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How Does Decentralised  
Minimum-Wage Setting  
Affect Unemployment  
and Informality? The Case  
of Indonesia

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## ABSTRACT/RESUME

### **How does decentralised minimum-wage setting affect unemployment and informality? The case of Indonesia**

The Indonesian labour market is characterised by widespread informality. To some extent, these outcomes can be attributed to a sharp increase in the real value of the minimum wage since 2001, when minimum-wage setting was decentralised to the provincial governments. To test this hypothesis, this paper uses survey data on the labour market (*Sakernas*), household income and expenditure (*Susen*) and the industrial sector (*Survei Industri*) to construct a district-level dataset spanning the period 1996 to 2004. The effects of changes in the minimum wage on unemployment, formal-sector employment and the incidence of informality in urban areas are estimated separately by fixed effects and jointly by a seemingly unrelated regression (SUR) estimator. Our findings show that an increase in the minimum-to-mean wage ratio is associated with a net increase in employment: a rise in informal-sector employment more than compensates for job losses in the formal sector. This Working Paper relates to the 2008 *OECD Economic Assessment of Indonesia* ([www.oecd.org/eco/surveys/indonesia](http://www.oecd.org/eco/surveys/indonesia)).

*JEL codes:* J23; J31; J64

*Keywords:* Indonesia; minimum wage; informality; employment; unemployment

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### **Comment la décentralisation de la fixation du salaire minimum affecte le chômage et l'informalité ? L'expérience de l'Indonésie**

Le marché du travail indonésien est caractérisé par une importante informalité. Dans une certaine mesure, ces résultats peuvent être attribués à une forte augmentation de la valeur réelle du salaire minimum depuis 2001, quand la fixation du salaire minimum a été décentralisée vers les provinces. Pour tester cette hypothèse, ce document utilise les données des enquêtes sur le marché du travail (*Sakernas*), sur les revenus et les dépenses des ménages (*Susen*) et sur le secteur industriel (*Survei Industri*) pour construire une base de données au niveau des administrations locales pour la période entre 1996 et 2004. Les effets de l'évolution du salaire minimum sur le chômage, sur l'emploi du secteur formel et sur l'informalité urbaine sont estimés séparément par un modèle à effets fixes et conjointement par SUR. Nos résultats suggèrent qu'une augmentation du ratio salaire minimum/salaire moyen entre 1996 et 2004 est accompagnée d'une nette augmentation de l'emploi : une augmentation de l'emploi du secteur informel a plus que compensé les pertes d'emploi du secteur formel. Ce Document de travail se rapporte à l'*Évaluation économique de l'OCDE de l'Indonésie, 2008* ([www.oecd.org/eco/etudes/indonesie](http://www.oecd.org/eco/etudes/indonesie)).

*Classification JEL :* J23 ; J31 ; J64

*Mots clés :* Indonésie ; salaire minimum ; informalité ; emploi, chômage

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## HOW DOES DECENTRALISED MINIMUM-WAGE SETTING AFFECT UNEMPLOYMENT AND INFORMALITY? THE CASE OF INDONESIA

By  
Margherita Comola and Luiz de Mello<sup>1</sup>

### 1. Introduction

Indonesia is a very interesting case for empirically testing the impact of minimum-wage legislation on employment and informality. The country went through a process of fiscal decentralisation in 2001 that, among other things, devolved minimum-wage setting responsibilities to the provinces and local governments. Devolution was followed by a sharp increase in the real value of the minimum wage to about 65% of the median wage in 2004, far exceeding labour productivity gains. Previous empirical literature suggests that this minimum-wage hike is among the main culprits for persistent unemployment since the 1997-98 financial crisis (SMERU, 2001; Suryahadi *et al.*, 2003).

It is not easy to gauge empirically the effects of changes in the minimum wage on labour-market outcomes. Job losses tend to be stronger the higher the minimum wage in relation to average earnings and the sharper its increase over time. But other labour-market characteristics, such as the prevalence of informality, which accounted for close to 70% of urban employment in 2004, are likely to also play a part. To shed light on this issue, we constructed a dataset using survey data on the labour market (*Sakernas*), household earnings and expenditure (*Susenans*) and the industrial sector (SI, *Survei Industri*) for 1996-2004, thereby spanning the pre- and post-decentralisation periods. In particular, we investigate whether or not – and, if so, the extent to which – an increase in the minimum-to-mean wage ratio drives urban workers out of the formal sector and into informality. This displacement effect would be consistent with the predictions of standard dual-economy models of labour market segmentation (Welch, 1976; Gramlich, 1976; Mincer, 1976; Brown, Gilroy and Kohen, 1982).

This study contributes to the existing literature in two main ways: *first*, we build a panel using the local governments, rather than the provinces, as the units of observation, while all previous literature focuses on provincial data (Rama, 2001; Suryahadi *et al.*, 2003). *Second*, to our knowledge, this is the first paper to estimate jointly the effects of the minimum wage on formal-sector employment, informality and unemployment using seemingly unrelated (SUR) techniques. Previous empirical work for Indonesia and other developing countries have estimated the effect of the minimum wage on labour-market outcomes separately. In doing so, they ignore the interdependencies that exist among these outcomes in response to

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changes in the minimum wage. Our estimating strategy therefore accounts for the presence of such interdependencies.

Our main finding is that an increase in the relative value of the minimum wage is associated with higher informality and lower formal-sector employment, which is in line with previous empirical evidence for Indonesia. Also, an increase in the minimum-to-mean wage is associated with a decrease in “queuing unemployment”, a phenomenon that takes place when individuals faced with a job loss prefer to remain unemployed while “queuing” for a formal-sector job, instead of working informally. A more interesting finding is perhaps that a minimum-wage hike is associated with a net increase in total (formal and informal) employment: the increase in informal-sector employment more than offsets the corresponding loss of jobs in the formal sector. This finding is consistent with the “lighthouse effect”, described by Neri, Gonzaga and Camargo (2001) in the case of Brazil, which we also find for Indonesia, whereby informal-sector earnings rise in tandem with the minimum wage, thus attracting inactive workers into the labour market.

The paper is organised as follows. Section 2 reviews the literature on the impact of the minimum wage on employment in both developed and developing countries. Section 3 describes the data used in the empirical analysis, discusses labour-market trends and summarises the main institutional features of minimum-wage setting in Indonesia. Section 4 elaborates on the estimating strategy and reports the empirical findings for the entire working-age population and, separately, for males and females. Section 5 concludes.

## **2. Literature review**

Minimum-wage legislation is meant to protect vulnerable workers by ensuring that low pay is consistent with the satisfaction of basic living standards. Nevertheless, it can be argued that, to the extent that the minimum wage destroys jobs, it harms, rather than protects, workers whose attachment to the labour force is weak. If the minimum wage is set above its market-clearing level, job losses are likely, because it induces a shift in labour demand away from unskilled to skilled labour, and, where possible, from the formal to the informal sector.

### ***Developed countries***

Neoclassical theory suggests that, in a perfectly competitive labour market with homogeneous labour and full compliance with minimum-wage legislation, setting the minimum wage above its market-clearing level would be equivalent to a negative labour-demand shock, which would lead to job losses (Stigler, 1946). The magnitude of the corresponding disemployment effect depends on the wage elasticity of labour demand and the elasticity of substitution between skilled and unskilled labour. However, in a non-competitive environment, the minimum wage may have a positive, rather than negative, effect on employment. This is especially the case where firms have discretion in wage setting (“monopsonistic employer”) or if employers set wages above their equilibrium level to induce workers to be more productive (Rebitzer and Taylor, 1995).

Empirical studies have in general failed to validate the predictions of the neoclassical model. The empirical literature has focused on developed countries, in particular the United States and Europe (see Dolado *et al.*, 1996, and Brown, 1999, for surveys). The first generation of studies (surveyed by Brown Gilroy and Cohen, 1982) used time-series techniques and found the expected negative relationship between the minimum wage and employment, in particular for teenagers, whose attachment to the labour force is particularly tenuous. However, the time-series approach was criticised subsequently on the grounds that it does not allow for appropriately disentangling the effects of the minimum wage on employment from those of unobserved changes in macroeconomic conditions.

To overcome these difficulties, a second generation of empirical studies relied predominantly on survey-based data. This literature finds much weaker evidence of a disemployment effect associated with the minimum wage. A few longitudinal studies show that vulnerable individuals, such as youths, are more likely to be unemployed after a rise in the statutory minimum wage (Neuman and Wascher, 1995; Currie and Fallick, 1996; Bazen and Marimoutou, 1997). But in many cross-sectional studies the estimated employment elasticity of the minimum wage is statistically insignificant or even positive (Card, 1992; Card and Kruger, 1995; Neuman and Wascher, 1992; Bell, 1997; Bazen and Skourias, 1997; Burkhauser, Couch and Wittenburg, 2000; Neuman and Wascher, 2004). A positive employment elasticity would be consistent with the prediction of non-competitive models.

### *Developing countries*

The literature on how the minimum wage affects employment in developing country is rather limited. The conventional theoretical framework is that of a dual economy, where the formal sector behaves as in the neoclassical model (*i.e.* employment falls in response to a minimum-wage hike), and minimum-wage provisions do not apply in the informal sector (Welch, 1976; Gramlich, 1976; Mincer, 1976; Brown, Gilroy and Kohen, 1982). In this setting, an increase in the minimum wage reduces employment in the formal sector and increases informality, because the displaced workers from the formal sector are absorbed into the informal sector. The net employment effect depends on the elasticity of labour supply (because workers may drop out of the labour force, instead of seeking an informal-sector job) and demand and the size of the informal sector.

The bulk of empirical studies available to date use Latin American data. As in the case of developed countries, evidence of a discernible negative effect of minimum-wage hikes on employment is mixed. For example, Bell (1997) reports a strong disemployment effect for Colombia in the 1980s, when the real value of the minimum wage rose substantially, but not for Mexico, on the basis of industrial- and employment-survey data for each country. Maloney and Nuñez (2004) also find a negative employment effect in both the formal and the self-employed sectors in Colombia. Bosch and Manacorda (2007) find no effect for the overall employment rate, although some workers who had previously been employed in the informal sector are shown to find jobs in the formal sector. Their results are nevertheless not robust econometrically and fail to control for evolving macroeconomic conditions. Evidence is also available for Costa Rica. Gindling and Terrell (2007) report a negative employment effect in the formal sector, but El-Hamidi and Terrell (2002) find a positive employment effect for formal-sector workers and no effect for the self-employed on the basis of household-survey data, although the authors do not control for other determinants of employment or the presence of interactions between formal- and informal-sector employment.

The case of Brazil is instructive of the need to take wage setting in the informal sector into account when estimating the impact of the minimum wage on employment. Using household-survey data, Neri, Gonzaga and Camargo (2001) show that the minimum wage truncates the earnings distribution in the informal sector, but not in the formal sector, as predicated by standard dual-economy models. To some extent, this effect is also observed in Mexico on the basis of household-survey data (Fairris *et al.*, 2005). These findings suggest that the interactions between the formal and informal sectors in response to changes in the minimum wage may be more complex in practice than in theory. Based on employment-survey data, Lemos (2006) finds no evidence of an adverse employment effect associated with the minimum wage in the formal and informal sectors, while Foguel, Ramos and Carneiro (2001) report a negative effect in the formal sector and a positive effect in the informal sector on the basis of time-series data.



*The case of Indonesia*

There is a small literature on Indonesia using pooled provincial data to evaluate the response of formal- and informal-sector employment to changes in the minimum wage. Alatas and Cameron (2003) studied the impact of the minimum wage on total employment during 1990-96 using industrial-survey data. They used the difference-in-difference approach of Card and Krueger (1995) to exploit variations in the level of the minimum wage between the provinces of Jakarta and West Java. Their estimated disemployment effect is small, if at all significant, and depends on firm type and size. Islam and Nazara (2000) also report very weak evidence in favour of the disemployment hypothesis. By contrast, the results presented in SMERU (2001) point to a negative elasticity for total urban employment, which is larger for females than males, youths than older workers, and among lower-skilled individuals.

Rama (1996) uses pooled industrial-survey data at the provincial level to estimate the impact of the minimum wage on formal-sector employment during 1988-94. His findings suggest that doubling the minimum wage leads to a 0-5% decrease in formal-sector employment. An increase in the minimum wage is also shown to lead to a rise (fall) in employment in large (small) firms. In a different context, Bird and Manning (2002) use employment-survey data to estimate the impact of minimum-age increases on the allocation of employment between the formal and the informal urban sectors. They regressed the ratio of informal-to-formal sector employment on the real minimum wage for a pool of 20 provinces during 1990-2000. Their findings suggest that employment shifted towards the informal sector after the 1997-98 financial crisis.

### 3. An overview of the Indonesian labour market and minimum-wage provisions

#### *Data*

##### *Main sources*

Our dataset is based on different surveys of individuals, households and industrial firms available from the Indonesian Statistics Bureau (*Badan Pusat Statistik*, BPS). Our main data source is the National Labour Force Survey (*Sakernas*), which started to be collected in 1976 and focuses on the socio-economic and labour-market characteristics of individuals and households. Annual waves of *Sakernas* cannot be treated as a panel, but rather as large-scale repeated cross-sections. We focused on five waves (1996, 1998, 2000, 2002 and 2004), including an average of 204 thousands individuals per wave (a minimum of 99 thousand individuals were surveyed in 1998 and a maximum of 275 thousand individuals were surveyed in 2002).

Employment status is reported in *Sakernas* as follows. Each household member belonging to the working-age population<sup>2</sup> is classified as inactive, employed or unemployed depending on his/her status during the week prior to data collection.<sup>3</sup> Employed individuals are classified as salaried workers (employees), employers, self-employed or family/unpaid workers. Information on earnings is available only for salaried workers.

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2. The working-age population is defined as those aged at least 10 years until 1997 and at least 15 years from 1998. In our analysis we restricted the sample to individuals aged 15-65 years throughout the sample period.

3. All individuals who were working during the previous week (or only temporarily out of work despite having a job) were classified as workers. We treated respondents as unemployed if they declared to be out of work and to be looking for a job.

The *Sakernas* classification allows for a definition of informality based on employment status. Of course, there is no universally accepted definition; in some countries, informality is measured on the basis of compliance with social-security legislation. In others, it is defined according to a worker's labour-market status and occupation. Since a definition of informality based on social security coverage is unfeasible for Indonesia, in our baseline definition we treat as informal-sector workers all individuals who are self-employed, employers or family/unpaid workers. Thus, in our baseline definition, only salaried workers are considered to work in the formal sector. This definition is consistent with that used in previous empirical literature for Indonesia (surveyed above) and by BPS. Nevertheless, to test the robustness of our findings, we also re-estimated the baseline regressions using an alternative definition of labour informality, which treats all agricultural workers as informal, regardless of whether they are salaried workers or not. Based on *Sakernas* data, 14 and 20% of salaried workers in 1996 and 2004, respectively, declared to be working in agriculture. According to this alternative definition, the formal sector includes non-agricultural salaried workers only.

Since *Sakernas* does not include information on earnings for non-wage employment, we used the National Socio-Economic Survey (*Susenas*) to compute a proxy for informal-sector earnings. *Susenas* is an annual multi-purpose repeated cross-section survey that contains information on socio-economic, labour, demographic and health status characteristics of around 200 thousand households (over 900 thousand individuals). The core questionnaire is supplemented every year by a specific-purpose module covering about 60 thousand households on a topic that is covered at regular intervals. Information is available in the core module at the individual level and in the specific-purpose module at the household level. We focused on the "household income and expenditure" module, which is surveyed every three years. This module contains information on non-wage income at the household level (*i.e.* total household income from non-wage agricultural/non-agricultural activities). We used the information available for 1996, 1999, 2002 and 2005 to construct a proxy for district-level non-wage income.

Finally, we used data from the Industrial Survey (SI, *Survei Industri*) to compute a measure of district-level labour productivity. SI is an annual panel survey of all manufacturing establishments with twenty or more employees, or about 22 thousands establishments per year during our period of analysis. We used information available for 1996, 1998, 2000, 2002 and 2004.

#### *Construction of district-level indicators*

Our empirical analysis puts emphasis on local governments, rather than provinces, individuals or households, as the units of observation. Local governments can be regencies (*kabupaten*) or cities (*kota*). The main differences between these jurisdictions are related to demographic and economic structure, rather than administrative hierarchy: regencies tend to be larger in area than cities, and non-agricultural activities are typically more prevalent in cities. However, there are rural and urban areas in both regencies and cities. In what follows, we use the term "district" more generally to refer to both regencies and cities. The districts have their own administrative and legislative bodies, and decentralisation since 2001 has put them at the helm of service delivery, especially in health care and education.

Changes in Indonesia's administrative structure over the years poses considerable challenges for the computation and comparability of district-level data. In 2004 Indonesia was divided into 33 provinces, 349 regencies and 91 cities. Between 1996 and 2004, the province of East Timor became independent and 7 new provinces and 146 new districts were created by splitting the existing ones. In order to construct our district-level panel, we matched the districts surveyed in *Sakernas* during 1996-2004 using the official district codes published by BPS.<sup>4</sup> Whenever a district was split into two or more new regencies/cities during 1996 and 2004, and only one of these new jurisdictions kept its original name, we considered the

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4. Available from <http://www.bps.go.id/mstkab/index.html>.

new regencies/cities all together as a unique observation and computed the relevant indicators for the years after the split by population-averaging the data across the new districts. Based on this matching procedure, and focusing on the districts with non-zero urban population, we obtained an unbalanced panel of 293 districts for five years, or about 1 151-1 114 observations across specifications.

### ***Labour-market trends***

Before turning to the estimations, basic labour-market indicators are reported in Table 1. The labour-force participation, employment, unemployment and informality rates were computed on the basis of individual-level *Sakernas* data for 1996 and 2004 (the indicators are available for the intermediate years upon request).

The indicators show that labour-force participation has been fairly stable over time at about two-thirds of individuals aged at least 15 years. Participation is higher in rural than urban areas, reflecting the tendency for all household members to work in family plots. In addition, labour supply is higher for males than females and tends to rise with educational attainment.

Labour demand patterns are comparable to those of labour supply. Employment tends to be higher for males than females, for residents of rural areas than urban dwellers and among prime-age individuals than youths and elderly workers. As for unemployment, it is particularly high for youths, workers with secondary education and women. It increased substantially during 1996-2004, albeit from a small base, for older workers and for the least educated individuals (*i.e.* those with no schooling). To a certain extent, high unemployment among the workers who would otherwise be best equipped to find a job in the formal sector (*i.e.* those with tertiary education) suggests that these individuals may not be willing to work in the informal sector. When faced with a job loss, they may prefer to wait for a formal-sector job, instead of working informally, so long as they can support themselves and their families in the meantime, a phenomenon that is often referred to as “queuing unemployment”.<sup>5</sup>

Finally, labour informality is widespread, at about 70% of the employed population in 2004. Informality is less widespread among men than women, workers living in urban than rural areas, and among prime-age and younger individuals. Unlike participation and employment in the formal sector, informality declines with educational attainment.

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5. The unemployment rates reported in Table 1 are comparable over time, because the same methodology is used for both 1996 and 2004. This is not the case of the statistics reported by BPS, which are affected by a methodological change in 2001. The new definition includes individuals who are preparing to launch a new business and those who are not in the labour force but willing to work. Inclusion of these discouraged job-seekers is thought to account for a large share of the increase in unemployment after 2001 (Sugiyarto *et al.*, 2006).

Table 1. Trends in labour-force participation, unemployment and employment, 1996 and 2004

In per cent

	1996				2004			
	Labour force participation	Employment	Unemployment	Informal sector <sup>1</sup> (Per cent of employment)	Labour force participation	Employment	Unemployment	Informal sector <sup>1</sup> (Per cent of employment)
<b>Total<sup>2</sup></b>	<b>66.1</b>	<b>62.6</b>	<b>5.3</b>	<b>65.4</b>	<b>65.0</b>	<b>60.7</b>	<b>6.7</b>	<b>69.6</b>
By gender								
Males	82.7	78.9	4.6	61.1	83.5	78.6	5.8	67.9
Females	49.9	46.7	6.5	72.5	46.7	42.9	8.2	73.0
By age								
15-24	50.9	42.6	16.4	57.7	50.0	39.0	22.1	60.1
25-54	76.5	74.7	2.4	64.1	74.2	71.8	3.2	68.5
55-64	66.1	65.9	0.3	83.3	63.5	63.1	0.6	88.3
65+	40.3	40.2	0.2	89.8	39.7	39.6	0.2	95.5
By residence								
Rural	71.7	69.4	3.2	77.2	69.8	67.1	3.9	86.4
Urban	58.8	53.8	8.6	45.7	60.1	54.2	9.9	48.7
By education								
No schooling	67.6	67.0	0.9	82.0	63.5	62.8	1.2	92.2
Primary	67.5	65.7	2.7	74.2	66.6	64.9	2.6	84.5
Lower secondary	51.4	47.9	6.9	62.6	55.9	51.7	7.5	72.2
Upper secondary	71.2	61.4	13.8	34.2	68.9	58.7	14.8	40.9
Tertiary	86.3	76.3	11.6	12.4	85.3	77.3	9.4	15.0

1. The informal-sector is defined as including all self-employed, employers and unpaid workers.

2. Refers to all individuals aged 15 years and above.

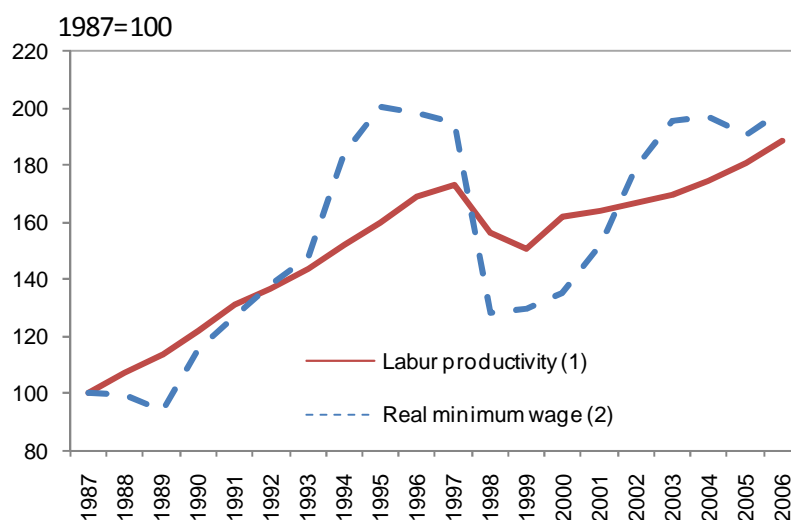
Source: Sakernas and authors' calculations.

### *Minimum-wage provisions and trends*

Minimum-wage provisions are applicable to regular, full-time work. The minimum wage is set on an annual basis at the sub-national level of government on the basis of an estimated cost of living indicator (KHL), which is used as an initial benchmark. This indicator was introduced in the late 1990s and is defined in terms of caloric intake. Since decentralisation in 2001, the level of the minimum wage has been calculated by the local governments and then proposed to the provincial government by a tri-partite wage council, including representatives from labour, government and the private sector. Typically, the lowest minimum wage proposed by the local governments in a given province is chosen by the provincial government. By contrast, prior to decentralisation, the minimum wage used to be set nationally by the central government on the basis of an estimated needs indicator (KHM),<sup>6</sup> which corresponds to a lower caloric intake benchmark than that implied by KHL (2 600 as opposed to 3 000 calories per day in the case of KHL).<sup>7</sup>

Of particular importance for the empirical analysis reported below is the increase in the real value of the minimum wage over time, especially during 2000-03. The minimum wage rose faster in real terms than value added per employee, especially during the 1990s and 2000-03 (Figure 1), and, as a result, it is very high in relative terms, at about 65% of the median wage in 2004. To put this relative value in perspective, the ratio of minimum-to-median wage was about 45% on average in the OECD area in 2004 (OECD, 2008).

Figure 1. Minimum-wage trends, 1987-2006



1. Defined as gross value added divided by total employment deflated by the GDP deflator.
2. Defined as the simple average of the province/district-level minimum wages deflated by the GDP deflator.

Source: Ministry of Manpower, World Bank (WDI database) and authors' calculations.

6. Until end-2000, there were different minimum wages within a few provinces (Riau, South Sumatra, West Java, East Java and Bali) and for selected sectors of activity.

7. For more information on minimum-wage setting, see SMERU (2001) and Widarti (2006).

#### 4. The effect of the minimum wage on formal-sector employment, informality and unemployment

##### *Estimating strategy*

Our empirical strategy is to estimate the impact of the minimum wage on the labour market by regressing the formal-sector employment, informality and unemployment rates on the minimum-to-mean wage ratio (the so-called Kaitz index). Our estimating equation is as follows:

$$Y = \beta_0 + \beta W_{it} + \gamma X_{it} + \alpha_{it} + e_{it}, \quad (1)$$

where  $Y = [E \ I \ U]'$ ,  $W$  is the Kaitz index,  $X$  is a vector of controls (defined below),  $\alpha$  are fixed effects, and  $e$  is an error term. The formal-sector employment, informality and unemployment rates are denoted by  $E$ ,  $I$  and  $U$ , respectively. Time and districts are indexed by  $i$  and  $t$ , respectively.

We ran Equation (1) first for the formal-sector employment, informality and unemployment rates separately including fixed effects. But our basic hypotheses are that an increase in the minimum wage is associated with a fall in formal-sector employment, and that the workers displaced from the formal sector are absorbed into the informal sector. Therefore, the error terms are bound to be contemporaneously correlated across equations, such that  $E(ee') = \Sigma$  with  $\sigma_{ij} \neq 0$  for  $i \neq j$ , where  $i, j = (E, I, U)$ . To deal with this problem, we also estimated Equation (1) using a seemingly unrelated (SUR) technique as first proposed by Zellner (1962).<sup>8</sup>

##### *Definition of the variables*

Because our units of observation are the districts, all variables were computed using the reference district's adult population (aged 15-65 years) living in urban areas. We restricted the sample to the urban population, because the formality rate is very low in rural areas (Table 1). As noted above, our baseline definition of formal-sector employment includes only salaried workers. The definition of the variables to be included in the regressions is reported in Table 2. Basic descriptive statistics are reported in Table 3.

The main variable of interest is the Kaitz index. It is computed for salaried workers (or non-agricultural salaried workers, depending on the definition of informality) only, because minimum-wage legislation does not apply in the informal sector. The set of controls is in line with the literature based on longitudinal data (Bell, 1995; Maloney, 1995; Neumark and Wascher, 2004) and includes indicators of labour-market conditions (hourly wages and hours worked for formal- and informal-sector workers), labour productivity, demographic effects (shares of population aged 15-25 and 56-65 years), economic structure (the reference district's size, measured by the resident population, urbanisation rate and share of employment in the industrial sector) and time effects.

We also control for human capital and deal with the likely endogeneity of educational attainment by following Duflo (2001) in using information on the number of schools built in each district during implementation of a large school construction programme (*Sekolah Dasar INPRES*) between 1973-74 and 1978-79. We multiplied the number of schools built in each district by the share of adult population born after 1963 to focus on the cohort that was exposed to the programme. Duflo (2001) shows that the

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8. Bosch and Manacorda (2007) used municipal data for Mexico to assess the impact of a decline in the real value of the minimum wage during 1988 to 1994 on employment. They ran separate regressions for wage-earners and the self-employed, whereas we argue that the impact of the minimum wage should be estimated jointly for formal-sector employment and informality.

cohort of individuals borne in districts that benefited from the programme was more likely to stay longer at school and to earn more once joining the labour force.

Table 2. **Variable definitions**

Variable name	Definition
Formality rate	Share of formal-sector workers (salaried workers or non-agricultural salaried workers, depending on model specification) in the reference population (all workers, males or females, depending on model specification).
Informality rate	Share of informal-sector workers (based on the different definitions of formality) in the reference population (all workers, males or females, depending on model specification).
Unemployment rate	Share of unemployed individuals in the reference population (all workers, males or females, depending on model specification).
Kaitz index	Ratio of minimum-to-mean wage for formal-sector workers. The mean wage of formal-sector workers is computed over the reference population (all workers, males or females, depending on model specification).
Hourly wage (formal-sector workers)	Mean hourly wage of formal-sector workers computed for the reference population (all workers, males or females, depending on model specification).
Hourly wage (informal-sector workers)	As <i>Sakernas</i> does not provide information on informal-sector earnings, a proxy for the hourly wage of informal-sector workers was computed as follows. In <i>Susen</i> as all household members aged 10 years and above declare their working status ( <i>i.e.</i> salaried worker, employer, self-employed or family/unpaid worker) and the hours worked in a week, while information on wage income and earnings from agricultural and non-agricultural activities is collected at the household level. We selected those households where all members are non-salaried workers and have no wage earnings and computed the mean hourly wage for these households in each district. As <i>Susen</i> as is not available for all the years used in the sample, 1996-99 averages (when both are available) were used for 1998, 1999-2002 averages (when both are available) were used for 2000 and 2005 data was used for 2004.
Labour productivity	Mean value added per worker in the reference district's manufacturing sector computed using Industrial Survey ( <i>SI</i> ) data.
District size	Adult population living in urban areas in the reference district.
Urbanisation rate	Share of the reference district's population living in urban areas.
Hours worked (formal-sector workers)	Mean weekly hours worked by formal-sector workers computed for the reference population (all workers, males or females, depending on model specification).
Hours worked (informal-sector workers)	Mean weekly hours worked by informal-sector workers computed for the reference population (all workers, males or females, depending on model specification).
Share of employment in industry	Share of overall employment in industry computed for the reference population (all workers, males or females, depending on model specification).
School intensity	Share of the reference district's population born after 1963 multiplied by the number of schools built per children in the reference district under <i>Sekolah Dasar INPRES</i> during 1973-78.
Share of population aged 15-25 years	Computed by district.
Share of population aged 56-65 years	Computed by district.

Source: *Sakernas*, *Susen*as, *SI*, and authors' calculations.

Table 3. Descriptive statistics

Variable	N	Mean	Max.	Min.	St. dev.
<b>Tables 4, 5 and 6</b>					
Formality rate	1 356	.2561589	.0962086	0	.5578948
Informality rate	1 356	.3265715	.1305288	0	1
Relative MW (Kaitz index)	1 346	.478825	.1715298	.0699266	2.266667
Hourly wage (formal-sector workers)	1 346	3 132.423	2 016.432	198.6111	19 915.23
Hours worked (formal-sector workers)	1 346	44.12226	5.345696	13.2	66.4
Hours worked (informal-sector workers)	1 351	42.02239	7.364704	8.142858	72.2
<b>Table A2</b>					
Formality rate	1 356	.2409455	.0969737	0	.5483871
Informality rate	1 356	.341785	.1337732	0	1
Relative MW (Kaitz index)	1 341	.4672413	.1571179	.0699266	2.266667
Hourly wage (formal-sector workers)	1 341	3 185.336	2 037.014	198.6111	19 915.23
Hours worked (formal-sector workers)	1 341	44.20197	5.277119	13.2	64.1
Hours worked (informal-sector workers)	1 351	42.07321	7.206902	8.142858	72.2
<b>All Tables</b>					
Unemployment rate	1 356	.0503209	.036484	0	.2564103
Hourly wage (informal-sector workers)	1 243	3 293.962	3 067.389	91.71908	39 960.99
Labour productivity	1 285	29 893.67	46554.3	53.71875	63 4631.1
District size	1 356	273.042	584.865	14	9582
Urbanisation rate	1 356	.4291226	.3030861	.0340909	1
Share of employment in industry	1 356	.1157774	.1066493	0	.8235294
Share population aged 15-25 years	1 356	.2641881	.0633269	.0357143	.4857143
Share population 56-65 years	1 356	.0626621	.032863	0	.2173913
School intensity	1 356	.0626621	.032863	0	.2173913

Source: Sakernas and authors' calculations.

## Regression results

### Working-age population

The results of the estimation of Equation (1) for the formal-sector employment, informality and unemployment rates separately by fixed effects and jointly by SUR are reported in Table 4 for the entire working-age (15-65 years) population. The standard errors reported in the fixed-effect estimations are robust to serial correlation and heteroskedasticity. Hours worked and demographic factors were used to fulfil the exclusion restrictions in the SUR equations.

The Kaitz index is negatively signed and statistically significant in the formality and unemployment equations, and positively signed and statistically significant in the informality equation, regardless of the estimator used. These findings are in line with the theoretical prediction of a displacement effect for formal-sector workers, who are subsequently absorbed into the informal sector. The negative and significant coefficient on unemployment suggests that the decrease in formal-sector employment due to a rise in the relative value of the minimum wage shifts workers from “queueing” unemployment to the inactive population or the informal sector.

As for the remaining covariates, the results are as follows. Formal-sector hourly wages only affect formal-sector employment in the SUR regressions, while informal-sector hourly wages are associated with changes in unemployment in both OLS and SUR estimations. Hours worked have a bearing on employment in the informal sector. Labour productivity and urbanization are not correlated with the



Table 4. Minimum-wage legislation and informality, formal-sector employment and unemployment: Entire working-age population

	Fixed effects			SUR		
	Formality	Informality	Unemployment	Formality	Informality	Unemployment
Kaitz index	-0.0532* [0.062]	0.0823*** [0.001]	-0.0237*** [0.001]	-0.0515*** [0.002]	0.0869*** [0.000]	-0.0230*** [0.001]
Hourly wage (formals)	5.22e-06 [0.160]	-4.97e-06 [0.189]	-4.08e-07 [0.731]	5.18e-06** [0.019]	-4.35e-06 [0.104]	-4.75e-07 [0.599]
Hourly wage (informals)	3.42e-07 [0.736]	5.38e-07 [0.594]	-1.03e-06*** [0.000]	3.52e-07 [0.691]	5.56e-07 [0.617]	-1.03e-06*** [0.006]
Labour productivity	8.87e-08 [0.390]	-6.08e-08 [0.638]	2.59e-08 [0.563]	8.12e-08 [0.315]	-8.68e-08 [0.394]	2.25e-08 [0.510]
District size	7.77e-06*** [0.003]	-9.30e-06*** [0.001]	9.42e-07 [0.376]	7.52e-06 [0.137]	-9.59e-06 [0.130]	1.01e-06 [0.636]
Urbanisation rate	-0.0176 [0.626]	0.00654 [0.889]	0.0100 [0.391]	-0.0144 [0.511]	0.00841 [0.760]	0.0114 [0.219]
Hours worked (formals)	-0.000333 [0.636]			-0.000192 [0.595]		
Hours worked (informals)		-0.00208*** [0.000]			-0.000990*** [0.002]	
Share of employment in industry	0.201*** [0.000]	-0.194*** [0.000]	-0.0109 [0.444]	0.201*** [0.000]	-0.193*** [0.000]	-0.0113 [0.361]
School intensity	44.53*** [0.002]	-59.81*** [0.001]	6.707 [0.320]	50.45*** [0.000]	-63.25*** [0.000]	10.58* [0.055]
Share of population aged 15-25 years			0.113*** [0.000]			0.0715*** [0.000]
Share of population aged 56-65 years			0.161*** [0.000]			0.165*** [0.000]
1998	-0.0305*** [0.000]	0.0332*** [0.000]	-0.00376 [0.226]	-0.0312*** [0.000]	0.0344*** [0.000]	-0.00369 [0.170]
2000	-0.0448*** [0.000]	0.0569*** [0.000]	0.00367 [0.371]	-0.0479*** [0.000]	0.0552*** [0.000]	0.00312 [0.333]
2002	-0.0932*** [0.000]	0.0993*** [0.000]	0.00795* [0.097]	-0.0950*** [0.000]	0.0989*** [0.000]	0.00438 [0.299]
2004	-0.0965*** [0.000]	0.0975*** [0.000]	0.00672 [0.228]	-0.0988*** [0.000]	0.0951*** [0.000]	0.00466 [0.322]
Constant	0.246*** [0.000]	0.448*** [0.000]	0.00910 [0.488]	0.167*** [0.002]	0.560*** [0.000]	0.0378* [0.074]
No. of obs.	1151	1148	1151	1148	1148	1148
No. of districts	265	264	265	264	264	264
R-squared	0.167	0.142	0.062	0.519	0.558	0.397

Note: Robust standard errors in brackets; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.  
Source: Sakernas, Susenas, SI, and authors' estimations.

distribution of employment between the formal and informal sectors and unemployment. Economic structure matters in that the share of employment in industry is associated with higher employment in the formal sector and lower employment in the informal sector, regardless of the technique used to estimate the

regressions. Human capital, proxied by school intensity to avoid a possible endogeneity bias arising from inclusion of educational attainment in the regressions, is strongly negatively (positively) correlated with formal-sector (informal-sector) employment, regardless of the estimation technique used. It affects unemployment positively when the regressions are estimated by SUR, suggesting the presence of “queuing unemployment” for better educated workers. Scale effects, proxied by district size, only matter in the formal/informal-sector employment regressions estimated by fixed effects. Time effects are strongly significant in the formal-informal employment regressions, regardless of the estimator used. The age structure of the population is positively significant in the unemployment equation. This is as expected, because unemployment is very high among youths.

### *Robustness checks*

The baseline results rely on the identification hypothesis that the minimum wage is exogenous to district-level formal-sector employment and labour-market conditions. This identification hypothesis is important because, by construction, all the variation in the Kaitz index arises from the within-province variation in district-level mean formal-sector wages. The hypothesis is valid because, as noted above, the minimum wage is set through a political process at the provincial, rather than district, level on the basis of caloric intake indicators. But this may not be true for some of the districts, because the provincial governments typically set the minimum wage at the level of the lowest minimum wage put forward within each province. It may therefore be the case that the Kaitz index is endogenous for low-income districts. To make sure that this is not driving our results, we re-estimated the regressions by excluding from the sample those districts whose average wages are below their respective provinces’ median wage. Our main findings (not reported but available upon request) are nevertheless robust to this re-estimation, which lends credence to our identification hypothesis.

The baseline findings are robust to a change in the definition of informality. To test this hypothesis, we re-estimated the baseline regressions while treating only non-agricultural salaried workers as formal. The results, reported in Table A1, are comparable to the baseline findings in the sign and magnitude of the estimated coefficients. We also run the baseline regression for the three types of informal-sector workers (*i.e.* self-employed, employers and family/unpaid workers) separately. The results of these regressions (not reported but available upon request) show that the increase in informality arising from a hike in the Kaitz index is entirely due entirely to higher self-employment, the group of workers that accounts for the bulk of the informal sector.

### *Males and females*

Another consideration is that the effect of the minimum wage on labour-market outcomes may differ between males and females. To shed further light on possible gender differentials, the baseline regressions were re-estimated by SUR for males and females. The results reported in Table 5 for formal- and informal-sector employment are comparable to those reported above for the entire working-age population: an increase in the relative value of the minimum wage is associated with higher informality and lower employment in the formal sector. As for unemployment, the minimum wage appears to have a negative effect for female but not for males. Hourly wages in the formal sector affect formal-sector employment positively (negatively) for males (females) and informal-sector employment negatively for males (no effect for females). The finding suggests that rising wages in the formal sector attract male workers who might otherwise work informally to the formal sector, leaving unemployment unchanged. For females, by contrast, rising formal-sector wages depress employment in the formal sector. Nevertheless, informal-sector wages affect unemployment negatively, suggesting that women may be attracted to the informal sector when wages rise in that sector, rather than registering as unemployed.

Table 5. Minimum-wage legislation and informality, formal-sector employment and unemployment:  
Males and females, SUR estimates

	Males			Females		
	Formality	Informality	Unemployment	Formality	Informality	Unemployment
Kaitz index	-0.0569*** [0.000]	0.0744*** [0.000]	-0.00614 [0.207]	-0.0282*** [0.000]	0.0273*** [0.001]	-0.00566** [0.040]
Hourly wage (formals)	5.61e-06** [0.020]	-7.81e-06*** [0.004]	2.29e-07 [0.822]	-2.99e-06* [0.078]	7.89e-07 [0.715]	4.04e-07 [0.568]
Hourly wage (informals)	1.06e-06 [0.381]	3.79e-07 [0.785]	-8.01e-07 [0.123]	-3.09e-07 [0.715]	5.21e-07 [0.655]	-1.27e-06*** [0.001]
Labour productivity	8.31e-08 [0.454]	-2.22e-07* [0.082]	5.62e-08 [0.240]	5.49e-08 [0.479]	2.18e-08 [0.840]	5.09e-09 [0.884]
District size	1.01e-05 [0.141]	-1.21e-05 [0.124]	8.47e-07 [0.775]	4.53e-06 [0.344]	-5.49e-06 [0.406]	3.96e-07 [0.854]
Urbanisation rate	-0.00576 [0.847]	0.0124 [0.718]	-0.00726 [0.574]	-0.0111 [0.594]	-0.0209 [0.470]	0.0258*** [0.007]
Hours worked (formals)	-0.000395 [0.324]			-0.000327 [0.302]		
Hours worked (informals)		-5.48e-05 [0.855]			-0.000776** [0.023]	
Share of employment in industry	0.305*** [0.000]	-0.249*** [0.000]	0.00157 [0.923]	0.0243 [0.282]	-0.0177 [0.571]	-0.0157 [0.124]
School intensity	94.55*** [0.000]	-76.53*** [0.000]	6.085 [0.426]	-8.234 [0.495]	-56.54*** [0.001]	14.80** [0.012]
Share of population aged 15-25 years			0.00377 [0.883]			0.0552** [0.011]
Share of population aged 56-65 years			0.145*** [0.001]			0.112*** [0.002]
1998	-0.0515*** [0.000]	0.0505*** [0.000]	0.000876 [0.810]	-0.00460 [0.435]	0.0103 [0.207]	-0.00436 [0.105]
2000	-0.0801*** [0.000]	0.0826*** [0.000]	0.00653 [0.144]	0.00359 [0.616]	0.0190* [0.052]	-0.00278 [0.394]
2002	-0.142*** [0.000]	0.166*** [0.000]	0.000901 [0.874]	-0.0280*** [0.001]	0.0267** [0.019]	-0.00139 [0.740]
2004	-0.147*** [0.000]	0.166*** [0.000]	0.00177 [0.779]	-0.0196* [0.050]	0.0193 [0.147]	-0.000570 [0.899]
Constant	0.173** [0.013]	0.656*** [0.000]	0.0239 [0.411]	0.201*** [0.000]	0.438*** [0.000]	0.0601*** [0.005]
No. of obs.	1142	1142	1142	1114	1114	1114
No. of districts	264	264	264	263	263	263
R-squared	0.512	0.547	0.338	0.490	0.593	0.420

Note: All models are estimated by SUR. Standard errors are reported in brackets; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.  
Source: Sakernas, Susenas, SI, and authors' estimations.

As regards human capital, we experimented with replacing school intensity, which cannot be computed for males and females separately, by the shares of population having attainment primary and lower-secondary education. The results (not reported but available upon request) are comparable to those

reported in Table 5, although the effect of formal-sector hourly wages on informal-sector employment loses significance in the regression for male workers.

#### *Net effect on employment*

The fact that an increase in the minimum-to-mean wage ratio increases informality and depresses formal-sector employment does not predict the overall employment effect of minimum-wage hikes. To be sure, we re-estimated Equation (1) as a two-equation model for total (formal- and informal-sector) employment and unemployment as the dependent variables. The results are reported in Table 6.

The parameter estimates for the entire working-age population show that an increase in the Kaitz index is associated with an increase in total employment and a decrease in unemployment. An increase in informality associated with minimum-wage hikes therefore more than compensates for concomitant job losses in the formal sector and the exit of some unemployed individuals from the labour force. In the case of male workers, the net effect on employment is positive, and minimum-wage hikes do not affect unemployment. This finding is consistent with the results reported in Table 5, where the (positive) effect of changes in the Kaitz index on informality is greater in magnitude than the (negative) effect on formal-sector employment. In the case of females, however, the net employment effect is null, because an increase in informality offsets a concomitant decrease in formal-sector employment.

The finding that an increase in the relative value of the minimum wage has a positive net effect on employment, at least as far as male workers are concerned, is consistent with the so-called “lighthouse effect”, according to which inactive workers are attracted to the labour market, because rising wages in the formal-sector are associated with higher pay in the informal sector. This seems to be the case in Indonesia: the coefficient of the Kaitz index is a regression of informal-sector earnings on the Kaitz index is consistently positive and significant (results obtained by fixed effects available upon request).

## **5. Conclusions**

There is considerable controversy over the impact of minimum-wage legislation on employment in both developed and developing countries. Empirical evidence available to date for a variety of countries points towards a relatively mild, if at all significant, disemployment effect. The case of Indonesia is interesting, because the decentralisation of minimum-wage setting to the provinces in 2001 offers the opportunity to revisit this topic. Also, the Indonesian minimum wage is very high, even in comparison with OECD countries, at about 65% of the median wage in 2004, which suggests that its disemployment effect might be potentially strong.

The panel methodology used in this paper improves upon the empirical literature by recognising the complexities of labour-market dynamics in a dual economy, such as Indonesia, where the impact of the minimum wage on employment is affected by the pervasiveness of informality. According to the definition used in this paper, over 70% of employment is considered informal. We address this issue by correcting for contemporaneous correlations among the residuals of the labour-market outcome equations. Another contribution of the paper is its focus on local, rather than provincial, governments as the units of observation. This is useful not only for exploiting a much richer source of variations in the data, but also to avoid the potential endogeneity of the minimum wage at the provincial level.

The main findings reported in the paper – that minimum-wage hikes destroy formal-sector jobs, but that these job losses are more than compensated for by the expansion of the informal sector – suggests that minimum-wage legislation is hurting, instead of protecting, vulnerable workers. Its use as social-protection and income-redistribution instruments can therefore be called into question. These findings are therefore not without policy implications. A policy recommendation that arises from the empirical analysis is that

further increases in the minimum wage could be capped so as not to exceed labour productivity gains. This, or, if it were possible, a gradual reduction over time would help to alleviate the adverse employment impact of such a high minimum wage (in relation to the median) and to facilitate formalisation in the labour market.

Table 6. **The effect of the minimum wage on total employment and unemployment: Two-equation SUR estimates**

	Total		Males		Females	
	Employment	Unemployment	Employment	Unemployment	Employment	Unemployment
Kaitz index	0.0368** [0.018]	-0.0226*** [0.001]	0.0171* [0.051]	-0.00597 [0.221]	-0.00121 [0.889]	-0.00564** [0.040]
Hourly wage (formals)	1.08e-06 [0.605]	-4.97e-07 [0.582]	-2.34e-06 [0.213]	2.28e-07 [0.823]	-2.72e-06 [0.251]	3.95e-07 [0.577]
Hourly wage (informals)	9.11e-07 [0.266]	-1.03e-06*** [0.006]	1.44e-06 [0.118]	-8.01e-07 [0.123]	2.38e-07 [0.838]	-1.27e-06*** [0.001]
Labour productivity	-1.02e-08 [0.891]	2.22e-08 [0.516]	-1.40e-07* [0.099]	5.59e-08 [0.242]	5.37e-08 [0.617]	5.02e-09 [0.886]
District size	-2.14e-06 [0.646]	1.02e-06 [0.632]	-2.03e-06 [0.699]	8.58e-07 [0.772]	-1.07e-06 [0.871]	4.02e-07 [0.852]
Urbanisation rate	-0.00555 [0.784]	0.0113 [0.222]	0.00640 [0.779]	-0.00746 [0.564]	-0.0305 [0.290]	0.0257*** [0.007]
Hours worked (formals)	-0.000105 [0.816]		-0.000511 [0.259]		-0.000505 [0.280]	
Hours worked (informals)	-0.000796** [0.014]		-1.35e-05 [0.965]		-9.32e-05 [0.799]	
Share of population aged 15-25 years		0.0643*** [0.001]		-0.000778 [0.976]		0.0532** [0.014]
Share of population aged 56-65 years		0.151*** [0.000]		0.132*** [0.002]		0.108*** [0.003]
Share of employment in industry	0.00725 [0.788]	-0.0114 [0.354]	0.0561* [0.051]	0.00148 [0.928]	0.00750 [0.810]	-0.0156 [0.125]
School intensity	-13.64 [0.228]	10.47* [0.058]	18.13 [0.156]	5.811 [0.448]	-64.93*** [0.000]	14.75** [0.013]
1998	0.00347 [0.552]	-0.00353 [0.189]	-0.000994 [0.877]	0.00100 [0.783]	0.00676 [0.406]	-0.00431 [0.109]
2000	0.00680 [0.334]	0.00319 [0.322]	0.00272 [0.730]	0.00660 [0.139]	0.0230** [0.020]	-0.00275 [0.398]
2002	0.00342 [0.698]	0.00384 [0.362]	0.0244** [0.010]	0.000544 [0.924]	0.000216 [0.985]	-0.00153 [0.714]
2004	-0.00473 [0.655]	0.00457 [0.332]	0.0195* [0.084]	0.00174 [0.783]	0.000829 [0.952]	-0.000576 [0.898]
Constant	0.712*** [0.000]	0.0401* [0.058]	0.833*** [0.000]	0.0258 [0.375]	0.623*** [0.000]	0.0609*** [0.004]
No. of obs.	1148	1148	1142	1142	1114	1114
No. of districts	276	276	264	264	263	263
R-squared	0.592	0.396	0.462	0.337	0.652	0.420

Note: p values in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1

(1) 1 unit = 100 000 rupiah; (2) 1 unit = 1 000 individuals; (3) Calculated on the group of reference.

Source: Sakernas and authors' estimations.

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## APPENDIX

Table A1. Minimum-wage legislation and informality, formal-sector employment and unemployment: Alternative definition of informality, SUR estimates.

	Formality	Informality	Unemployment	Formality	Informality	Unemployment
Kaitz index	-0.0720*** [0.002]	0.105*** [0.000]	-0.0259*** [0.002]	-0.0702*** [0.000]	0.107*** [0.000]	-0.0254*** [0.001]
Hourly wage (formals)	3.98e-06 [0.237]	-3.24e-06 [0.376]	-1.13e-06 [0.305]	3.84e-06* [0.073]	-2.72e-06 [0.311]	-1.20e-06 [0.185]
Hourly wage (informals)	6.41e-07 [0.479]	2.00e-07 [0.825]	-9.79e-07*** [0.001]	6.47e-07 [0.451]	2.50e-07 [0.821]	-9.74e-07*** [0.009]
Labour productivity	1.46e-07 [0.134]	-1.34e-07 [0.262]	4.07e-08 [0.374]	1.38e-07* [0.079]	-1.61e-07 [0.114]	3.72e-08 [0.275]
District size	5.95e-06** [0.022]	-7.62e-06*** [0.009]	1.18e-06 [0.259]	5.68e-06 [0.246]	-7.86e-06 [0.212]	1.25e-06 [0.553]
Urbanisation rate	-0.0363 [0.292]	0.0254 [0.598]	0.00966 [0.412]	-0.0331 [0.120]	0.0272 [0.321]	0.0111 [0.231]
Hours worked (formals)	-0.000111 [0.877]			-3.00e-06 [0.993]		
Hours worked (informals)		-0.00217*** [0.000]			-0.000992*** [0.002]	
Share of employment in Industry	0.219*** [0.000]	-0.216*** [0.000]	-0.00973 [0.498]	0.219*** [0.000]	-0.215*** [0.000]	-0.0100 [0.413]
School intensity	33.23** [0.025]	-49.17*** [0.005]	8.420 [0.182]	39.21*** [0.001]	-52.42*** [0.001]	12.38** [0.026]
Share population aged 15-25 years			0.110*** [0.000]			0.0698*** [0.000]
Share population aged 56-65 years			0.158*** [0.000]			0.162*** [0.000]
1998	-0.0339*** [0.000]	0.0369*** [0.000]	-0.00367 [0.244]	-0.0346*** [0.000]	0.0380*** [0.000]	-0.00364 [0.179]
2000	-0.0465*** [0.000]	0.0580*** [0.000]	0.00480 [0.244]	-0.0496*** [0.000]	0.0562*** [0.000]	0.00425 [0.187]
2002	-0.0825*** [0.000]	0.0880*** [0.000]	0.00869* [0.061]	-0.0841*** [0.000]	0.0876*** [0.000]	0.00515 [0.224]
2004	-0.0832*** [0.000]	0.0835*** [0.000]	0.00778 [0.145]	-0.0851*** [0.000]	0.0810*** [0.000]	0.00573 [0.225]
Constant	0.249*** [0.000]	0.439*** [0.000]	0.00927 [0.480]	0.186*** [0.000]	0.531*** [0.000]	0.0375* [0.075]
No. of Obs.	1146	1143	1146	1143	1143	1143
No. of districts	265	264	265	264	264	264
R-squared	0.152	0.129	0.063	0.544	0.580	0.400

Note: p-values in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1  
Source: Sakernas and authors' estimations.

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