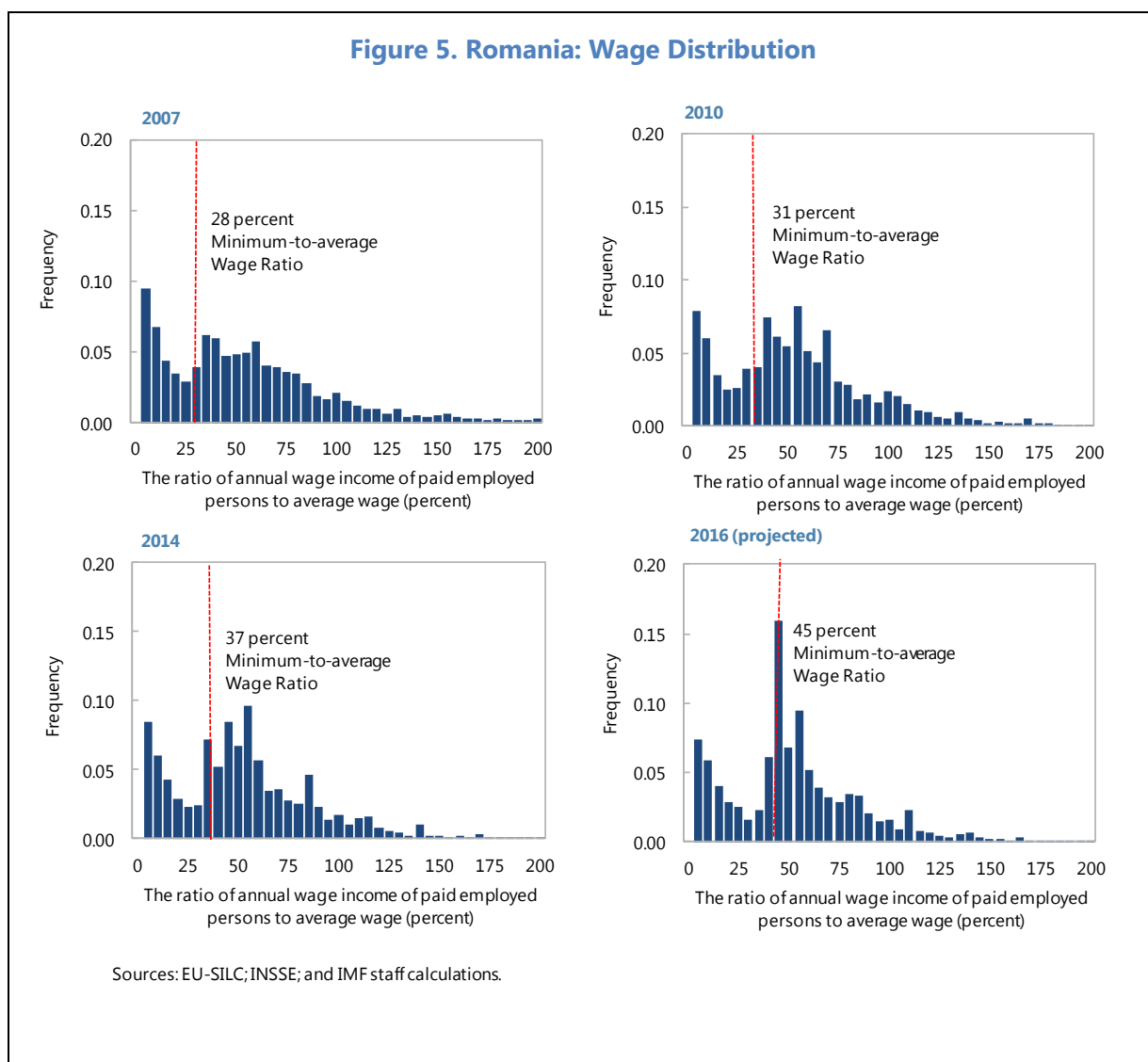
Figure 4. CESEE: Income Inequality



**37. A closer look at micro-level data from EU-SILC for Romania offers further insight into the distributional consequences of minimum wages** (Annex V). The analysis follows the methodology of Maloney and Mendez (2004) and The United States Congressional Budget Office (2014). Since it is focused on Romania, one needs to be cautious in drawing inferences for other countries in the region and beyond. Results can be expected to depend, among other factors, on the share of workers at or below the minimum wage, labor force participation, and the degree of compliance with minimum wage regulation.



**38. In Romania, the wage distribution has become more equal over the past decade as real minimum wages were pushed up and minimum wage incidence rose** (Figure 5). Since 2007, real wages have increased substantially and the percentage of workers earning less than a certain amount of real income declined over time. At the same time, more and more workers earn the minimum wage—an estimated 45 percent in 2016, compared to around 30 percent in 2007. Accordingly, bunching of wages at, or close to, the minimum wage has become more pronounced. Overall, the wage distribution has improved: the ratio of the top and bottom wage deciles declined from 21.2 in 2007 to 15.6 times in 2014, and to an estimated 13.1 in 2016. And the wage distribution has also become more balanced around the typical wage income.

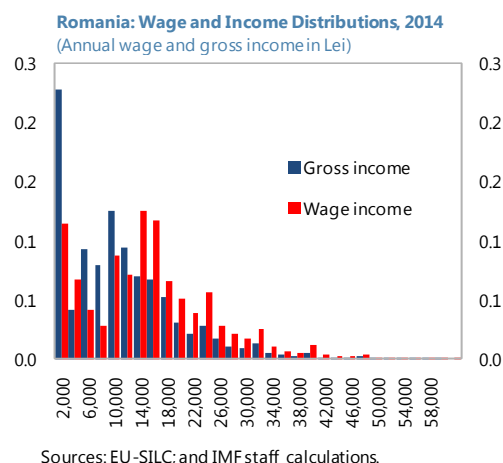


**39. The distributional benefits of the minimum wage hikes seem to diminish at higher minimum wage levels.** Romania's minimum wage hikes appear to have had strong re-distributional effects during 2009–12 when wage disparities fell sharply. The more recent increases during 2013–16 in contrast seem to have primarily lifted the entire wage scale while leaving wage relativities largely

unchanged. That said, this finding could also reflect the changing influence of other factors on the wage distribution that cannot be controlled for in this case study.

**40. Improvements in the wage distribution due to minimum wage hikes are likely to have carried over to the income distribution, but only partially so.**

After all, households' wage income is by far their largest income component. However, not all households at the bottom of the income distribution can benefit from higher minimum wages. This concerns above all the unemployed and those living on small pensions. Accordingly, while wage and income distributions in Romania are similar, one can see a frequency spike at very low incomes but not at very low wages. Tackling inequality more fundamentally therefore require policy efforts that go much beyond minimum wages.



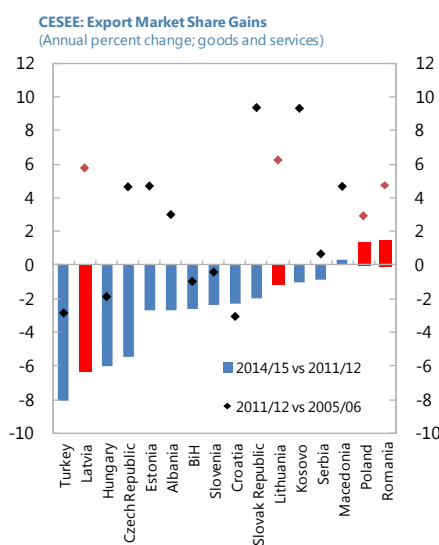
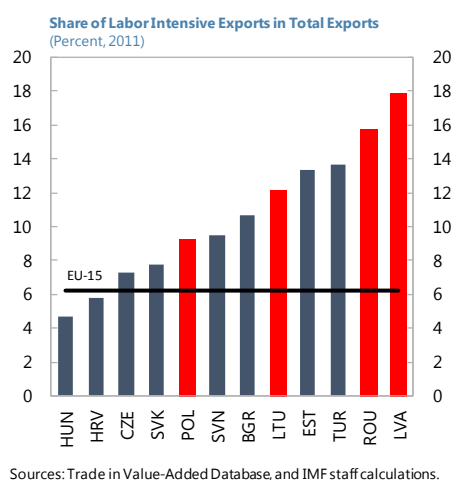
### Minimum Wages and Competitiveness

**41. Minimum wages can impinge on competitiveness by affecting firms' prices and profits.** Various adjustment channels are available to firms when faced with rising minimum wages: cutting employment and new hiring, reducing non-wage costs, raising prices for customers, trying to boost productivity, or simply living with reduced profits. In reality, one would expect firms to apply a mix of responses. Most likely, firms in the tradable sector have less scope to pass higher labor costs into prices than firms operating predominantly in the domestic economy where their competitors are subject to the same wage cost pressures. The price channel could therefore be muted in the case of exporters with the other channels playing more strongly.

**42. The literature confirms that firms utilize a number of adjustment channels when confronted with higher minimum wages, but there is no one-size-fits-all response.** Regarding profits, stock market valuation of low-pay firms in the U.S. appears largely unaffected by minimum wages (Card and Krueger, 1994), but profits of U.K. firms were materially hurt when the national minimum wage was introduced in 1999 (Draca et al., 2011). Regarding prices, studies for the U.S. find limited pass-through, except for the restaurant industry (Lemos, 2008). These results are echoed in the case of the U.K. (Wadsworth, 2010). Regarding productivity, there is some evidence that firms with a large share of low-paying jobs responded to higher minimum wages by raising productivity (Riley and Bodibene, 2015; and Rizov and Croucher, 2011). However, this might simply be due to a reduction in official hours worked. Hungary's 57 percent minimum wage hike in 2001 seems to have entailed a 20 percent increase in total labor costs for highly exposed firms, but profits did not materially fall and nominal sales soared (Harasztosi et al., 2015). This suggests that higher labor costs were mostly passed through into higher prices for customers.

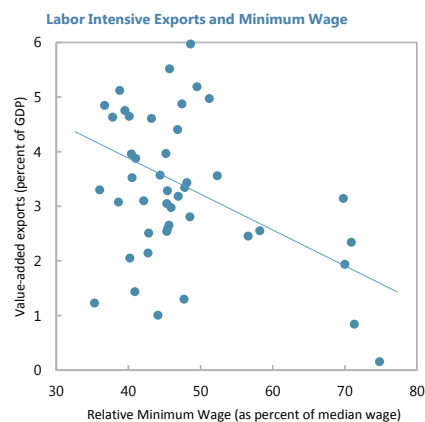
**43. CESEE countries are potentially at risk of weakened competitiveness related to sharp minimum wage hikes.** Competitiveness is generally not an immediate concern, but minimum

wages could erode price-competitiveness at least in some sectors for two main reasons. First, CESEE is more exposed to loss of competitiveness because labor-intensive exports comprise a much larger share of total exports than for example in Western Europe, particularly in Latvia, Lithuania, and Romania. Second, in several countries, wage growth has outstripped productivity growth in recent years, meaning that unit labor costs rose faster than in the EU as a whole, eroding competitiveness. While the tradable sector could often draw on some productivity cushions built up in the post-crisis adjustment period, these seem now largely exhausted. Consequently, competitiveness could be weakened if sharply rising minimum wages continue to fuel general wage growth. Most CESEE countries have lost global export market shares in recent years, and those that continue to register gains are doing so at a much lower rate than in the past. Real effective exchange rates have appreciated also and often stand much higher now than in 2005, before the boom-bust cycle developed.<sup>11</sup>



<sup>11</sup> However, real effective exchange rate developments can be misleading because they do not properly account for gains in non-price competitiveness, which is an important aspect in catching-up economies such as those in CESEE. Thorough competitiveness assessments therefore require an eclectic approach and expert judgment, which are carried out in the context of the bilateral consultations with IMF member countries.

**44. Analysis of firm-level data suggests that minimum wages could dampen export performance in labor-intensive sectors.** Key determinants of export performance in CESEE are supply-chain linkages, the quality of human capital, and the business environment, but minimum wages play a role as well (Rahman et al., 2015). Building on this research, evaluation of the large firm-level data set shows that export growth in value-added terms is adversely affected by minimum wage hikes when controlling for other relevant factors (Table A3.2). The results are statistically significant for labor-intensive manufacturing and labor-intensive services.



**45. Further analysis of the firm-level data set suggests that minimum wage hikes appear to also generally cut into profits, especially in the tradable sector** (Table A3.3). According to the regression results, a 10 percent increase in minimum wages reduces profit margins by 3 percent and by 8 percent for firms in the tradable sector. While some firms might be able to protect profits by passing higher labor costs into prices, the average firm seems not to be in a position to fully do so, especially exporters, which compete with firms in other countries that are not subject to the same minimum wage hikes. The analysis also sheds light on other adjustment channels. There is no discernible impact on the capital-labor ratio and therefore no empirical support for the view that minimum wage pressures prompt firms to substitute capital for labor. The effect of minimum wages on productivity is inconclusive—if it is measured as operating revenue per employee there is a significant negative impact, but if it is measured as gross value added per employee, the impact is positive though barely significant.

## C. Conclusions

**46. The above analysis provides some important pointers to answer the two questions posed in the beginning about the appropriate level and pace on increase in minimum wages, but the full answers depend on broader considerations.** The main contribution of the paper is to clarify the trade-offs associated with minimum wage policies. It does not analyze in detail where the main challenges for each of the countries lie, which will also influence where governments come down on minimum wages. That said, income inequality seems an important issue in Latvia, Lithuania, and Romania, while Poland is broadly in line with European standards, according to Gini coefficients and income gap indicators. Among the four countries, the challenge to competitiveness appears largest in Latvia judging from market share and real effective exchange rate developments, unemployment is particularly high in Latvia and Lithuania, fast wage growth needs to be watched especially in Latvia and Romania, and all four countries should be mindful of their large shadow economies. The paper is certainly silent on social preferences, i.e. the extent to which efficiency and equity gains or losses should be traded off.



## What is an Appropriate Range for Minimum Wage Levels in CESEE?

**47. The real question is not whether minimum wage hikes are good or bad, but about the appropriate minimum wage level.** If one accepts that hiking minimum wages can be advantageous when their level is low and counterproductive when their levels are already very high, there must be an optimal level somewhere in between. The case for benefits from hikes at low levels is well researched, with higher minimum wages improving the wage distribution but not much affecting employment. There could even be efficiency gains—hikes could boost insufficient aggregated demand, spur efforts to improve productivity, or help correct preexisting market imperfections, such as monopsonistic labor demand, costly job search, or information asymmetries—although direct evidence of such effects remains scant. Yet, clearly there must be an upper bound above which further increases come with too many adverse side effects. Otherwise it would be possible to make everybody rich at a stroke of the pen by simply setting the minimum wage high enough.

**48. Few studies address the question about the appropriate minimum wage level head on, but those that touch upon it, situate it somewhere between 25 and 50 percent of the average wage.** IMF policy recommendations in this area are generally contingent upon the prevailing minimum wage level: (i) the U.S. should increase the federal minimum wage—currently pegged at less than 30 percent of the average wage—to confront poverty (IMF, 2015b); (ii) France should consider a temporary freeze of its minimum wage, with currently exceeds 50 percent of the average wage, to remove an obstacle for employment of the young and the low-skilled (IMF, 2013); and (iii) Columbia should address the binding minimum wage of some 70 percent of the average wage, because it hinders the employment recovery and fosters informality (IMF, 2011). Rutkowski (2003) concludes that, as a rule of thumb, the minimum wage should not exceed 40 percent of the average wage in developing countries, with the threshold lower when unemployment is high and concentrated among the young and low-skilled. A joint ILO, OECD, IMF, and World Bank report concludes that a minimum wage of 30-40 percent of the median wage would strike a suitable balance (G20, 2012, p. 12). This roughly corresponds to a range of 25-35 percent for the minimum-to-average wage ratio. Based on social considerations, the Council of Europe establishes a considerably higher floor for the minimum wage—there is no discussion about an upper bound. According to its European Social Charter, workers have a right to “fair remuneration sufficient for a decent standard of living for themselves and their families” (European Social Charter (revised), 1996, Part I, §4), which is taken to mean minimum net pay of at least 60 percent of average net pay.<sup>12</sup> In terms of gross pay, this may correspond to a ratio of around 50 percent.

<sup>12</sup> This is according to Council’s European Committee of Social Rights. The 60 percent number applies unless countries can demonstrate that less constitutes fair remuneration, in which case a 50 percent threshold still needs to be respected (European Council, 2008, p. 43). The 60 percent requirement is defined in terms of net pay. Because of progressive taxation, it corresponds to about 50 percent in terms of gross pay. Few of the Council’s 47 member countries comply with this requirement though (European Trade Union Confederation, 2015)

**49. This paper sees the range where further minimum wage hikes run into stark trade-offs at 40 to 50 percent of average wages for CESEE countries.** The evidence presented here suggests negative employment effects from minimum wage hikes. Disemployment seems to become more of a problem at higher initial levels of the minimum wage. Although more research is clearly needed and results will vary across countries within CESEE, trade-offs apparently become much starker around a minimum-to-average wage ratio in the mid-40s. Taking estimation results at face value, at a ratio of 45 percent, a further 10 percentage minimum wage hike is associated with a reduction of youth employment by 2 percent, but at a level of 30 percent the reduction is a much more tolerable 0.4 percent. The point of starker tradeoffs is probably somewhat higher than in advanced economies, because wages tend to be underreported to a greater extent in CESEE, artificially inflating the reported ratio of minimum to average wages, with a reported minimum wage ratio of, say, 50 percent corresponding to a true ratio close to 40-45 percent. There is also suggestive evidence that the distributional benefits of the minimum wage diminishes once it reaches high levels. Caution is also grounded in concerns that very high minimum wages likely spur evasion and informality, which hamper their distributional benefits, undermine rule of law, and slow down productivity growth. Moreover, the empirical analysis may not fully bring out adverse employment effects, because it is mostly based on episodes of relatively low minimum wages and is not designed to capture long-run effects.

### **What is an Appropriate Pace of Minimum Wage Hikes in CESEE?**

**50. The appropriate pace of minimum wage increases very much depends on country-specific circumstances.** The focus of the literature is on quantifying the pass-through from minimum wages to general wages, rather than the appropriate pace of minimum wage hikes. Several exercises carried out in this paper put the pass-through in the range of 10 to 45 percent. It is wide not only because of methodological differences but is mainly reflective of the specifics of the case in hand. One would expect elasticities to be the larger, the more workers are on minimum wage and the tighter overall wage structures and benefit systems are linked to the minimum wage. And in times of tight labor markets, pass-through will likely be stronger than at the bottom of the business cycle. Furthermore, the ultimate economic effect of minimum-wage induced costs depends on the adjustment channels available to firms, notably whether they can pass them on to customers in the form of higher prices, and whether they have profit buffers to absorb the hit.

**51. Minimum wage policies should be calibrated so as not to add further fuel to general wage growth in those CESEE countries where it is already high.** In the past few years, general wage growth has typically exceeded productivity growth by a wide margin. So far, the tradable sector has been able to absorb this pressure on its competitiveness by drawing on buffers built up in the post-crisis adjustment period, but these appear now largely depleted. To protect competitiveness going forward, wage growth needs to moderate and minimum wage policy ought to be consistent with this objective. Perpetuating the current pace of minimum wage hikes would be risky, especially since pass-through to general wages is now likely to be much higher than in the past, as the minimum wage directly applies to more workers, and because CESEE's relatively labor intensive exports are sensitive to rising wage costs. Countries where general wage growth is

unsustainable should therefore keep minimum wage increases aligned with productivity gains, even when their minimum wage level is currently unproblematic.

## **Policies for Appropriate Minimum Wages and Better Income Distribution**

**52. The process of setting minimum wages should be depoliticized.** Minimum wages have a powerful emotional appeal and are politically difficult to resist. Who would not want to help those that are struggling for decent pay? But there are limits and drawbacks to what minimum wages can achieve. Firms typically pass some of the additional costs into higher prices, reducing the purchasing power of all consumers, including those living on lower incomes than minimum-wage earners. Where profits do take a hit, competitiveness may suffer with adverse consequences for growth and employment. These critical but indirect effects are difficult to communicate and can easily get lost in the political debate. This argues for creating some distance between minimum wage setting and the political process. The involvement of independent experts has played a positive role in this regard in France, Germany, and the U.K., even though these countries could go further still, as well as better ensure that the interest of the unemployed are duly taken into account. Indexation and formula-driven mechanisms as the default option for minimum wage adjustments are another way to depoliticize the process. But it is important that escape clauses are in place to deal with unforeseen developments, such as in the case of the Netherlands. Also, a generous indexation mechanism that comes to be seen as a floor for minimum wage hikes with the government expected to provide discretionary top up runs the risk of pushing minimum wages too high over time, as for example in France.

**53. Minimum wages could be differentiated to alleviate adverse side effects.** The appropriate minimum wage level is unlikely to be the same across a country's economy. What may be fitting for most workers might be counterproductive for those working in poorer regions, for those with low skill levels, for young people without experience, or for the long-term unemployed. Indeed, it is these groups where the literature identifies most of the negative fallout. Accordingly, many countries set differentiated minimum wages. For example, Germany exempts apprentices and in the U.K. lower minimum wage rates apply for the young. With few exceptions, CESEE countries set a single national minimum wage, but they should take note of the widespread practice elsewhere to tailor the minimum wage better to circumstances.

**54. Addressing income inequality requires a broad policy approach—the task cannot be shouldered by minimum wage policy alone.** Income inequality is high in CESEE by European standards, giving rise to social and economic concerns (IMF, 2016). Minimum wages can improve the wage distribution, but overreliance on this policy lever risks undue negative side effects. Moreover, their impact on income distribution is limited, because those at the very bottom of the income distribution may not work at all and minimum-wage earners may be part of better-off households. While minimum wages are politically appealing because they do not have important direct fiscal costs, making larger inroads into income equality requires higher and better targeted social protection spending, more progressive income tax systems, and more comprehensive taxation of capital and wealth.

## Annex I. Minimum Wage Arrangements

**Table A1.1. Minimum Wage Arrangements in CESEE**

	<b>Decision Making Body</b>	<b>Frequency of Adjustment</b>	<b>Geographical Coverage</b>	<b>Exceptions</b>
Albania	Government	Annual	National	None
Bosnia and Herzegovina	Government following collective bargaining agreement	Ad hoc	Different minimum wages for the entities	Lower rate for textile workers; youth under new Labor Code
Bulgaria	Government following social partners' recommendations	Ad hoc	National	None
Croatia	Government	Annual	National	None
Czech Republic	Government following social partners' recommendations	Annual	National	Lower rate for the disabled
Estonia	Government following collective bargaining agreement	Annual	National	None
Hungary	Government following social partners' recommendations	Annual	National	None
Lithuania	Government based on tripartite council recommendation	Annual, ad-hoc interim change in mid-2015	National	None
Latvia	Government following social partners' recommendations	Annual	National	None
FYR of Macedonia	Government	Annual	National	None
Montenegro	Government following recommendations of social partners; set at 30 percent of average wage in Labor Law but further ad-hoc increases in 2014 and 2015	Annual	National	None
Poland	Government following consultations with social partners	Annual, semi-annual if inflation exceeds 5 percent	National	80 percent of minimum wage for new labor market entrants in first year
Romania	Government following consultations with social partners	Ad hoc; typically annual in practice	National	None
Serbia	Social and Economic Council (comprising government and social partners)	Semi-annual	National	None
Slovakia	Government following social partners' recommendations	Annual	National	Six different rates depending on job complexity
Slovenia	Government	Annual	National	None
Turkey	Minimum Wage Fixing Board (comprising government and social partners); recent increases have matched the ruling party's campaign pledges	At least every two years; in practice more often	National	Lower rate for youth under the age of 16

Sources: Eurostat; and national authorities.

**Table A1.2 Minimum Wage Arrangements in Selected Western European Countries**

	<b>Decision Making Body</b>	<b>Frequency of Adjustment</b>	<b>Geographical Coverage</b>	<b>Exceptions</b>
Belgium	National Labor Council, comprising employer and employee representative bodies. Government can impose a decision if social partners do not reach agreement. Minimum wage indexed to CPI excl. alcohol, tobacco, and fuels ("health index")	Biannual, with interim hikes when the cumulative increase of the "health index" exceeds 2 percent	National. Sectoral top-ups are negotiated by social partners and extended by royal decree	Lower minimum wage rate for those below the age of 21 years; Lower rates also for those with seniority of less than 6 and 12 months
France	Set by government with input by a group of experts and in consultation with social partners. A formula links the minimum wage to the CPI for the poorest 20 percent households plus one half of the average wage increase in the economy. Government decides on discretionary top-ups to the formula-driven increases	Annual, with interim hikes when the cumulative CPI increase reaches 2 percent	National	Lower rates for those under 18 years of age and with experience of less than 6 months. Additional discounts of 10 and 20 percent for those aged below 17 and below 16 years, respectively.
Germany	Government upon recommendation of commission comprised of an equal number of employer representatives and trade unions, a chair jointly determined by social partners, and two non-voting academic advisors	Biannual. No indexation	National	Those under the age of 18 years, apprentices, interns, and long-term unemployed during their first 6 months of re-employment are exempt
Netherlands	Government sets the minimum wage as a fraction of averages wages in collective agreements	Semiannual in line with developments of collectively agreed wages. Hikes are suspended if the number of welfare recipients rises above a certain threshold	National	Age-dependent fraction of standard minimum wage for those under the age of 23 years. Lowering the threshold to 21 years is under discussion
U.K.	Set by government upon recommendation by the Low Pay Commission. The nine commissioners are drawn from a range of employer, employee, and academic backgrounds. They act in an individual capacity	Annual	National	Age-dependent fraction of standard minimum wage for those under the age of 25 years

Sources: National authorities; and IMF staff.

## Annex II. Methodology: Minimum Wages and General Wage Growth

1. Previous studies of the pass-through effect of the minimum wage on the average wage are mostly static. In contrast, this study adds a time dimension, allowing wage adjustments to gradually take full effect. Therefore, one can characterize the impact of the minimum wage change on average wage over time and identify whether the minimum wage shock would have temporary or persistent effects on the average wage. Nevertheless, longitudinal data are generally limited, especially for CESEE economies. In this case, traditional VAR estimates are not feasible and this study therefore employs the new panel VAR technique instead.
2. To identify the wage pass-through at the regional level, panel VARs are estimated to construct the average pass-through effects across 14 CESEE countries.

$$y_{it} = A_{0i}(t) + A_i(l) Y_{t-1} + u_{it}, \quad i=1, 2, \dots, N; \text{ and } t=1, 2, \dots, T.$$

$Y_t$  is the stacked version of  $y_{it}$ , which is the vector of changes in real average wages, employment growth, real labor productivity growth, changes in the terms of trade, and changes in real minimum wages for each country  $i=1, 2, \dots, N$ . The choice of variables follows Blanchard and Katz (1999) and Goretti (2008). All variables are in real terms using the consumer price index as deflator. Data are quarterly from 1995q1 to 2015q2. The panel is unbalanced. Lags included are chosen to minimize the information criterion statistics. The system is estimated using the GMM method.

## Annex III. Firm Level Analysis Using the Orbis Database

1. The firm level analysis in this paper utilizes the Orbis database by Bureau van Dijk, which compiles data on public and private enterprises globally. The strength of the database is that company data are reported in standardized format within and across countries, and that non-listed companies are also covered. But there are also drawbacks. Coverage is uneven across countries and despite the large number of firms included, not all variables of interest are available uniformly.
2. The regression analysis involves about half a million observations related to 200,000 firms. This covers a sizable portion of national employment as reported in Table A3.1. Although the vast majority of firms is small or medium sized, large firms dominate in terms of the share of employment. In the analysis, micro, small, medium, and large firms are defined as those having 1-10, 10-50, 50-250, and above 250 employees, respectively. This is similar to the European Commission's categorization, although the asset component of the definition is dropped to retain more observations. Following the literature, the tradable sector is taken to comprise agriculture, manufacturing, transportation and storage, IT and communication, and professional services.
3. The full regression results are reported in Tables A3.2 and A3.3.

**Table A3.1. Coverage of Firms in the Orbis Database, 2013**

	Orbis coverage as share of national employment (Percent)	<i>Of which due to :</i>	Micro firms	Small firms	Medium firms	Large firms
BG	33		7	25	32	37
CZ	28		4	14	25	57
EE	47		20	27	27	26
HR	36		16	22	24	39
HU	41		11	20	21	47
LT	21		0	5	32	62
LV	41		7	22	32	39
PL	3		0	3	17	79
RO	14		9	8	21	61
SI	29		4	15	25	55
SK	35		12	22	26	40

Sources: Orbis database and IMF staff calculations.

**Table A3.2. Determinants of Value-Added Exports in CESEE, 2000-13**

	(1) Total	(2) Manufacturing	(3) Services	(4) Labor Intensive Manufacturing	(5) Labor Intensive Services
Relative Minimum Wage (minimum to mean wage, %)	-13.34	10.39	0.911	-0.732**	-0.332*
Supply Chain Integration Index	0.738***	0.329***	0.352**	0.0398	0.0708
Tertiary education attainment in labor force	0.105	-0.221***	0.227***	0.000	-0.00451
Real effective exchange rate	0.0935	0.0357	0.175	0.0471	-0.107
GDP per capita	0.000487***	0.000272**	3.47e-06	4.92e-05	0.000203**
Constant	-46.68**	-21.89	-37.19**	-4.437	12.32
Observations	45	45	45	90	135
R-squared	0.578	0.580	0.473	0.139	0.112

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1, Errors are robust to country clustering

Regression results of OLS regression of exports in value added.

**Table A3.3. Impact of Minimum Wage on Firms' Employment, Wages, Productivity, and Profits, 2009-13**

	(1) Δ Employment	(2) Δ Wage per employee	(3) Δ Productivity (1)	(4) Δ Productivity (2)	(5) Δ Capital to Labor Ratio	(6) Δ Profit margin
Lagged dependent variable	1.525***	0.512***	0.326***	0.213***	-6.428	0.020
Δ minimum wage	-0.042***	0.127***	-0.071***	0.049*	-63.313	-0.335*
Δ minimum wage× Tradeable Sector	-0.0173***	0.055***	-0.018**	0.008	22.688	-0.490**
Δ minimum wage× Small	0.0494	-0.184***	0.073**	-0.063**	72.275	0.190
Tradeable Sector	0.406***	-0.100***	0.035	-0.060**	-74.992	4.436
Small	-2.624***	0.937***	-0.599***	0.012	-689.996	-0.375**
GDP Growth	0.037***	0.008***	0.022***	0.017***	7.861	1.224***
Observations	755,776	739,003	751,787	655,793	754,998	812,298
Number of firms	266,607	260,948	265,448	237,967	266,420	267,214

Source: IMF staff calculations using annual firm level data in the ORBIS database for 11 CESEE countries.

\*\*\* is significant at 1 percent; \*\* at 5 percent; \* at 1 percent.

Note. Δ minimum wage, Δ Employment, and Δ Wage per employee are in percent. Other dependent variables are simple differences. Productivity (1) is defined as ratio of operating revenue to employment. Productivity (2) is defined as ratio of remuneration plus profits to employment and resembles gross value added to employee. Profit margin is EBITDA to operating revenue. Small indicates firms with fewer than 50 employees. The model is estimated using an Arellano-Bond dynamic two-step panel data estimator with robust standard errors. Lagged dependent and independent variables were



## Annex IV. Methodology: Minimum Wages and Employment

1. This study estimates the effects of minimum wages (MW) on employment by means of pooled regressions across countries and time of the form:

$$E_{it} = a + b w_{it} + d X_{it} + f_i + g_t + h_{it}$$

where  $i$  indexes countries;  $t$  indexes years during the period 2000-14;  $E$  is the employment rate of young workers (less than 25 years);  $w$  is the minimum-to-average wage ratio (MW/AW); and  $X$  is a vector of control variables, including adult (over 25 years) unemployment and/or GDP growth to capture cyclical conditions, and the relative size of the youth population to control for supply factors.  $f$  are country-fixed effects; and  $g$  are time-fixed effects. This approach follows OECD (1998) and Neumark and Wascher (2004), and is now common in the minimum wage literature.

2. The technical challenges associated with such regressions are well-known. The roughly similar economic structures in the selected countries, including MW setting mechanisms (Table A1.1), help justify the use of pooled regressions, and the wide variations in MW increases and cyclical conditions across countries described above should help in the identification process. Nevertheless, the estimation is prone to the omission of potential factors that affect employment, especially considering the ongoing economic transformation in these countries. Also, while the use of MW/AW as the key indicator has been standard in the literature, partly to mitigate endogeneity problems, it raises the possibility that the estimated effects on employment reflect changes in the AW rather than the MW. This study attempts to alleviate such concerns by testing different specifications and controls, including labor market institutional indicators, although data availability and the small sample sizes limit such testing.

3. To allow for the possibility of a threshold above which the MW affects employment, equations of the form are also estimated

$$E_{it} = a + b \max(w_{it} - w_0, 0) + d X_{it} + f_i + g_t + h_{it}$$

or

$$E_{it} = a + b w_{it} + c \text{ dummy } w_{it} + d X_{it} + f_i + g_t + h_{it}$$

where  $w_0$  in the first equation represents a tipping point such that there is no impact if the ratio is below that threshold. *dummy* in the second equation is a dummy variable for countries with MW/AW above a fixed threshold. Identifying a tipping point, if it exists, is likely to be difficult from the sample at hand, as MW/AW has stayed within a narrow range and was mostly relatively low.

4. However, a more plausible hypothesis than a threshold is that the MW has increasingly larger effects on employment as it becomes more and more binding. But more substantively, a common tipping point across countries, or even within a single country, presumes that low-income earners have roughly the same relative marginal productivity of labor (MPL), or alternatively that

firms employing low-income earners somehow have the same threshold beyond which they begin to no longer employ such workers. Thus, as an alternative, a regression with a quadratic term of the minimum wage added is estimated

$$E_{it} = a + b w_{it} + c(w_{it})^2 + d X_{it} + f_i + g_t + h_{it}.$$

5. The same equations are also estimated with the MW-to-labor productivity (LP) ratio instead of MW/AW. Conceptually, the MW/LP ratio is a more direct measure of the distortionary effects of MW increases than MW/AW. But it could raise identification problems in view of the direct correlation between LP (defined as nominal GDP divided by total employment) and youth employment, although this is mitigated by controlling for GDP growth.

6. In Table A4.1 the estimated MW impact on employment under the baseline specification appears to be small negative but statistically insignificant. The regression in column 1 exhibits a significant negative coefficient on the MW ratio, implying an elasticity of almost -0.3. However, this equation suffers from serial correlation (as apparent from the Durbin-Watson statistic). The inclusion of a lagged dependent variable as an explanatory variable (column 2) lowers the significance of the coefficient—it becomes statistically significant at the 15 percent level—implying an elasticity of almost -0.1. The addition of lagged GDP growth (column 3) further alleviates serial correlation and reduces the significance of the MW coefficient, implying an elasticity of almost -0.05. For comparison, similar regressions are run with the adult employment rate as the dependent variable (lower panel of the Table A4.1). The implied elasticities are now clearly insignificant and in fact positive.

7. Estimation of the equation with squared MW/AW (Table A4.1, column 4) has the expected negative sign on the squared term, suggesting that the impact of a MW increase on youth employment is stronger when the initial MW/AW level is higher. Table A4.2 illustrates the impact of different MW increases on youth employment at different levels of MW/AW under the linear and quadratic specifications (Table 1, columns 3 and 4).<sup>1</sup> According to the latter model, a 5 percent increase of the MW when the MW/AW level is at 45 percent would reduce youth employment by about 1 percent, a substantial loss, whereas the impact is less than half a percent when the MW/AW level is at 35 percent. However these results should be viewed with caution as the coefficients on the MW and the squared term are statistically jointly insignificant.

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<sup>1</sup> Note that even in the linear specification, a degree of non-linearity creeps in, as the effects are expressed in percentage terms while the equation is in levels.

**Table A4.1. Employment Rates and Minimum Wages Relative to Average Wages**

Variable	(1)	(2)	(3)	(4)
Youth employment to population ratio				
YOUTHMPRATIO(-1)		0.58***	0.61***	0.60***
GDP(-1)			0.19***	0.19***
MW/AW(-1)	-0.19***	-0.06	-0.04	0.117
SQUARED MW/AW(-1)				-0.0024
ADUNEMP	-0.77***	-0.39***	-0.25***	-0.26***
YOUTHPOP	0.51**	0.40**	0.48***	0.47**
C	29.22	8.23	3.33	1.1
R-squared	0.84	0.92	0.93	0.93
Durbin-Watson stat	0.53	1.60	1.69	1.7
<b>Youth employment elasticity</b>	-0.28	-0.09	-0.06	
Adult employment to population ratio				
ADULTEMPRATIO(-1)		0.66***	0.77***	
ADULTEMPRATIO(-2)			-0.21***	
GDP(-1)		0.20***	0.19***	
MW/AW(-1)		0.03	0.04*	
C		17.00	22.4	
R-squared		0.98	0.98	
Durbin-Watson stat		1.71	2.00	
<b>Adult employment elasticity</b>		0.02	0.03	

\*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent respectively.

**Table A4.2. Impact of Minimum Wage Hikes on Youth Employment, in Percent**

Initial MW/AW level 1/	25	30	35	40	45	50	55	60
MW increase, in pct	Linear specification 2/							
5	-0.21	-0.25	-0.29	-0.33	-0.37	-0.41	-0.45	-0.50
10	-0.41	-0.50	-0.58	-0.66	-0.74	-0.83	-0.91	-0.99
20	-0.83	-0.99	-1.16	-1.32	-1.49	-1.65	-1.82	-1.98
	Quadratic Specification 3/							
5	-0.03	-0.19	-0.40	-0.66	-0.97	-1.33	-1.75	-2.21
10	-0.09	-0.42	-0.86	-1.40	-2.04	-2.79	-3.64	-4.60
20	-0.31	-1.03	-1.96	-3.11	-4.49	-6.07	-7.88	-9.91

Source: IMF staff calculations.

1/ Underlying regressions use minimum wages (MW) relative to average wages (AW) as explanatory variable.

2/ Derived from regression results shown in Table A4.1 column 3.

3/ Derived from regression results shown in Table A4.1 column 4.

8. The estimated MW impact on youth employment using the MW/LP ratio also appears to be modestly negative, but in contrast to the MW/AW specification the results are robust and statistically significant. Table A4.3 shows the results for the same estimations as above with MW/LP substituted for MW/AW. Encouragingly the results are very similar to the previous ones, with the key difference that the coefficient on the MW/LP ratio now remains statistically significant when additional controls are introduced. Adding the MW/AW ratio as an explanatory variable yields an insignificant coefficient and does not materially alter the employment elasticity (column 4), suggesting that the MW/LP ratio is a better indicator of the MW impact on employment. As pointed out earlier, the estimated effects on employment could reflect the correlation between LP and youth employment irrespective of changes in the MW. However, running the regression with real labor productivity or real GDP added as separate explanatory variables, or with real minimum wage and real labor productivity used as separate explanatory variables in lieu of the MW/LP ratio, does not alter the results (while they worsen statistical properties).<sup>2</sup>

9. Estimation of the equation with squared MW/LP (column 5) confirms the earlier results. Furthermore, while the coefficients on the MW/LP and the squared term are individually statistically insignificant, they are nonetheless jointly significant at the 5 percent confidence level.<sup>3</sup>

<sup>2</sup> Similarly estimation of the equation in logs rather than levels.

<sup>3</sup> The F-statistic for both coefficients equal to 0 is 3.68, with a p-value of 0.03.

**Table A4.3. Employment and Minimum Wages Relative to Labor Productivity<sup>1/</sup>**

Variable	(1)	(2)	(3)	(4)	(5)
Youth employment to population ratio					
YOUTHMPRATIO(-1)		0.57***	0.60***	0.61***	0.6***
GDP(-1)			0.17***	0.15**	0.15**
MW/LP(-1)	-5.64***	-2.99***	-2.27**	-4.4**	2.87
SQUARED MW/LP(-1)					-2.16
MW/AW(-1)				0.09	
ADUNEMP	-0.75***	-0.39***	-0.27***	-0.26***	-0.26***
YOUTHPOP	0.56**	0.38**	0.46***	0.49***	0.51***
C	27.7	10.21	5.48	3.59	1.40
R-squared	0.87	0.92	0.93	0.93	0.93
Durbin-Watson stat	0.62	1.63	1.69	1.7	1.73
<b>Youth employment elasticity</b>	-0.28	-0.15	-0.11	-0.09	...

\*, \*\*, and \*\*\* indicate significance at the 10, 5, and 1 percent respectively.

<sup>1/</sup> The minimum wage ratio is defined as the gross monthly minimum wage divided by annual output over by annual employment.

## Annex V. Methodology: Wage and Income Distribution in Romania

1. The EU-SILC is the EU reference source for comparative statistics on income distribution and social exclusion at the European level. Romania's EU-SILC data are provided through the National Institute of Statistics of Romania (INSSE). This study focuses on the developments of the distribution of wages or gross employment income of persons in paid employment.<sup>1</sup> The data are both cross-sectional and longitudinal, compiled annually from 2007 to 2014. In 2014, for example, there were 7,508 households or 15,661 persons interviewed in the survey. Of those, 2,499 persons were unemployed and 13,162 persons were either employees or self-employed. This study considers only those employed on payrolls—6,836 persons accounting for about 43.6 percent of the sample in 2014. The wage distributional data for 2015 and 2016 are projected to capture the impacts of sharp minimum wage hikes in recent years. Specifically, sub-minimum wage workers are assumed to receive the wage hikes at the growth rate of the minimum wage, workers at minimum wage would immediately be paid at the new minimum wage, and workers above minimum wage would receive a raise as suggested by the estimated wage pass-through.<sup>2</sup>
2. Table A5 reports the results in detail.

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<sup>1</sup> Paid employed persons refer to those employed persons, including employees, self-employed, and family workers, with gross employment income greater than zero. Gross employment income includes gross employee cash or near cash income for employees, and gross cash benefits or losses from self-employment for self-employed and family workers. Paid employed persons refer to those employed persons with income greater than zero.

<sup>2</sup> The pass-through effect on gross wage for Romania is estimated at around 0.4 percent for a one percent increase of the minimum wage.

Table A5. Romania: Wage and Income Distribution

	2007	2008	2009	2010	2011	2012	2013	2014	proj 2015	proj 2016
MW annual income	4,680	6,000	7,200	7,200	8,040	8,400	9,000	10,500	12,150	14,200
%change	18.2	28.2	20.0	0.0	11.7	4.5	7.1	16.7	15.7	16.9
Gross wage annual	16,916	20,906	22,672	23,240	24,383	25,606	26,890	28,320	30,714	33,601
%change	22.6	23.6	8.4	2.5	4.9	5.0	5.0	5.3	8.5	9.4
Paid workers at or under MW	2,276	2,139	2,066	1,970	2,024	2,041	2,218	2,409	2,659	3,161
Paid workers	7,906	7,339	7,207	7,154	6,920	6,841	6,932	6,836	6,836	6,836
<b>Share of MW paid workers</b>	<b>28.8</b>	<b>29.1</b>	<b>28.7</b>	<b>27.5</b>	<b>29.2</b>	<b>29.8</b>	<b>32.0</b>	<b>35.2</b>	<b>38.9</b>	<b>46.2</b>
<i>Distribution of Annual Wage</i>										
<b>Median annual wage</b>	8,013	9,349	10,997	11,726	12,081	12,130	12,432	13,233	14,065	15,014
% change		16.7	17.6	6.6	3.0	0.4	2.5	6.4	6.3	6.7
<b>Skewness (0=normal)</b>	3.0	5.4	11.4	7.6	4.1	2.1	2.0	1.7	1.8	1.8
<b>Kurtosis (3=normal)</b>	23.5	109.0	403.0	225.7	75.7	17.9	17.7	14.5	14.9	15.5
10th percentile	900	1,400	1,650	1,500	1,600	1,800	1,750	1,743	2,016	2,357
90th percentile	19,101	21,347	24,188	24,387	24,199	24,462	25,146	27,226	28,937	30,890
<b>Wage gap (top-to-bottom income)</b>	<b>21.2</b>	<b>15.2</b>	<b>14.7</b>	<b>16.3</b>	<b>15.1</b>	<b>13.6</b>	<b>14.4</b>	<b>15.6</b>	<b>14.4</b>	<b>13.1</b>
<i>Distribution of Gross Annual Income</i>										
<b>Median gross annual income</b>	4,200	5,317	6,765	7,736	8,200	8,371	8,400	8,798	n.a.	n.a.
<b>Skewness (0=normal)</b>	4.2	5.8	9.8	6.7	3.8	2.7	34.4	44.3	n.a.	n.a.
<b>Kurtosis (3=normal)</b>	42.5	111.4	374.5	195.1	64.7	29.3	2598.7	2955.4	n.a.	n.a.
10th percentile	0	0	0	0	0	0	0	0	n.a.	n.a.
20th percentile	490	630	976	1116	1180	910	791	950	n.a.	n.a.
90th percentile	14072	15295	17797	19248	19134	19559	20292	22005	n.a.	n.a.
<b>Income gap (90th to 20th income percentiles)</b>	<b>28.7</b>	<b>24.3</b>	<b>18.2</b>	<b>17.2</b>	<b>16.2</b>	<b>21.5</b>	<b>25.6</b>	<b>23.2</b>	n.a.	n.a.

Sources: EU-SILC, INSSSE, and IMF Staff Calculations.

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