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Publication date:
2016

Document Version
Publisher's PDF, also known as Version of record

Citation for published version (APA):
Hansen, H., Rand, J., & Torm, N. (2016). *The impact of minimum wage adjustments on Vietnamese wage inequality*. (1 ed.) International Labour Organisation.

International Labour Organization

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First published 2016

The impact of minimum wage adjustments on Vietnamese wage inequality / International Labour Organization, ILO Country Office for Viet Nam. - Hanoi: ILO, 2016.

ISBN: 978-92-2-128941-8 (print)
ISBN : 978-92-2-128942-5 (web PDF)

International Labour Organization; ILO Country Office for Viet Nam.

wage differential / minimum wage / wage structure / Viet Nam

13.07

ILO Cataloguing in Publication Data

Printed in Viet Nam

Preface

Minimum wages, in various forms, exist in more than 90 percent of the International Labour organization's (ILO) member States. Minimum wage systems aim to protect workers against unduly low pay, helping to ensure a just and equitable share of the fruits of progress to all, and a minimum living wage to all who are employed and in need of such protection.

The Minimum Wage Fixing Convention, 1970 (No. 131) and the accompanying Recommendation No. 135, include important principles relating to factors to be considered during the minimum wage setting process, in including the needs of workers and their families as well as other social and economic considerations, such inflation and productivity. A further key principle is that it should be participatory and tripartite, to ensure the representation of those involved in the decision.

Historically the purpose of minimum wages has evolved from a policy tool to be used selected in a few low-wage sectors to an instrument of universal social protection with broader coverage.

In line with the global trends, Viet Nam has seen major improvements in its minimum wage policy and system in recent years. Before 2012, Viet Nam's had a two tier system with differing minimum wage rates for domestic enterprises and foreign enterprises, which were fixed by the government. The establishment of the tripartite National Wage Council in 2013 has transformed Viet Nam's minimum wage system by merging two minimum wage rates into a single rate with regional differentiation as well as providing for tripartite participation in developing minimum wage recommendations.

This working paper is timely, as there is a growing need to examine the impact of minimum wages on the labour market. In this paper, the authors (Henrik Hansen, John Rand and Nina Torm) highlight the impact of minimum wage changes in the distribution of wages in the informal and other sectors. In this respect, an improvement in income distribution for a large proportion of the employed population is emerging. However, due to some structural characteristics in the rural sector as well in household production, the "light-house" effect of the minimum wage that is evident in minimum wages in other developing countries, apply here only for those in the upper layer of the informal sector.

With the publication of the working paper, the ILO seeks to continue to contribute to policy discussion and debate about the continuous improvement of the minimum wage fixing process, which should be based on a regular examination of impact of minimum wages on jobs, wage levels and wage distribution in Viet Nam's labour market.

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Acknowledgements

* We are grateful for financial support as well as productive and stimulating collaboration with the International Labour Organization's (ILO) offices in Hanoi, Bangkok and Geneva, and for constructive comments and feedback received by Patrick Belser, Malte Luebker and Rosalia Vazquez-Alvarez. We would also like to thank participants at the Vietnam National Wage Conference in Hanoi on 25-26 November 2014 and the 4th Regulating for Decent Work Conference in Geneva on 8-10 July 2015.

Recognition is also due to the General Statistics Office (GSO) in Hanoi for granting access to the Labour Force Survey data on which this paper is based and for providing substantial assistance in interpreting the data. The usual caveats apply.

List of abbreviations

CPI	Consumer Price Index
FIE	Foreign Investment Enterprise
GDP	Gross Domestic Product
GSO	General Statistics Office
ILO	International Labour Organization
LFS	Labour Force Survey
MoLISA	Ministry of Labour, War Invalids and Social Affairs
SME	Small and Medium Enterprises
SOE	State-owned Enterprises
UK	United Kingdom
US	United States
VCCI	Viet Nam Chamber of Commerce and Industry
VES	Vietnamese Enterprise Survey
VGCL	Viet Nam General Confederation of Labour
VHLSS	Viet Nam Household Living Standards Survey

The impact of minimum wage adjustments on Vietnamese wage inequality

Abstract

Using Vietnamese Labour Force Survey data we analyse the impact of minimum wage changes on wage inequality. Minimum wages serve to reduce local wage inequality in the formal sectors by decreasing the gap between the median wages and the lower tail of the local wage distributions. In contrast, local wage inequality is increased in the informal sectors. Overall, the minimum wages decrease national wage inequality. Our estimates indicate a decrease in the wage distribution Gini coefficient of about 2 percentage points and an increase in the 10/50 wage ratio of 5-7 percentage points caused by the adjustment of the minimum wages from 2011 to 2012 that levelled the minimum wage across economic sectors.

JEL Classification: J31; J45; J48.

Keywords: Minimum wage; Wage Distribution; Labour; Viet Nam

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1 Introduction

One of the intended purposes of minimum wages is to improve the economic conditions of those at the bottom of the wage distribution thereby reducing both inequality and the number of working poor.[1] In spite of a large literature, the question of whether minimum wage adjustments actually reduces wage inequality remain controversial and empirically ambiguous, depending on the country context including the way in which minimum wage policy is carried-out.

In Viet Nam, minimum wage policies changed markedly in the mid-1990s as part of the country's ongoing market reforms and since then Viet Nam has had several coexisting minimum wage rates varying across location and economic sector.[2] Minimum wage rates have typically been adjusted January 1st every year after negotiations between the government and the labour market associations during the fall the previous year whereby minimum wage changes have typically reflected both changes in needs as well as expected changes in economic capacity. However, in 2012 the different minimum wage rates across the economic sectors were aligned leading to a considerable non-negotiated increase in the minimum wage for workers in formal non-state enterprises and state enterprises. As a result the ratio of minimum wages to average wages (the Kaitz index) rose from about 41 per cent in 2011 to 55 per cent in 2013.

Based on data from the Vietnamese Labour Force Survey (LFS) 2011-2013, we use this alignment to estimate the impact of the minimum wage legislation on wage inequality. We follow Lee (1999) in estimating the effect of the minimum wage on the shape of local wage distributions. These local wage distributions are defined over provinces, economic sectors, and time in accordance with the different minimum

[1] According to the ILO, the minimum wage is understood to mean "the minimum sum payable to a worker for work performed or services rendered, within a given period, whether calculated on the basis of time or output, which may not be reduced either by individual or collective agreement, which is guaranteed by law and which may be fixed in such a way as to cover the minimum needs of the worker and his or her family, in the light of national economic and social conditions" (ILO, 1992).

[2] Viet Nam classifies all economic activities including both private and public production as well as public administration into sectors according to ownership of the entity. The main sectors are non-state, state and foreign.

wage levels in Viet Nam in 2011, such that each local wage distribution can be associated with a single minimum wage level and thus a single "effective minimum wage" defined as the (log of) the ratio of the minimum real wage to the median real wage. Our regression results indicate that the minimum wage has a both statistically and economically significant impact on the lower tail of the local wage distributions in the formal sectors, thereby reducing local wage inequality. In contrast, the minimum wage changes do not appear to have had any impact on the lower wages in the informal sectors (agriculture and household production). Instead, we find a significant and substantial impact on the upper tail of the local wage distributions in the informal sectors.

With these conflicting results, the overall impact of the minimum wage changes on the national Vietnamese wage distribution could go either way. Therefore, we quantify the effect of the changes by computing counterfactual individual wages to construct counterfactual national wage distributions. The counterfactual distributions indicate that the minimum wage changes reduced wage inequality, as measured by the Gini coefficient and the coefficient of variation, both in the formal sector and for Vietnamese wage workers as a whole, while wage inequality increased in the informal sectors. Zooming in on the lower part of the wage distribution our results indicate that the 10/50 wage ratio would have been 5-7 percentage points lower in the absence of minimum wage changes from 2011 onwards. For workers in the formal sector the impact on the 10/50 wage ratio was probably as much as 7-10 percentage points increase. We conclude that in Viet Nam the minimum wage legislations do appear to decrease wage inequality.

The paper is structured as follows. Section 2 provides a brief overview of the relevant minimum wage literature. In Section 3, we discuss the context of Vietnamese minimum wage legislation and recent adjustments as analysed in the paper. In Section 4, we introduce and summarize the LFS data. The main results are presented in Section 5 following a detailed description of the methodology and econometric approach applied including the underlying identifying assumptions. Finally, Section 6 provides concluding remarks.

2 Literature

Empirical studies of the effects of minimum wage adjustments on labour market outcomes have until recently focused mostly on industrialized countries (especially the UK and the US) within a competitive labour market framework, according to which a minimum wage imposed above the market equilibrium leads to higher average wages and a decrease in employment.[3] Recent reviews are generally not sympathetic to this standard neoclassical interpretation of minimum wage implications. For instance, assessing alternative research designs in US-based studies Allegretto et al. (2013) find only modest employment effects related to minimum wage changes. In terms of wages, comprehensive meta-analyses of US studies by Belman and Wolfson (2014), and Doucouliagos and Stanley (2009) find that minimum wages serve to increase the earnings of those at the bottom of the income distribution and thereby reduce wage inequality.

Methodologically, most existing studies rely on a "differential impact approach" comparing groups that are more or less affected (high versus low earners), due either to their geographical location and/or position in the wage distribution. In the case of the UK, for instance, Stewart (2002; 2004), applies a difference-in-difference approach using individual level panel data from Labour Force Surveys (LFS) when he examines the bite of the multilevel minimum wage. The results reveal some impact on the wage distributions varying by geographical areas, yet show little evidence of any employment effect on low-wage workers.

In the US, Lee (1999) uses variation in the effective minimum wage across regions to show that during the 1980s the declining real minimum wage accounted for the vast majority of the growing wage gap between the 10th and 50th percentile. Similarly, a more recent study by Slonimczyk and Skott (2012) finds that the subsequent increase in federal minimum wages led to decreasing wage inequality and that both total and low skilled employment increased. Addressing concerns of measurement error biases in previous studies, in particular in Lee (1999), Autor et al. (2016) use an instrumental variable approach to show that the equalizing effect of minimum wages in the lower half of the wage distribution is much smaller than previously

[3] In this section we focus on studies that are considered directly relevant for our empirical analysis rather than reporting the numerous and extremely mixed findings of the large body of work on minimum wages.

found. The authors also address the important issue of whether minimum wages spill-over to the upper part of the distribution and they convincingly argue that the estimated spill-over effects are due to measurement error. In sum, the most widely cited studies of countries from the Global North seem to display evidence in favour of an equalizing effect of minimum wage changes.

The analysis of minimum wage effects is generally more complex in developing countries characterized by heterogeneous labour markets, large informal sectors and limited enforcement and compliance with minimum wage regulations.[4] Nevertheless, such analyses may be particularly important in less advanced economies, where minimum wages are likely to affect a larger proportion of a typically more vulnerable workforce.[5] Some, for example Hamermesh (1994), argue that a Harris-Todaro-type two-sector model comprising (i) a formal sector where coverage is complete and enforcement is present and (ii) an informal sector in which coverage and enforcement are rare and incomplete provides a more suitable framework for analysing minimum wages in a developing country context. In this setting, the imposition of a minimum wage may, through decreasing the amount of labour absorbed in the formal sector, lead to a reallocation of workers to the informal sector, in turn lowering wages in this sector (Harrison and Leamer, 1997). Focusing on low-income countries and covering a range of labour regulations Nataraj et al. (2012) conclude that the evidence points to negative effects of regulations on formal employment, and a compensating positive effect on informal employment. The effect on the overall employment (and unemployment) rate is ambiguous. Other studies, as outlined below, have shown that minimum wages in the formal sector may also have positive wage effects on the informal part of the economy. Thus, labour market outcomes of a minimum wage adjustment may differ depending on the theoretical framework adopted. Moreover, even in a neoclassical model, the minimum wage effect on any given category of workers will depend on the elasticity of substitution across different worker types. One may even find that minimum wage

[4] Non-compliance, however, is not restricted to developing countries. For instance, Weil (2005) documents that around 27 per cent of workers are paid less than the minimum-wage rate in the US.

[5] Until recently, there was a comparative dearth of literature analysing the impact of minimum wage policies in low-income countries. Yet, in a comprehensive review of developing country work, Betcherman (2015) illustrates the varying results from modest negative, to insignificant or small positive impacts on aggregate employment, though with young workers consistently being more likely to be negatively affected. In terms of wages, the overall findings are positive (in some cases with knock-on-effects in the informal sector) and likewise for the distribution of earnings and reduction of poverty, whereas for productivity there is more ambiguity, due partly to the lack of developing country studies in this area. See Freeman (2009) for an earlier review of labour regulation employment effects in developing countries.

increases encourage substitution of skilled for unskilled workers (Aaronson and French, 2007), resulting in improved productivity yet without causing an overall change in employment.

In spite of the challenges, there is a growing number of minimum wage related studies from developing and emerging economies and until now, Latin America claims the vast majority. Based on Colombian household data linking individuals across consecutive quarters, Maloney and Núñez (2004) document an impact on the wage distribution both in the vicinity of the minimum wage and higher up the wage distribution (a numeraire effect), with significant dis-employment effects. Examining the multiple minimum wage levels in Costa Rica Gindling and Terell (2007) analyse repeated cross-sections of individual (household) data from 1988-2000 and show that a 10 per cent increase in the minimum wage reduces employment in the covered sector by around 1 per cent while the number of hours worked decreases by 0.6 per cent. The effect is more severe in the lower half of the skill distribution. Based on data from the Brazilian Monthly Employment Survey 1982-2004 Lemos (2004, 2005, 2007 and 2009) uses panel data techniques in a variety of set-ups. The results are mixed, but overall there is little evidence of adverse employment effects (in both the formal and informal sector) due to minimum wage adjustments. For instance, Lemos (2009) finds that contrary to the theoretical prediction of the two-sector model, minimum wages serve to increase salaries in the low end of the wage distribution in both the formal and the informal sector, indicating that formal sector regulation has spill-over effects to the latter segment – the so-called lighthouse effect.[6] Similarly, using Argentinian household survey data and exploiting geographical variation and a similar (difference-in-difference) methodology to Stewart (2002), Khamis (2013) finds that minimum wages have a stronger wage effect in the informal compared with the formal sector. Also documenting the existence of knock-on effects, Bosch and Manacorda (2010) find that the decrease in the real minimum wage in Mexico during the 1990's explains the rising wage inequality, especially in the lower part of the wage distribution.

Studies of countries on the African continent remain more limited, yet using the 1998 LFS in Kenya Andalón and Pagés (2009) find evidence that minimum wages are positively associated with the wages of low-educated workers and women and thereby serve to reduce the earnings gap. Focusing on the effects of the 2002 South

[6] Lemos (2007) also finds a strong compression in the wage distribution for both private and public sector workers with no adverse employment effects on the more vulnerable segment of the workforce (women, lower educated and teenagers).

African minimum wage legislation for domestic workers, Dinkelman and Ranchhod (2012) apply a difference-in-difference method to LFS data, to show that domestic worker wages increased by 13-15 per cent in the 16 months following the implementation of the law. Also on South Africa, Bhorat et al. (2013) develop a compliance violation index and show that both the level and depth of non-compliance are important in quantifying violation of minimum wage legislation, illustrating the importance of sector variation in compliance. In sum then, studies from Latin America and Africa reveal rather modest adverse employment effects, if any, and document the potential of minimum wages to reduce wage inequality, making regulations a viable anti-poverty instrument in these settings.

Turning to Asia, a series of studies have focused on the implications of the doubling of the real minimum wage during the early 1990s in Indonesia, using both firm and worker data. Based on the 1993 LFS (complemented with a national wage survey), Rama (2001) shows that the steep rise in the Indonesian minimum wage led to a 5-15 per cent increase in average wages, and a modest fall in employment by less than 5 per cent. Also on Indonesia, Magruder (2013) uses three waves of panel family life surveys and a combination of difference-in-difference and spatial regression discontinuity design to show that the doubling of the minimum wage led to a 10 per cent increase in wages and a fall in self-employment by 10-20 per cent. Moreover, quantile regressions reveal that the minimum wage rise had a positive wage effect, especially at the bottom of the distribution where wages rose by 150-160 per cent. Although, the analysis is based on a relatively small sample, the findings are in line with the "big-push model". In the case of Thailand, Del Carpio et al. (2014) apply a standard difference-in-difference estimator to LFS data making use of the provincial variation in the wage floor to show that during 1998-2010 minimum wage increases had positive effects on individual wages. Observed differences in magnitude between women and younger workers as well as across education categories, point to the importance of including standard socio-economic characteristics. In terms of employment status, the study finds no evidence in favour of workers being pushed into the informal sector due to wage increases. Again, the Asia region reveal positive wage results across all segments of the wage distribution and an increased formalization of the workforce, as opposed to formal workers being "crowded-out" to the informal sector.

Finally, focusing on Viet Nam, Nguyen (2010) applies difference-in-difference and propensity score matching to data from the Viet Nam Household Living Standards Survey (VHLSS) 2004 and 2006 to measure the impact of the 2005 minimum wage adjustment on wages, expenditure and employment. Nguyen finds evidence of a

reduction in formal sector employment but no significant impact on wages, which could be related to the fact that during the period of analysis the minimum wage did not vary by region and also real minimum wages hardly increased.[7] In a more recent study, using the Vietnamese Enterprise Survey (VES) from 2008-2010 Nguyen (2014) finds that minimum wage increases are associated with a small increase in average wages and a slight reduction in employment, yet the results are uninformative about the effect on workers at the lower end of the wage distribution. Also based on VES, Hansen et al. (2014) use a triple-difference approach to reveal differences in wage responses for high and low wage firms suggesting that minimum wage adjustments affect the wage distribution.

[7] As such, the minimum wage rise is less likely to be perceived by employers as longer-lasting increases in the cost of low-wage labour. Neumark and Wascher (2007) also point to the importance of specifying the minimum wage in real or relative terms, especially in longer samples.

3 The Vietnamese context

In Viet Nam, the concept of the minimum wage goes back to 1946.[8] Yet, it was only officially defined in 1995 with the introduction of the Labour Code: "the minimum wage is the lowest wage fixed based on the cost of living in order to ensure compensation for workers doing the simplest job in normal working conditions and enabling them to reproduce their labour". The basic idea remains more or less the same in the most recent version of the Labour Code (2012): "the minimum wage is the lowest rate that is paid to the employee who performs the simplest work in the normal working conditions and that must ensure the minimal living needs of the employees and their families". [9] The so-called common minimum wage is not an actual minimum wage in the classical sense in that it does not determine a wage floor. However, it forms the basis for calculating; (a) wage scales for government staff and state sector workers; (b) wage scales for the payment of social insurance, unemployment insurance and health insurance for workers of state-owned enterprises (SOEs); (c) allowances for redundant workers due to the restructuring of SOEs; (d) pensions, allowances for veterans, and other social transfers. As such, the minimum wage depends largely on the capacity of the Government budget.

In terms of the actual process of setting the regional minimum wage, this has traditionally been Government-led based on separate and indirect consultations between the Government and the different industrial relation parties, albeit with limited representation of the latter. More specifically and as specified in the corresponding decrees, MoLISA (The Ministry of Labour, War Invalids and Social Affairs) has assumed the prime responsibility coordinating with the VGCL (Viet Nam General Confederation of Labour), the VCCI (Viet Nam Chamber of Commerce and Industry), concerned ministries, agencies and provincial-level People's Committees in informing employees and employers of the region-based minimum wage levels. MoLISA has taken the lead in inspecting and ensuring compliance and decisions on

[8] See Hansen et al. (2014) for a more complete historic account of minimum wage development in Viet Nam.

[9] In accordance with the recommendations of Viet Nam nutrition institute (2008), the minimum sufficient expenditure level, as calculated from the Viet Nam Household Living Standards Survey (VHLSS) (2008), is based on the value of food and non-food consumption items required to ensure 2300 kcal/day for an adult and 1600 kcal/day for a child (ILSSA, 2012). However, recent reports point out that the minimum wage level is always below the sufficient minimum daily expenditure level (MoLISA, 2011). (National Wage Council, 2014).

the adjustment of the region-based minimum wage. The authorization for procedures of adjusting regions has (in theory) been conducted at the province level, yet in practice this has not been done in an agreeable manner (MoLISA, 2011).

The minimum wage setting process, which generally takes place on an annual basis in the late fall, has traditionally played an important role in the Vietnamese labour market because the minimum level represents the base according to which the wage level and thus the social insurance contributions of different workers are calculated. Specifically, firms must pay the government 17 per cent of a formal worker's wage as social insurance. Since actual wages are often misreported, the social security administration uses the minimum wage as a basis for calculating the compulsory social insurance contribution by firms. Within this set-up, the statutory minimum wage replaces independent and additional collective bargaining, reflecting the fact that unions are limited in their capacity to organize and carry out collective bargaining in firms or at the industry level. As alluded to above, in the state sector, wages remain tied to the base minimum wage, yet less so in the domestic private sector as the market economy is maturing.

Traditionally, minimum wage rates have been set at different levels for different economic sectors.[10] Minimum wages only apply for registered enterprises and public administration. Hence, the relevant economic sectors are State (consisting of the public sector and state owned enterprises), Private (private enterprises with no foreign ownership), and Foreign investment (enterprises with partly foreign ownership). According to GSO (2014), about 2/3 of the Vietnamese wage workers are directly covered by the minimum wage regulations.

In 2012 the minimum wage rates were aligned with the intention of overcoming discrimination between workers from private and foreign investment companies, resulting in a steep rise in the minimum wage for private companies.[11] Regional variation in minimum wages still remains, though. The regional differences are aimed

[10] Viet Nam has a classification of economic sectors broadly according to ownership. The classification has three main sectors: State, Non-state, and Foreign investment. The Non-state sector is further divided into four sub-sectors: (i) Agriculture, forestry, fishery, household; (ii) Household of individual production; (iii) Collective and (iv) Private.

[11] In fact, the 2012 minimum wage came into effect already on 1/10/2011.

[12] The regional variation in minimum wages is based on several criteria including the comparable price index, GDP per capita, the share of poor households, consumption levels of different types of commodities; the average wage levels in different types of enterprises; revenue per capita and the share of wage-earners (MoLISA, 2011).

at ensuring the purchasing power of the minimum wage for the same commodity at different prices.[12] However, in practice, the criteria used for regional minimum wage variations are opaque, in turn rendering the adjustment process inconsistent. Moreover, implementation is complicated by the fact that the regional division is based on administrative units whereby neighbouring locations with very similar characteristics may apply different regional minimum wages.

From 2011 to 2012 the nominal minimum wage for workers in private enterprises increased by as much as 50-75 per cent (depending on the region), equivalent to an increase of 34-57 per cent in real terms. The following year (2012 to 2013), the rise was less dramatic at 15-17 per cent in nominal terms, equivalent to 9-12 per cent in real terms (see Table 1). The minimum to average wage ratio (the Kaitz index) calculated at the district level increased from 38 per cent in 2011 to 54 per cent in 2013 while the minimum to median wage ratio rose from 44 per cent to 60 per cent, indicating a substantial increase in the "bite" of the minimum wage.

Table 1: Minimum wages, by year, ownership type and region

	Nominal minimum wages				Real minimum wages			
Economic sector	Private and State		Foreign investment		Private and State		Foreign investment	
Year	Min Region	Max Region	Min Region	Max Region	Min Region	Max Region	Min Region	Max Region
2011	830	1 350	1 100	1 550	684	1 113	907	1 278
2012	1 440	2 000	1 440	2 000	1 071	1 487	1 071	1 487
2013	1 650	2 350	1 650	2 350	1 171	1 668	1 171	1 668

Note: Wages are in 1,000 VND per month. Real wages have been deflated using the CPI index (base year=2010)

While the large increases from 2011 to 2012 are caused by the alignment of minimum wages across economic sectors, the increases from 2012 to 2013 are related to a change from a government-led system to a more collective bargaining system.[13] The complexity of managing multilevel systems is exacerbated in low enforcement capacity environments such as Viet Nam where labour inspections, as

[13] Some studies stress the need to consider the mechanism through which the minimum wage is determined and uses cross-country heterogeneity in regime type to explain variations in minimum wage levels. For instance, Boeri (2012) finds that the minimum wage level is generally lower in countries where it is determined unilaterally by the Government compared with being the outcome of negotiations between unions and employers associations.

one of the means to ensure compliance, tend to be the exception rather than the rule.[14] In fact, in 2012, an auditing process across Vietnamese manufacturing firms found that about 33 per cent of firms had violations related to wages and benefits (Del Carpio and Pabon, 2014). Under weak enforcement, employers may prefer to hire a mixed workforce, where some workers receive the mandated minimum wage rate and others less, either informally or through contracting.

[14] Especially small and medium enterprises (SMEs) are seldom inspected (see CIEM, 2006, 2008, 2010, 2012 and 2014). At the same time, SMEs are more likely to find minimum wages binding, due to the positive relationship between firm size and wages found in Viet Nam and generally in the literature, see Oi and Idson (1999) and Söderbom et al. (2005).

4 Minimum wages and local wage distributions

4.1. The shape of local wage distributions and the impact of minimum wages

In the seminal paper describing the impact of minimum wages on the wage distributions across the US states, DiNardo, Fortin, and Lemieux (1996) assume that the minimum wage has no spill-over effect to wages above the minimum wage level. By this assumption, the minimum wage can only affect the lower left tail of the distributions, and the wage distributions are expected to have sharp discontinuity points at the level of the minimum wage. Lee (1999) modifies this restrictive identifying assumption by supposing, instead, that the minimum wage has no impact on the median wage and above, but only on wages below the median. Bosch and Manacorda (2010) use the same identifying assumption for wage distributions in Mexico, although they modify the assumption to state that the 70th percentile of the distributions are unaffected by minimum wage changes.

For Viet Nam we cannot assume that high wages (say, the median wage and above) are unaffected by minimum wage changes. The reason is that the minimum wage for the state sector determines not only the lowest wages but also higher wages because remunerations are set as multiplicative mark-ups on the minimum wage. Thus, we expect changes in the minimum wage in the state sector to automatically lead to (close to) proportional changes in almost all wages in the sector. Further, because of the size of the state sector in Viet Nam the wage setting in that sector is likely to have substantial spill-over effects to the other economic sectors, whereby even high wage employees in non-state enterprises may be affected by minimum wage changes in the state sector.

As we show below, under certain assumptions about the local wage distributions, the wage distribution regressions in Lee (1999), Bosch and Manacorda (2010) and Autor et al. (2016) actually allow for minimum wage effects across the whole wage distribution. We illustrate this by being very explicit in the formulation of the observed and the latent wage distributions (the distributions that would have prevailed without the changes in the minimum wages) and we make a distinction between location and shape effects on the wage distributions following minimum wage changes.

First, we assume the latent distributions of the log-transformed wages are well approximated by distributions belonging to the family of location-scale distributions, such that the latent distributions across economic sectors and provinces in Viet Nam only differ in terms of location and scale, but not in terms of their "shape" (see e.g., Rinne, 2014).[15] Mathematically, we specify the latent wages (in logs) across location, economic sector and time as random variables with cumulative distribution functions given by

$$F(w^* \mid a_{jkt}, b_{jkt}) = F\left(\frac{w^* - a_{jkt}}{b_{jkt}}\right), \quad a_{jkt} \in \quad , b_{jkt} > 0 \tag{1}$$

where w^* are the latent log-wages (i.e., the log-wages we would have observed had there been no changes in the minimum wages), $F(\cdot)$ is a continuous cumulative density function having no other parameters and a_{jkt}, b_{jkt} are the location an scale parameters, respectively, that may vary across province (j), economic sector (k) and time (t). Given the distributional assumption, the quartile functions of the latent log-wages have a simple linear form

$$w^*_{jkt}(p) = F_w^{-1}(p \mid a_{jkt}, b_{jkt}) = a_{jkt} + b_{jkt} z_p \tag{2}$$

where $w^*_{jkt}(p)$ is the p^{th} quartile (or percentile) of the latent log-wage distribution in province j, economic sector k at time t and z_p is the p^{th} quartile of the parameter free distribution of the reduced latent log-wage variables.[16] Unfortunately, neither $w^*_{jkt}(p)$, a_{ijk}, b_{ijk} nor z_p are observed.

For the observed log-wages we assume they are additively related to the latent log-wages and the minimum wages, where $w_{jkt}(p)$ is the pth quartile of the observed log-wage distribution in province j, economic sector k at time t, while w^m_{jkt} is the minimum wage in the same province, economic sector and year.

$$w_{jkt}(p) = w^*_{jkt}(p) + \theta_{jkt} w^m_{jkt} + g(w^m_{jkt} \mid p) \tag{3}$$

[15] The family of location scale distributions is quite large, and the distributions need not be symmetric. Examples of symmetric distributions are the normal, the logistic, and the Cauchy distributions. Examples of asymmetric distributions are the half-normal, the exponential, the Rayleigh, and the Maxwell–Boltzmann distributions.

[16] If, say, the latent wages were log-normally distributed then z_p would be the quartiles of the standard normal distribution.

The important assumption in (3) is that the impact of the minimum wage can be decomposed into a location effect, $\theta_{jkt} w^m_{jkt}$, and a shape effect, $g(w^m_{jkt} \mid p)$. The location effect is (naturally) assumed to be constant within a given distribution while it may vary across distributions, say between the state sector (in which the elasticity, θ_{jkt}, is close to one) and the private sector (having a lower elasticity). In contrast, the shape effect is expected to vary by quartile while we assume it is common across distributions. Given these assumptions we can estimate the impact of the minimum wage on the shape of the distributions by looking at the difference between two quartiles, say the p^{th} and the median ($p = 50$)

$$\begin{aligned} w_{jkt}(p) - w_{jkt}(50) &= w^*_{jkt}(p) - w^*_{jkt}(50) + g(w^m_{jkt} \mid p) - g(w^m_{jkt} \mid 50) \\ &= b_{jkt}(z_p - z_{50}) + g(w^m_{jkt} \mid p) - g(w^m_{jkt} \mid 50) \end{aligned} \tag{4}$$

As z_p and z_{50} are (unknown) constants the quartile ranges can be linearly decomposed along the three dimensions

$$b_{jkt}(z_p - z_{50}) = \lambda_{j,p} + \omega_{k,p} + \tau_{t,p} + (\lambda\omega)_{jk,p} + (\lambda\tau)_{jt,p} + (\omega\tau)_{kt,p} + (\lambda\omega\tau)_{jkt,p} \tag{5}$$

In this decomposition λ_j is a province factor, ω_k is an economic sector factor while τ_t is a time factor. The four terms in parentheses are interactions of the three main factors, giving a complete linear decomposition of all quartile ranges of all the latent log-wage distributions. In the analysis, we specify the triple-interaction as

$$(\lambda\omega\tau)_{jkt,p} = \beta_{x,p} x_{jkt} + u_{jkt,p} \tag{6}$$

where x_{jkt} are averages of worker specific characteristics at the location, economic sector and time level that may influence the scale parameter, while we treat u_{jkt}, p as a disturbance term.

An important identifying assumption in Lee (1999) and Autor et al. (2016) is that the minimum wage affects the shape of the wage distribution through the "effective" minimum wage, specified as the difference between the minimum log-wage and the median log-wage, $(w^m_{jkt} - w_{jkt}(50))$. For the US data a quadratic specification of the effective minimum wage is needed, but as we show in the results section, for the Vietnamese data a linear specification appears more appropriate. Thus, we specify the shape effect of the minimum wage as

$$g(w^m_{jkt} \mid p) = \beta_p (w^m_{jkt} - w_{jkt}(50)) \tag{7}$$

Finally, an assumption that identifies the shape impact is that the minimum wage has no shape effect around the median

$$g(w^m_{jkt} \mid 50) = 0 \tag{8}$$

Inserting equations (5) to (8) in (4) we obtain a regression model that can estimate the shape impact of the minimum wage on the local wage distributions in Viet Nam

$$w_{jkt}(p) - w_{jkt}(50) = \beta_p(w^m_{jkt} - w_{jkt}(50)) + \beta_{x,p}x_{jkt} + \lambda_{j,p} + \omega_{k,p} + \tau_{t,p} + (\lambda\omega)_{jk,p} + (\lambda\tau)_{jt,p} + (\omega\tau)_{kt,p} + u_{jkt,p} \tag{9}$$

4.2. The Data

We use the Vietnamese Labour Force Survey (LFS) data collected by the Viet Nam General Statistics Office (GSO). The sampling frame of the LFS is the 2009 Population and Housing Census. Enumeration areas are re-sampled every two years whereby the areas surveyed in 2011 are different from those surveyed in 2012 and 2013. Individuals are sampled on a monthly basis providing quarterly indicators on employment status, wages, and several other socioeconomic factors. Individuals within each quarter are partly resampled to form a rotating panel and the survey is designed to be representative at the province level over a full year.[17] We do not make direct use of the panel structure, but we do take it into account in the regression analyses.

After inspecting and cleaning the data to ensure consistency over time, we have a sample of 1,966,864 observations distributed over four quarters in each year. Of these, only about 26 per cent (518,565) are wage workers. Details on the data cleaning procedure are given in Appendix A. Table A1 in Appendix B illustrates that our data cleaning has a negligible influence on the estimated employment in Viet Nam, both in terms of total numbers and in terms of composition. Our employment estimates are about 200 thousand people below the official estimates, which is less than 0.5 per cent of the employment estimates in each of the three years. Furthermore, the estimated composition of the employed population is equal to the official estimates to the first decimal point in terms of sex, residence, economic sector, and employment status.

[17] The sampling design and main findings are documented in the annual LFS reports (General Statistics Office, 2012, 2013, and 2014)

We use the information about hours worked to adjust the reported monthly wage according to a 48 hour workweek (Labour Code, 2012). We deflate the wages reported in the surveys using provincial consumer price indices based on household expenditure data on food and non-food items obtained from the Viet Nam Household Living Standards Survey (GSO, 2010). Our reference province is Ho Chi Minh City (HCMC) and the base year is 2010. Overall, the estimated average real wage is VND3 million per month. Between 2011 and 2013, the estimated average real wage increased from VND2.7 million to VND3.1 million. This is in accordance with the figures reported by the ILO (2014).

As noted, the minimum wage legislation is only legally binding for enterprises and workers in the formal sector. Unfortunately, there is no direct information about formality of the enterprises at which individuals are employed in the LFS surveys. Therefore, to classify workers into formal and informal employment we use information from the 2013 LFS about the current workplace having a business registration certificate, tax code, social insurance registration and written accounts.[18] Table A2 in Appendix B shows that firms who do not possess all four of these legal documents that are necessary for formal operation are operating in the agriculture or the household production sector, whereas the vast majority of firms in the private, state or foreign investment sectors have all four certificates. This consistent overlap between economic sector and formality allows us to use the sector definition in 2011 and 2012 to classify employed workers as working in formal or informal enterprises for all three years.[19] Thus, in the following we assume that minimum wage legislations are legally binding for all wage workers in the private sector, the state sector, and the foreign investment sector, while the legislations are not binding for wage workers in the agricultural sector or the household production sector. Using this simple, direct classification of formal and informal employment we find that 62 per cent of the wage workers are in formal employment.

Minimum wage non-compliance is fairly common in the formal sector, and we find an increase in non-compliance from 5 per cent in 2011 to 8 per cent in 2012 and 9 per cent in 2013.[20] Across the three economic sectors, non-compliance is highest for

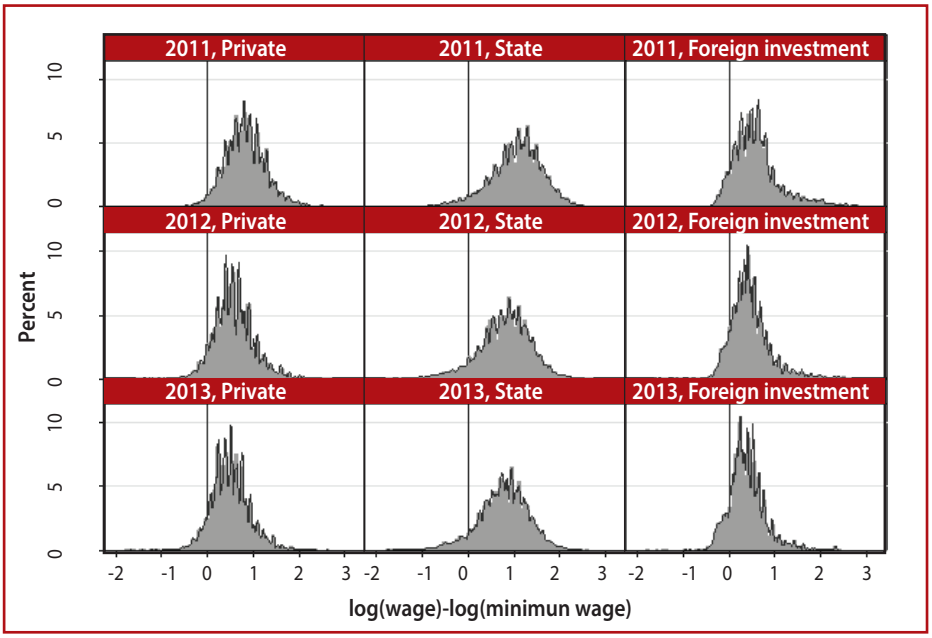
[18] In 2011 and 2012 the response rate on business registration certificate, tax code, social insurance registration and written accounts was extremely low, which is why we rely on the 2013 information along these variables.

[19] This categorization of the formal/informal sector is largely in accordance with ILO's definition (2003) based on the characteristics of the production unit.

[20] The non-compliance rates are estimated as the (survey weighted) share of employed wage workers in the three sectors, state, private and foreign who reported wages below the relevant minimum wage.

workers in FIEs (13 per cent in 2013) while it is almost the same rate for state sector and private sector wage workers as the private sector has just above 9 per cent while the state sector has just below 9 per cent non-compliance in 2013.

Figure 1: Distributions of log-wages normalized by log-minimum wages, by time and economic sector



Note: The plots are histograms of individual log-wages less the relevant minimum log-wage based on year, economic sector and province. Kernel density estimates are superimposed on the histograms.

The degree of non-compliance can also be seen from Figure 1 in which we show log-wage distributions by year and sector in which the individual log-wages are normalized by subtraction of the relevant minimum log-wage. In 2011 the minimum wage appears to have little influence on the tail distributions for the wages in the private and the state sector while the lower tail of the log-wage distribution for foreign investment enterprises appear compressed despite the larger fraction on wages below the (higher) minimum wage. Moving to 2012 and 2013 we observe a change in the lower tails of the distributions as there appears to be a compression around the minimum wages, despite the relative increase in non-compliance. In particular for wages in the foreign investment sector there is a substantial compression just at and above the minimum wage. This compression is also, to a much lesser extent though, visible for the wages in the private and the state sector.

5 Empirical results

5.1. The impact of minimum wage changes on local wage distributions in the formal sector

Using individual wage observations from the LFSs we generate log-wage distributions by province, economic sector and year, applying the LFS sampling weights to compute the local distributions. Having three years, three economic sectors and 63 provinces/cities, there are potentially 567 local wage distributions. However, in order to have meaningful data we only generate distributions if a year/sector/province combination has a sample of at least 100 individual observations. Since several of the local labour markets do not fulfil this requirement we end up having 444 local wage distributions. The "missing" distributions are, apart from one, all from the foreign investment sector. This is to be expected given the relatively small size, and geographical concentration, of that economic sector.

Figure 2: Local wage distributions, by year, economic sector and province

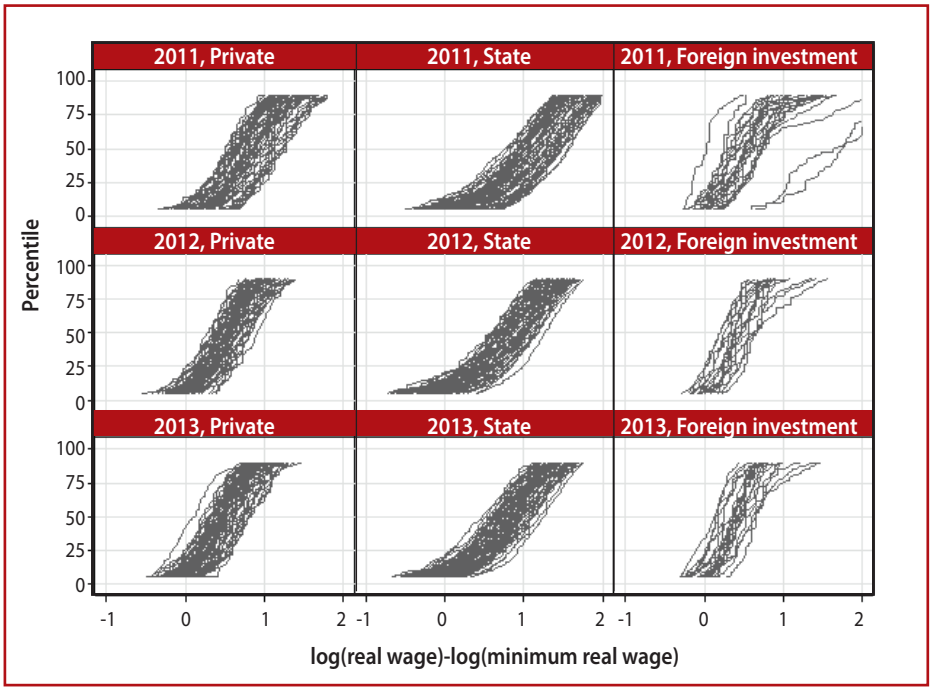


Figure 2 plots the 444 local wage distributions by year, economic sector, and province. Each line in the nine plots represents the empirical cumulated density function of a local log-wage distribution. The percentiles are given along the second axis (from 5 to 90 per cent) while the first axis gives the real log-wage. We have subtracted the relevant real minimum log-wage from all real log-wages to show the wage levels relative to the relevant minimum wage. The plots therefore also illustrate the degree of non-compliance in local labour markets. Several local distributions have a lower tail with wages below the minimum wage in all three economic sectors and the number of distributions increases from 2011 to 2012 in accordance with the individual data, as illustrated in Figure 1. Moreover, in 2012 and 2013 we find wages below the minimum wage for percentiles up to 20 per cent in the private and state sectors and for even higher percentiles in the foreign investment sector. This illustrates that non-compliance is not concentrated in a few provinces. Finally, Figure 2 also illustrates that the median wages in all local labour markets in the formal sector are above the relevant minimum wage.

Figure 3: Effective minimum log-wages, by year, economic sector, and province

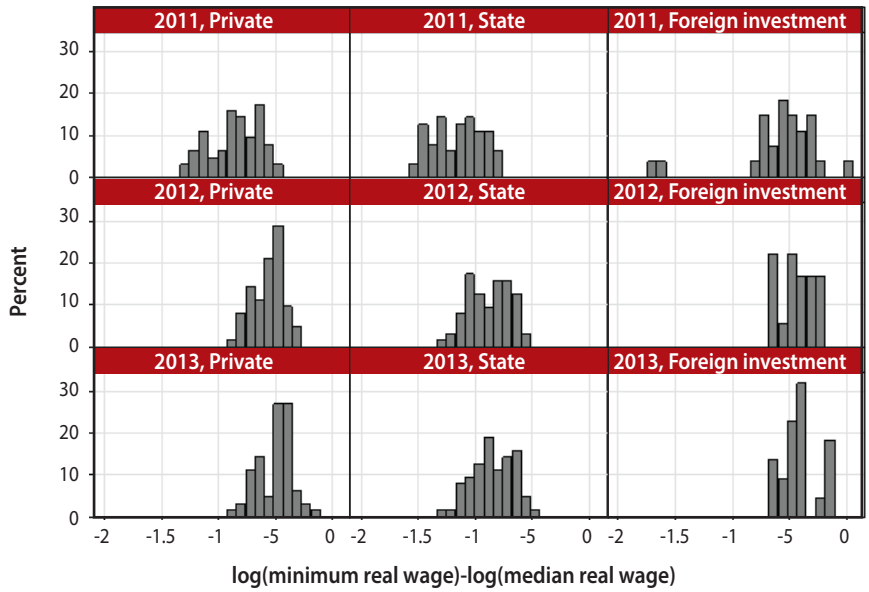


Figure 4: Effective minimum wages conditional on fixed factors and additional controls, by year, economic sector, and province

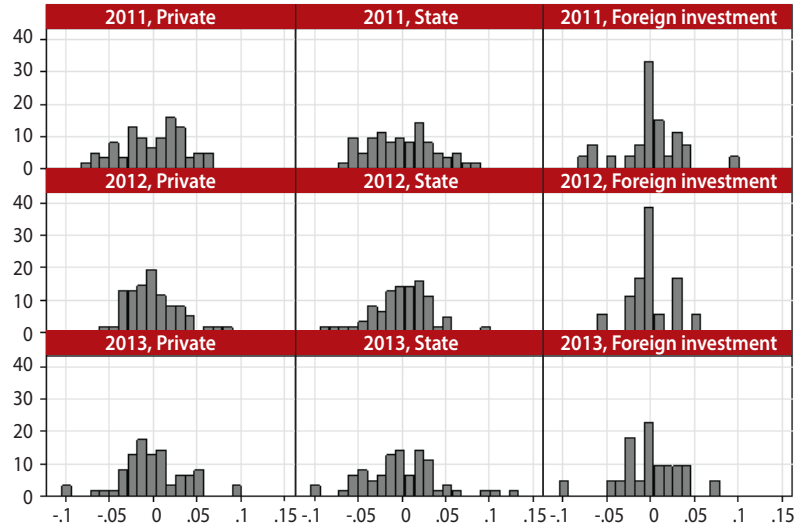


Figure 3 gives histograms of the effective minimum log-wage (the minimum log-wage less the median log-wage) across years, economic sectors and provinces. This is the central explanatory variable in the analysis. The increase in the effective minimum wage is clearly visible for the private sector and the state sector while the increase is much smaller in the foreign investment sector. It should be noted, however, that when we estimate the effect of the minimum wage change we condition on time, economic sector, and province fixed effects, including their interactions. This means that a very large fraction of the variation in the effective minimum wages is controlled for. The transformation of the effective minimum wage is illustrated in Figure 4 in which we present histograms of the effective minimum wage, conditional on fixed factors and the other covariates.[21] Figures 3 and 4 are comparable and the scale shows that the range (and variance) of the effective minimum log-wages is reduced by a factor of 10. Further, Figures 3 and 4 show that the two extreme observations in the foreign investment sector in 2011 (also visible in Figure 2) appear well accounted for by the fixed factors.

[21] In addition to the time, economic sector and province fixed factors we also condition on gender (share of female workers), average age, share of minority workers, share of urban workers, level of education (11 education categories), degree of worker tenure (4 tenure categories) and type of occupation (10 occupation categories).

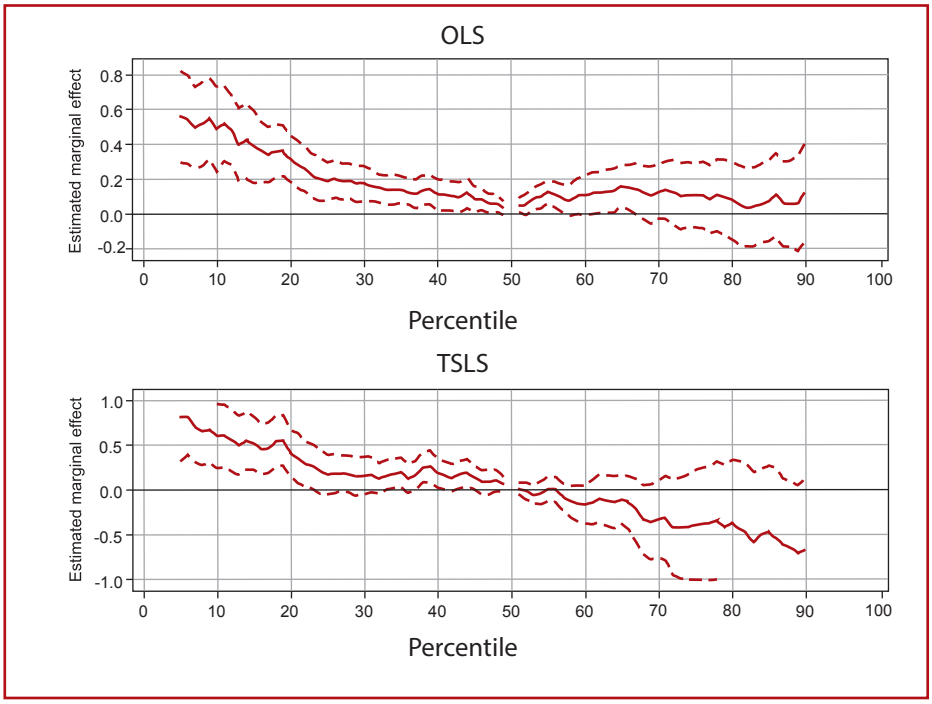
Table 2: Estimated impact of effective minimum wages on local wage distributions in the formal sector

	OLS		TSLS	
Percentile	**Marginal effect**	**s.e.**	**Marginal effect**	**s.e.**
w(5)-w(50)	0.560 ***	(0.135)	0.816 ***	(0.253)
w(10)-w(50)	0.485 ***	(0.126)	0.599 ***	(0.183)
w(20)-w(50)	0.318 ***	(0.069)	0.414 ***	(0.131)
w(30)-w(50)	0.173 ***	(0.051)	0.162	(0.107)
w(40)-w(50)	0.111 **	(0.047)	0.192 **	(0.085)
w(60)-w(50)	0.108 *	(0.058)	-0.161	(0.109)
w(70)-w(50)	0.129	(0.079)	-0.321	(0.220)
w(80)-w(50)	0.080	(0.114)	-0.362	(0.357)
w(90)-w(50)	0.122	(0.143)	-0.662	(0.403)

*Note: All regressions include province, economic sector and time fixed effects and the two-way interactions of the three fixed effects. The regressions also include controls for labor force composition in terms of age, gender, ethnicity, education, tenure and type of occupation. Standard errors are robust to heteroscedasticity, spatial and temporal clustering. *** Significant at the 1 per cent level; ** Significant at the 5 per cent level; * Significant at the 10 per cent level.*

Table 2 reports the estimated marginal effects of the effective minimum wages on selected quartiles of the local log-wage distributions while Figure 5 shows the estimated marginal effects by 1 percentage point intervals from the 5 per cent to the 90 per cent quartile. The regressions are as given in equation (9) and we report results of both ordinary least squares (OLS) and two-stage least squares (TSLS) regressions. We include the TSLS regressions because Autor et al. (2016) convincingly argue that the effective minimum log-wage may have measurement errors induced by the subtraction of the median real log-wage. In the TSLS regressions the minimum real wages (summarized in Table 1), interacted with province dummies, are used as instruments for the effective minimum wages.

Figure 5: Estimated effects of effective minimum wages on local wage distributions



Note: The lines are point estimates, by 1 percentage intervals (5 – 90 per cent). The dashed lines are upper and lower 95% point-wise confidence intervals.

The OLS estimates are positive, fairly large and significant for the lower half of the local log-wage distributions, yet generally insignificant for the upper part, indicating reduced local wage inequality. The TSLS estimates are slightly larger than the corresponding OLS estimates in the lower part of the distributions but, unsurprisingly, with larger standard errors. In the upper part of the distributions the TSLS point estimates are generally negative and clearly statistically insignificant. The larger TSLS point estimates in the lower part of the distributions are somewhat surprising considering that the instrumental variable estimation is expected to overcome a positive measurement error bias. In the upper part of the distribution, the OLS and TSLS results are in accordance with expectations.

Table 3: Estimated impact of effective minimum wages on local wage distributions in the formal sector using a quadratic function for the shape effect of the effective minimum wage

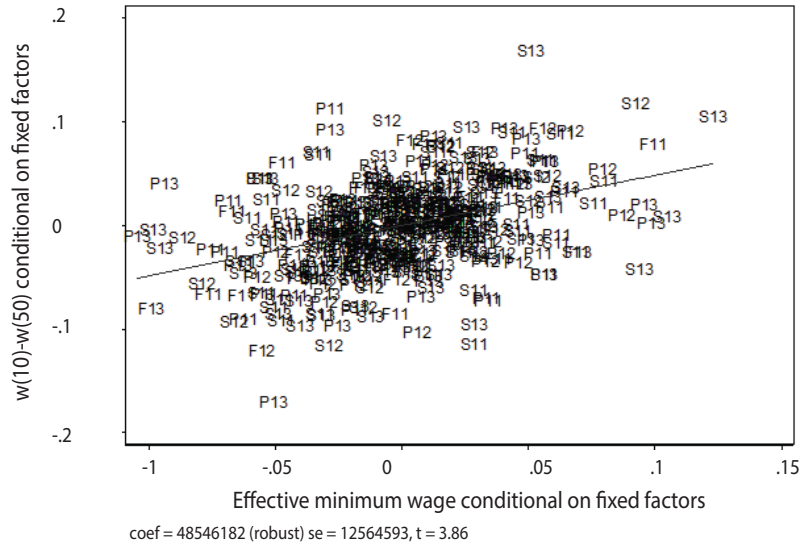
Percentile	Marginal effect	s.e.	Squared term	s.e.	Joint significance
Panel A: OLS					
w(5)-w(50)	1.370 **	(0.590)	0.236	(0.173)	0.000
w(10)-w(50)	1.128 **	(0.450)	0.187	(0.131)	0.000
w(20)-w(50)	0.652 **	(0.284)	0.097	(0.082)	0.000
w(30)-w(50)	0.194	(0.233)	0.006	(0.065)	0.004
w(40)-w(50)	0.531 ***	(0.192)	0.122 **	(0.055)	0.004
w(60)-w(50)	0.069	(0.249)	-0.011	(0.067)	0.150
w(70)-w(50)	0.093	(0.318)	-0.010	(0.085)	0.239
w(80)-w(50)	0.365	(0.434)	0.083	(0.118)	0.647
w(90)-w(50)	-0.080	(0.672)	-0.059	(0.195)	0.677
Panel B: TSLS					
w(5)-w(50)	2.382 ***	(0.915)	0.493 *	(0.280)	0.001
w(10)-w(50)	1.649 **	(0.641)	0.331	(0.206)	0.000
w(20)-w(50)	0.731 *	(0.430)	0.100	(0.131)	0.004
w(30)-w(50)	-0.056	(0.299)	-0.069	(0.094)	0.290
w(40)-w(50)	0.541 *	(0.306)	0.110	(0.095)	0.025
w(60)-w(50)	-0.197	(0.325)	-0.011	(0.106)	0.296
w(70)-w(50)	-0.188	(0.551)	0.042	(0.178)	0.339
w(80)-w(50)	0.482	(0.971)	0.266	(0.306)	0.458
w(90)-w(50)	0.261	(1.262)	0.291	(0.426)	0.247

*Note: All regressions include province, economic sector and time fixed effects and the two-way interactions of the three fixed effects. The regressions also include controls for labor force composition in terms of age, gender, ethnicity, education, tenure and type of occupation. The marginal effect is evaluated at an effective minimum log-wage of -0.9, which is the average level across sectors and provinces in 2011. The column "Joint Significance" gives the p-values of Wald tests of joint significance of the linear and squared terms. Standard errors are robust to heteroscedasticity, spatial and temporal clustering. *** Significant at the 1 per cent level; ** Significant at the 5 per cent level; * Significant at the 10 per cent level.*

The results could possibly be driven by a misspecification of the functional form. Specifically, both Lee (1999) and Autor et al. (2016) model the shape effect using a quadratic form for the effective minimum wage while we use a linear specification. To illustrate that our results are not driven by such a functional form misspecification, Table 3 reports estimated marginal effects from regression models using quadratic forms for the same subset of quantiles as given in Table 2 with OLS estimates in Panel A and TSLS estimates in Panel B. The quadratic specification gives the same pattern of estimated marginal effects but the effects, evaluated at an effective minimum log-wage of -0.92 (the average over economic sectors and provinces in 2011) appear excessive. Furthermore, the quadratic term is insignificant at conventional levels of significance for almost all quartiles.

In Figure 6 we illustrate the association between the effective minimum wage and the ten per cent real log-wage quartile in a partial scatter plot in which the fixed factors and other co-variates have been conditioned upon. The regression line in Figure 5 is the marginal effect estimated by OLS as given in Table 2 and the individual observations are given economic sector indicators (P = Private, S = State, F = Foreign investment) and year indicators (11 = 2011, 12 = 2012, 13 = 2013). The partial scatter plot gives no indication of a non-linear association, thus supporting our linear specification.[22] Furthermore, there are no signs of major sector or year clusters.

Figure 6: Estimated impact of the effective minimum wage on the 10th percentile of the low-wage distributions



Note: Observation markers indicate economic sector (P = private, S = state, F = foreign investment) and year (11 = 2011, 12 = 2012, 13 = 2013). The regression line is the OLS regression.

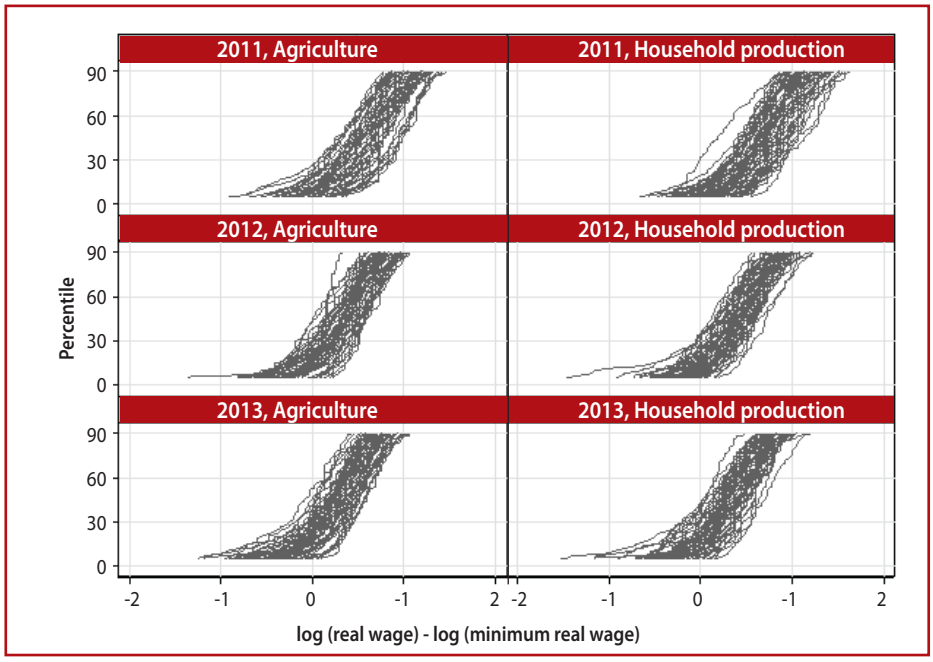
[22] Partial scatter plots for other quartiles give similar results.

In sum, we find the minimum wage changes to have had a significant statistical and economic impact on local wage distributions for workers employed in the formal sector. It is interesting to note that the impact is largest for the lowest segments of the distributions, indicating that increasing non-compliance does not imply that minimum wage changes have no impact on the lowest wages.

5.2. The impact of minimum wage changes on local wage distributions in the informal sector

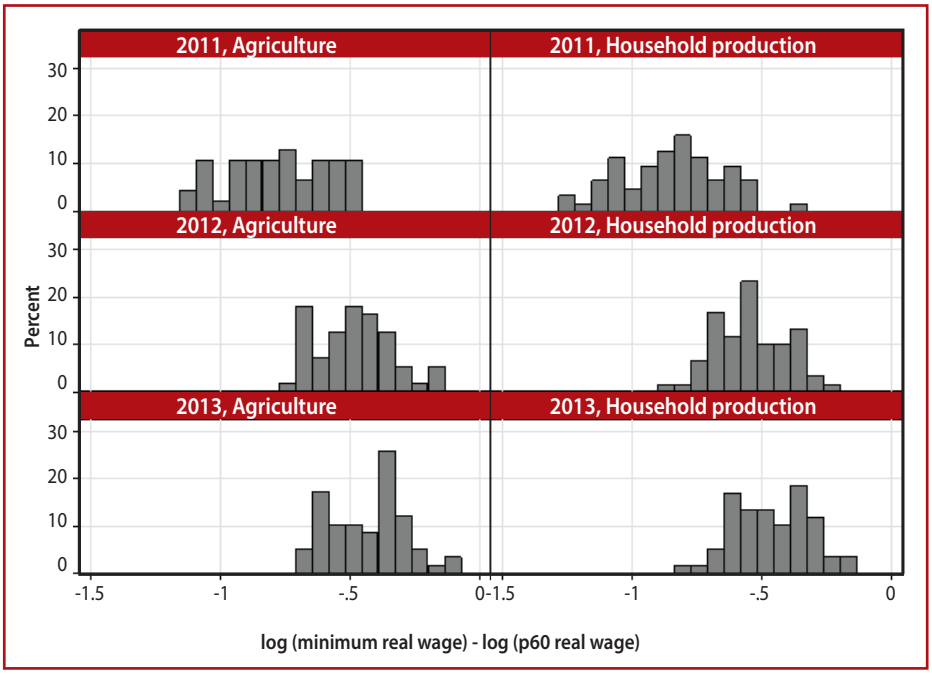
We also generate local wage distributions for the two informal economic sectors consisting of workers in agriculture and in the household production sector. Applying the criterion of having at least 100 individual observations underlying each local wage distribution we have a sample of 342 local distributions (out of 378 possible distributions). The missing distributions are predominantly for workers in agriculture.

Figure 7: Local wage distributions in the informal sector, by year, economic sector, and province



The local log-wage distributions for the two sectors, in which we have subtracted the formal private sector minimum log-wage from each observation, are given in Figure 7. That figure is directly comparable to Figure 2 and the differences are clearly visible: low wages are relatively more prevalent in the informal sectors and the local wage dispersion is larger in the two informal private sectors compared with the formal private sector. Furthermore, for several of the local distributions the median wage is below the minimum wage in 2012 and 2013. However, the 60 per cent quartile is larger than the minimum wage in all distributions. We use this observation to construct an effective minimum wage for the informal sector as the real minimum log-wage for the formal private sector less the 60th percentile log-wage in the local distributions. That is, we assume that the shape effect of the minimum wage is zero for the 60 per cent quartile, while the location effect may be different from zero. Histograms of the effective minimum log-wage for the informal sector are given in Figure 8. The pattern over time of the effective minimum wage in the informal sector indicates a somewhat smaller change in the location of the distributions compared to the formal sector, but this does not indicate anything about the possible impact on the shape of the distributions.

Figure 8: Effective minimum log-wages for the informal sector, by year, economic sector, and province



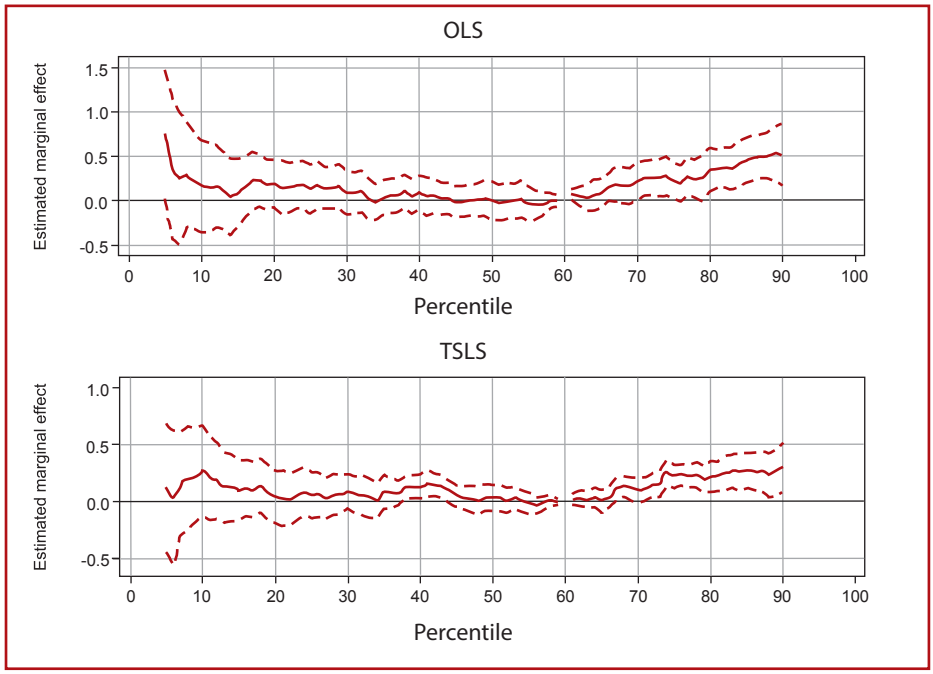
The estimated impact on the shape is reported in Table 4 and Figure 9. As for the formal sector analysis, we report point estimates for selected quartiles (Table 4) and estimated marginal effects by 1 percentage point intervals from the 5 per cent to the 90 per cent quartile (Figure 9).

Table 4: Estimated impact of effective minimum wages on local wage distributions in the informal sector

	OLS		TSLS	
Percentile	**Marginal effect**	**s.e.**	**Marginal effect**	**s.e.**
w(5)-w(60)	0.750 **	(0.372)	0.122	(0.289)
w(10)-w(60)	0.162	(0.265)	0.266	(0.204)
w(20)-w(60)	0.193	(0.137)	0.039	(0.119)
w(30)-w(60)	0.086	(0.127)	0.088	(0.077)
w(40)-w(60)	0.089	(0.099)	0.130 **	(0.055)
w(50)-w(60)	-0.001	(0.108)	0.033	(0.058)
w(70)-w(60)	0.211 *	(0.111)	0.097 *	(0.055)
w(80)-w(60)	0.340 ***	(0.128)	0.217 ***	(0.068)
w(90)-w(60)	0.513 ***	(0.180)	0.299 ***	(0.109)

*Note: All regressions include province, economic sector and time fixed effects and the two-way interactions of the three fixed effects. The regressions also include controls for labor force composition in terms of age, gender, ethnicity, education, tenure and type of occupation. Standard errors are robust to heteroscedasticity, spatial and temporal clustering. *** Significant at the 1 per cent level; ** Significant at the 5 per cent level; * Significant at the 10 per cent level.*

Figure 9: Estimated effects of effective minimum wages on local wage distributions in the informal sector



Note: The lines are point estimates, by 1 percentage intervals (5 – 90 per cent). The dashed lines are upper and lower 95% point-wise confidence intervals.

The OLS estimates show a fairly large and significant effect for the 5 per cent quartile, but insignificant results for all other quartiles in the lower tail (below w(60)). The large impact on the 5 per cent quartile is not confirmed by the TSLS regression, instead we find a statistically significant impact around the 40 per cent quartile. However, we think it is fair to conclude that the effective minimum wages in all likelihood has no systematic impact on the lower part of the local wage distributions in the informal sector.

In contrast, both estimators show a significant positive impact on the upper tail of the distributions, roughly from the 70 per cent quartile and upwards (to the 90th which is the upper most quartile we have included). The effect size is almost of the same order of magnitude as the impact on the lower tail quartiles in the formal sector. One possible interpretation of the result is that worker mobility between the formal and the informal sectors is larger for the relatively high wage workers in the informal sectors whereas the low wage workers in these sectors do not compete with low wage workers in the formal sectors. Unfortunately, our LFS data does not permit us to look closer at this hypothesis.

5.3. The impact of minimum wage changes on economy wide wage distributions

We use the estimated parameters from the local log-wage distributions to compute counterfactual estimates of the impact of the minimum wage changes on the national wage distributions. Following Lee (1999) we estimate counterfactual individual wages by adjusting for minimum wage changes from 2011 to 2012 and from 2011 to 2013. Specifically, we rank all individual observations according to the local percentile distributions within each year. We adjust the observed wage for individual *i* in province *j*, economic sector *k*, and year *t*, w_{ijkt}, by subtracting the estimated impact of the actual minimum wage and adding the estimated impact of the minimum wage as it was in 2011:

$$w^c_{ijk}(p) = w_{ijk}(p) - \hat{\beta}(w^m_{ijk} - w^m_{jks}),\ t = 2012, 2013; s = 2011 \quad (10)$$

We have two sets of impact estimates, using either the OLS or the TSLS coefficients, shown in Figures 5 and 9, and we estimate counterfactual individual wages using both sets of estimates.

The counterfactual wages estimated from (10) only include the shape effect of the minimum wages. As discussed in Section 4.1, the minimum wages also have a location effect such that the total effect of minimum wage changes may be different from the estimate in (10). Therefore we can estimate a total effect of the minimum changes as follows. First, notice that the change over time in the median log-wage is given by:

$$w_{jkt}(50) - w_{jks}(50) = (a_{jkt} - a_{jks}) + (b_{jkt} - b_{jks})z_{50} + (\theta_{jkt} - \theta_{jks})w^m_{jkt} + \theta_{jks}(w^m_{jkt} - w^m_{jks}),$$
$$t = 2012, 2013; s = 2011 \quad (11)$$

Here each term on the RHS represents the change over time in certain parts of the local log-wage distributions. The term in the first parenthesis is the pure location shift, covering general changes in productivity. The second term is the change over time in the dispersion parameter while third term is the change over time in the impact of a given minimum wage. If the first three terms are small relative to the minimum wage change (the fourth term), then the change in the median wage is a good estimator of the impact of the minimum wage change on the location of the wages. As the changes in the minimum wages were substantial from 2011 to 2012 (and 2013) while this short period probably had more limited changes in labour productivity and other location/scale changing factors, we believe the changes over

time in median wages over this short period are dominated by the location effect of the minimum wage changes. Thus, subtracting the median log-wage difference from the RHS of equation (10) we get an estimate of the total effect of the minimum wage changes from 2011:

$$w^c_{ijk}(p) = w_p(p)_{jkt} - \hat{\beta}\,(w^m_{jks} - w^m_{jkt}) - (w_{jks}(50) - w_{jkt}(50)), \quad (12)$$
$$\approx w^c_{jkt}(p) - \hat{\beta}_p(w^m_{jkt} - w^m_{jks}) - \theta_{jks}\,(w^m_{jkt} - w^m_{jks}), \quad t = 2012, 2013; s = 2011$$

Using the OLS and TSLS coefficients, we can now estimate four sets of counterfactual individual wages: Using equation (10) we only take account of the shape effect of the minimum wage change, while applying equation (12) we get total effects—possibly confounding the location effect with other local distribution location effects, though.[23]

[23] For the informal sectors we use the 60 per cent quartiles instead of the medians to estimate the location effect of the minimum wages.

Table 5: Inequality measures for actual and counterfactual national wage distributions

	2012					2013				
	Actual	OLS		TSLS		Actual	OLS		TSLS	
		Shape effect	Total effect	Shape effect	Total effect		Shape effect	Total effect	Shape effect	Total effect
Panel A: Gini coefficient (per cent)										
Formal sectors	28.5	30.7	31.3	30.7	31.4	28.1	30.9	31.7	30.8	31.6
Informal sectors	22.0	18.7	20.0	19.5	20.6	21.9	18.0	19.4	18.8	20.2
All Sectors	28.1	29.2	29.7	29.4	29.8	28.1	29.6	30.1	29.5	30.0
Panel B: Coefficient of variation (per cent)										
Formal sectors	57.3	60.8	61.8	60.8	61.8	57.0	61.4	62.7	61.0	62.3
Informal sectors	41.9	35.4	37.9	36.7	39.1	42.3	34.6	37.4	35.8	38.6
All Sectors	57.8	60.5	60.9	60.5	61.0	58.2	61.7	62.2	61.1	61.6

Note: Gini coefficients and coefficients of variation are estimated from individual LFS data using official survey weights. See the text for description of the computation of counterfactual wages.

We use the four sets of counterfactual wage estimates to generate 24 counterfactual national wage distributions, 12 distributions for each of the years 2012 and 2013 covering (i) formal sector wage employment, (ii) informal sector wage employment, and (iii) all wage employment. In Table 5 we report summary inequality statistics in the form of estimated Gini coefficients (Panel A) and coefficients of variation (Panel B). All estimates are based on wage measures at the individual level that are summarized using the original survey weights. Thus, the summary statistics are estimates of actual and counterfactual national measures.

As expected, the actual LFS data show that wage inequality is somewhat higher in the formal sectors compared to the informal sectors. But, at the same time it is interesting to note that the overall wage inequality, as measured by the Gini coefficient and the coefficient of variation, is close to the level of inequality in the formal sectors. Furthermore, we find almost no change in actual wage inequality from 2012 to 2013.

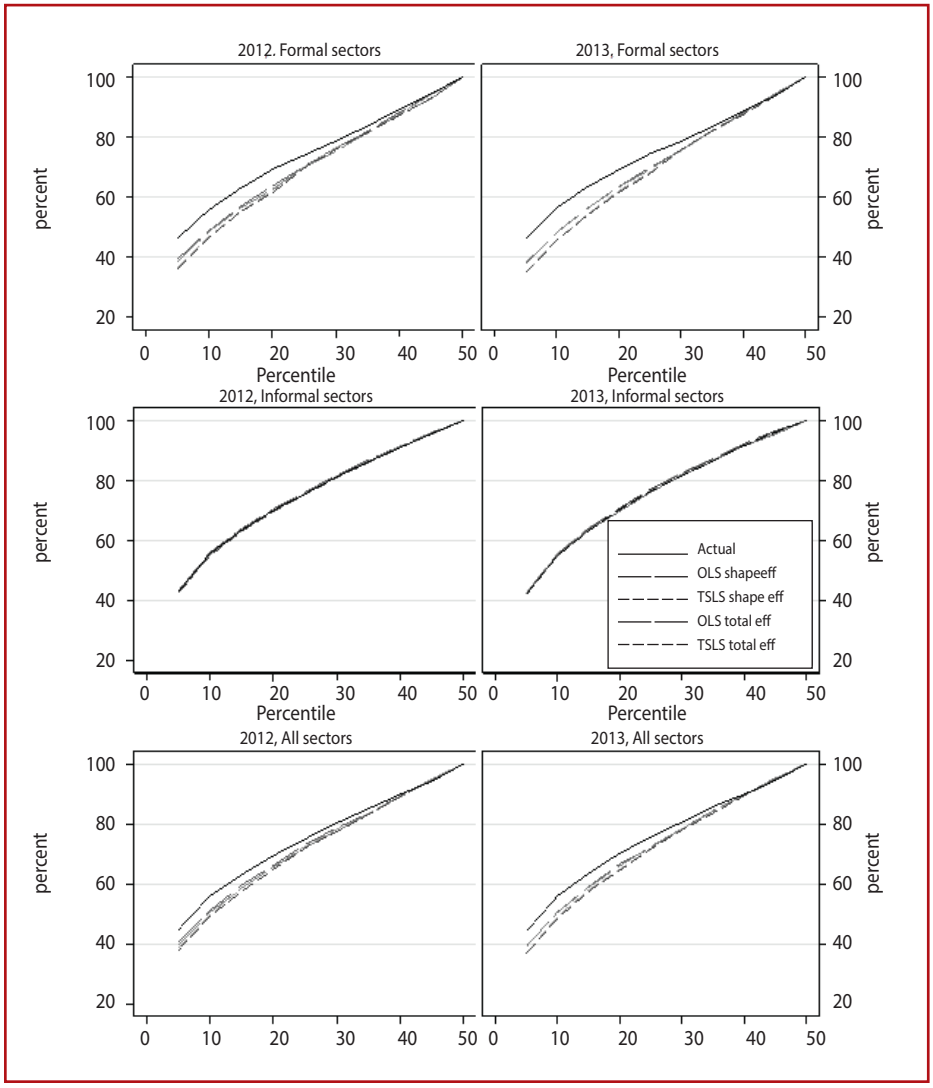
Comparing the actual inequality estimates to the counterfactual estimates we find that in the absence of the minimum wage changes from 2011 onwards, wage inequality would have been higher in the formal sectors (by around 2.5 Gini percentage points), but lower in the informal sector (by about 2 Gini percentage points). This result is to be expected, given the regression results for the local wage distributions. In addition, Table 5 shows that the choice of estimator (OLS or TSLS) has little qualitative impact on the result and also that the estimated total effect is close to the estimated shape effect for the formal sectors, while there is a slightly larger difference between the two effects for the informal sectors. We also find that the minimum wage changes have decreased overall wage inequality by about 2 Gini percentage points. This is quite a substantial difference in wage inequality. The coefficients of variation, given in Panel B of Table 5 confirms the conclusions obtained from the Gini coefficients, showing a completely parallel pattern of impacts on wage inequality.

Table 6: Selected percentile ratios of the actual and counterfactual national wage distributions

	2012					2013				
	Actual	OLS		TSLS		Actual	OLS		TSLS	
		Shape effect	Total effect	Shape effect	Total effect		Shape effect	Total effect	Shape effect	Total effect
Panel A: Formal sectors										
P(10)/P(50)	55.8	48.8	48.6	46.8	46.6	56.3	48.2	48.1	45.5	45.4
P(20)/P(50)	69.3	63.7	62.6	62.3	61.4	69.1	63.4	63.4	62.0	61.6
P(30)/P(50)	78.7	76.5	75.4	76.5	76.0	78.5	75.4	75.8	75.4	75.8
P(40)/P(50)	89.3	88.3	87.6	87.6	87.2	88.5	88.1	87.8	87.4	87.5
Panel B: Informal sectors										
P(10)/P(50)	55.7	56.1	55.3	55.8	55.0	55.0	55.7	55.4	55.3	54.9
P(20)/P(50)	70.0	70.6	69.9	70.1	69.6	69.8	70.7	70.8	70.1	70.3
P(30)/P(50)	81.2	81.8	81.3	81.4	81.0	81.7	82.6	82.4	82.1	81.6
P(40)/P(50)	91.0	91.4	91.4	91.1	91.0	91.6	92.2	92.2	91.7	91.6
Panel C: All sectors										
P(10)/P(50)	56.0	51.1	50.5	49.7	49.1	55.9	50.5	50.5	49.0	48.4
P(20)/P(50)	69.4	66.2	65.6	65.7	64.8	70.2	66.6	65.9	64.8	64.4
P(30)/P(50)	80.3	78.7	77.7	78.1	77.4	80.6	78.4	78.3	78.1	77.9
P(40)/P(50)	89.8	89.4	89.0	89.4	89.1	89.8	89.6	89.8	89.5	89.3

Note: All percentile ratios are estimated from individual LFS data using official survey weights. See the text for description of the computation of counterfactual wages.

Figure 10: Percentile ratios (P(x)/P(50)) of actual and counterfactual national wage distributions



In Table 6 and Figure 10 we focus on the lower part of the national wage distributions, by concentrating on quartile ratios (in per cent). For example, P(10)/P(50) is the 10/50 wage ratio, giving the wage level at the bottom 10th per cent divided by the median wage (in per cent). As seen in Table 6, in 2012 the national 10/50 wage ratio covering all sectors was 56 per cent while it decreased (ever so slightly) to 55.9 per cent in 2013. Thus, the wage level at the bottom 10 per cent was around 56% of the median wage in both years.

If there had been no change in the minimum wages from 2011 to 2012 and 2013, we estimate that the ratio would have been as low as 46-48 per cent in the formal sector, depending on the specific estimate. This is a substantial difference (8-10 percentage points) illustrating that the minimum wage changes have had a marked impact on the lower part of the national formal sector wage distribution. Table 5 and Figure 10, in which the counterfactual distributions are given by 5 percentage point intervals, both show that the choice of estimator (OLS or TSLS) has little impact on the result and also that the estimated total effect is close to the estimated shape effect. Thus, regardless of the choice of estimator we obtain results that are, economically, of the same order of magnitude, and the order of magnitude is substantial. Furthermore, the impact is noticeable also at the 20 per cent quartile, as the difference between the actual and the counterfactual distributions is around 5-8 percentage point.

For the informal sectors the results are quite different as we find virtually no change in the lower part of the wage distributions in 2012 and 2013 (see Panel B in Table 6 and middle section of Figure 10). Thus, the increase inequality noticed in Table 5 comes about from higher counterfactual wages in the upper part of the national distribution.

Finally, looking at the actual and counterfactual wage distributions for all sectors in Panel C of Table 5 and the lower part of Figure 10, we get results that are quite similar to the formal sector. Compared to the 8-10 percentage points difference between the actual and the counterfactual 10/50 ratio for formal sector wages we find a difference around 5-7 percentage points when looking at wages in all sectors. As the informal sectors account for some 38 per cent of the wage workers in Viet Nam the result is slightly surprising. However, the overall difference in the wage levels between the formal and the informal sectors has a fairly large impact on the median wage levels. The median real wage in the formal sector is VND2.971 million in 2012 while it is only VND2.288 million (more than 20 per cent lower) in the informal sector. The overall median real wage is VND2.654 million, thus when we look at wage inequality, by comparing the lower tail to the median wage level, both the nominator and the denominator changes when we compare wage inequality in the formal sector and all sectors. Overall, we thus find that the minimum wage changes from 2011 to 2012 and 2013 had a noticeable impact in terms of substantially decreasing the national wage inequality and the decrease in inequality mainly came about from increases in the lower part of the wage distribution. Still, the minimum wage changes did, in all likelihood, not increase the low wages in the informal sector.

6 Conclusion

Under central planning, the Vietnamese Government purposely maintained an egalitarian income distribution. But from the time of the initiation of reforms (doi moi) in 1986 and subsequent restructuring of the state sector wage system, remuneration of both (domestic) state and private sector workers has, in theory, been left to market forces. As such and in the context of growing global competition one of the objectives of the minimum wage is to protect the incomes of the most vulnerable workers. Although real wages have been growing steadily, with the exception of a slight dip following the economic crisis, there is also evidence of rising income inequality both along the rural/urban divide and within localities. However, solid evidence on the extent to which the imposed wage floor has had any distributional impact remains limited. In this paper, we set out to estimate the effect of changes in (real) minimum wages on the shape of the income distribution using Vietnamese Labour Force Survey data from 2011-2013, a period during which minimum wage increases were particularly high, due mainly to the merging of minimum wage rates applied to domestic and foreign firms in 2012.

We find that minimum wages have reduced wage inequality in the formal sectors by increasing the wages at the lower end of the distribution while it has increased wage inequality in the informal sectors by increasing the wages at the upper end of the distribution. The overall effect has been a significant decrease in wage inequality, though.

Focussing on the impact on wages at the lower end of the distributions we find that the wage level at the bottom 10 per cent was around 56 per cent of the median wage in 2012 and 2013. We estimate that these ratios would have been as low as 50 per cent, had there been no change in the minimum wages from 2011, onwards. This is a substantial difference. Furthermore, the impact is noticeable also at the 20th percentile, as the difference between the actual and the counterfactual distributions is around 3-6 percentage point. The impact of minimum wage changes thus appear to affect wages both below and above the minimum wage level in Viet Nam, indicating (i) that non-compliance does not imply non-impact and (ii) that substantial spill-over effects are present in the Vietnamese labour markets.

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The impact of minimum wage adjustments on Vietnamese wage inequality

In line with the global trends, Viet Nam has seen major improvements in its minimum wage policy and system in recent years. Before 2012, Vietnam's had a two tier system with differing minimum wage rates for domestic enterprises and foreign enterprises, which were fixed by the government. The establishment of the tripartite National Wage Council in 2013 has transformed Vietnam's minimum wage system by merging two minimum wage rates into a single rate with regional differentiation as well as providing for tripartite participation in developing minimum wage recommendations.

This working paper is timely, as there is a growing need to examine the impact of minimum wages on the labour market. In this publication, the authors highlight the impact of minimum wage changes in the distribution of wages in the informal and other sectors. In this respect, an improvement in income distribution for a large proportion of the employed population is emerging. However, due to some structural characteristics in the rural sector as well in household production, the "light-house" effect of the minimum wage that is evident in minimum wages in other developing countries, apply here only for those in the upper layer of the informal sector.

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ISBN: 978-92-2-128941-8 (print)
978-92-2-128942-5 (web PDF)