MINIMUM WAGE: DOES IT IMPROVE WELFARE IN THAILAND?

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We study the causal impact of the minimum wage on labor market outcomes, household consumption, inequality and poverty in Thailand by relying on policy variation in minimum wages over time across provinces. We find that minimum-wage increases have a large and significant impact on the likelihood of working in the uncovered sector among workers with elementary education. However, the impact is very small and insignificant among other labor market groups. In contrast, the minimum wage has large positive effects on the formal sector wages of low-earning workers, such as the young, elderly and low educated. Increases in the minimum wage are associated with reductions in household poverty and consumption inequality at the bottom half of the distribution.

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1. INTRODUCTION

The minimum wage constitutes a key labor market policy instrument in both developed and developing countries. In developing countries, where tax bases are limited and hence resources for other labor market policies (e.g., active labor market policies) are scarce, minimum wages are used even more often with an objective of lifting the fortunes of low-skilled workers and poor individuals. But do minimum-wage increases actually help them escape poverty? The answer to this question largely depends on the labor market impacts of the minimum wage across different types of workers.

In developed countries the academic debate has focused on the employment effects of the minimum wage. Although there is broad consensus on the positive impact of the minimum wage on average wages, its effects on employment are still heatedly debated. Some authors argue that the standard competitive analysis of the minimum wage, which predicts disemployment effects, is at odds with the evidence, which shows few signs of increased joblessness after minimum-wage increases in developed countries (see for instance Card and Krueger, 1995; Dickens, Machin and Manning, 1999; Dolton, Bondibene and Stops, 2015). Importantly, there are other theories that do not unambiguously predict disemployment effects of the minimum wage. As Stigler (1946) argued in his seminal article on minimum wages, when employers have the power to set wages, a skillfully set minimum wage can actually increase employment. Minimum wage increases may also encourage firms to sponsor training for their workers (Acemoglu and Pishke, 1999) or stimulate workers to upgrade their skills to avoid unemployment (Cahuc and Michel, 1996). Such investments enhance growth and thus employment. Other authors, including Neumark and Wascher (2008), argue that the literature tilts in favor of those studies that find a negative employment effect.

In developing countries, the study of the employment effects of the minimum wage is complicated by those countries' large uncovered sectors and frequent non-compliance with labor policy.[1] Considerable evidence gathered in Latin America yields nonuniform conclusions (as surveyed by Cunningham, 2007). Large negative effects of minimum wage increases on formal employment are found in Honduras (Gindling and Terrell, 2009), while effects are small in Costa Rica (Gindling and Terrell, 2007) and Colombia (Maloney and Núñez, 2004) and not statistically significant in Mexico (Bell, 1997) and Brazil (Lemos, 2009). Much less is known about other developing regions such as Southeast Asia, with the notable exception there of Indonesia, for which various studies have found small negative employment effects after minimum-wage spikes (Rama, 2001; Alatas and Cameron, 2008; Del Carpio, Nguyen and Wang, 2012). However, despite decreases in formal

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[1] The paper uses informal or uncovered sectors interchangeably (versus formal or covered sectors) to denote sectors in which workers are either not legally subject to the minimum wage law, or, despite being legally subject to the minimum wage legislation, the law is not enforced. See, for instance, the early contributions of Welch (1974), Mincer (1976), and Gramlich (1976).

employment, average employment rates did not change in either Indonesia (Comola and de Mello, 2011) or Vietnam (Nguyen, 2010). More recently, Magruder (2013) has argued that previous empirical studies evaluating the role of the minimum wage in Indonesia may have been contaminated by methodological (namely, endogeneity) biases, thus making the results less valid. He uses a difference in spatial differences estimator, which arguably reduces the likelihood of endogeneity biases, and finds that minimum-wage increases boosted employment and wages in the economic sectors covered by the policy. Studies on the minimum wage in developing countries outside Latin America and Asia are much scarcer, perhaps with the exception of South Africa (Dinkelman and Ranchhod, 2012; and Bhorat, Kanbur and Mayer, 2013).

The academic focus on how minimum-wage increases affect employment contrasts with policy makers' emphasis on how minimum-wage legislation would affect poverty and inequality.[2] In fact, the literature studying the impact of the minimum wage on poverty (Lustig and McLeod, 1997) or on household income or consumption inequality is much scarcer than the literature studying its impact on employment,[3] and most of it focuses on developed economies (Terrell and Almeida, 2008). Direct evidence for the US and New Zealand suggests that the minimum wage has no impact on poverty (Neumark, Schweitzer and Washer, 2005) or small poverty-reducing effects concentrated in specific labor market groups (Addison, Blackburn and McKinley, 1999; Maloney and Pacheco, 2012). In developing countries, Gindling and Terrell (2010) and Alaniz, Gindling and Terrell (2011) report poverty-reducing impacts among formal sector workers in Honduras and Nicaragua, respectively, while Neumark, Cunningham and Siga (2006) find non-significant effects in Brazil.

Interestingly, most studies find that disemployment effects tend to concentrate among the low-skilled, thereby casting doubt on the effectiveness of using minimum-wage policy as a lever to reduce poverty. Moreover, minimum-wage workers are often not the most disadvantaged in developing countries; on the contrary, formal minimum-wage workers are protected by labor policy, while workers in the informal sector often earn below the minimum wage. Thus, the minimum wage may not be an effective tool to reduce inequality or poverty in this context.

This paper conducts a fairly comprehensive examination of the impact of changes to the minimum-wage level in Thailand from 2000 through 2010. Most previous articles have focused on analyzing the minimum wage impact on either labor market outcomes or, more seldom, on poverty and inequality. Instead, the rather broad evaluation proposed here allows not only for an exploration of the minimum wage effects on household

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[2] For example, U.S. President Barack Obama, in his 2013 State of the Union address (available at https://obamawhitehouse.archives.gov/the-press-office/2013/02/12/remarks-president-state-union-address), said, "Tonight, let's declare that in the wealthiest nation on Earth, no one who works full-time should have to live in poverty, and raise the federal minimum wage to $9.00 an hour".

[3] A simple online search in Google Scholar for articles with the words "minimum wage" and "employment" in the title yielded 273 hits. Replacing "employment" with "poverty" or "inequality" yielded 39 and 43 hits, respectively.

consumption, poverty and inequality, but it is also informative about the labor market channels through which these outcomes are observed. The analysis also emphasizes the importance of heterogeneous effects, distinguishing impacts across different skill and age groups.

Thailand constitutes an excellent case study to analyze the impact of the minimum wage on labor market outcomes because of the way the country implements and administers its policy and because of the nature of its dual labor market (formal and informal). During the period of analysis, the minimum wage in Thailand was set by province, introducing a great variability of minimum wages across the country and over time. These various provincial minimum wages were set following a complex, two-tiered system that involved near-continual negotiations between tripartite committees at the provincial and national levels.

As the next section shows, such a complex negotiation process introduced a great deal of arbitrariness in the minimum wages set. Decision making responded more to the central government's desire to maintain provincial status quo than to a careful process of planning and targeting. As a result, variation of the minimum wage over time and within provinces was, to a large extent, exogenous to changes in the local labor market. Several pieces of evidence discussed in the paper suggest this to be the case. Hence, we rely on cross-province variation of minimum wage changes over time to estimate their impact on labor market and household outcomes—a strategy that, given the Thai institutional set up, is not likely to suffer from the common endogeneity biases found in many previous studies. This paper also contributes to the literature by shedding light on the impact of minimum-wage increases on labor and social outcomes in a middle-income country where large segments of the workforce are employed in the informal (uncovered) economy, where labor law is not binding. Indeed, as in most developing countries, the vast majority of Thai households have at least one member employed in the informal economy. In 2011, about 63 percent of the country's working-age population (15–60 years old) worked in the informal economy (NSO, 2011).

The remainder of the paper is organized as follows. The next section discusses the institutional features of the Thai minimum-wage system and describes the recent evolution of minimum wages in Thailand. Section 3 introduces the main datasets used for the analyses and describes the characteristics of minimum-wage workers. Section 4 discusses the method used to estimate the impact of the minimum wage on labor market outcomes and presents the main results, organized around three interrelated questions: How has the minimum wage affected wages on average and across distinct labor market demographic groups? How has the minimum wage affected formal and informal employment (especially among potentially vulnerable groups such as young, elderly, and low-skilled workers)? Has the minimum wage been an effective tool for tackling poverty and reducing inequality? Section 5 concludes with a summary of the paper's findings and a discussion of their implications.

2. THAI MINIMUM WAGES: INSTITUTIONAL BACKGROUND AND RECENT EVOLUTION

The minimum wage has been a key component in the development of Thai labor policy over the past four decades.[4] In 1972, the first minimum-wage legislation passed in Thailand, and the Ministry of Interior appointed a tripartite National Wage Committee (NWC) of government, employer, and employee representatives to recommend labor policy to the government and fix the minimum wage, which was defined as "a wage rate which an employee deserves and is sufficient for an employee's living." The first minimum wage was set at 12 baht per day in April 1973 in Bangkok and three surrounding provinces (Samut Prakan, Nonthaburi, and Pathum Thani). The criteria reportedly used in wage negotiations were the cost of living; the rate of inflation as reflected by the consumer price index (CPI); and, since 1990, economic growth. After 1973, minimum wages continued to be set by geographic zone, and, by 1998, three different minimum wages covered all 76 Thai provinces.[5]

The 1997–98 Asian financial crisis led to a reform of Thailand's labor policy, and the Labor Protection Act of 1998 (LPA, 2541) transformed the previous minimum-wage-setting system into a two-tiered system intended to differentiate minimum-wage levels by province and industry. The main objective of having province-specific levels was to take into account provincial differences in the cost of living and other socioeconomic conditions. The new system fully adopted the provincial differentiation, but the industry-level differentiation was not implemented, largely because it was too complex to administer.

One of the LPA 2541's primary mandates was the creation of a new minimum wage-setting machinery, which included three key institutions: the NWC, the Provincial Subcommittees on Minimum Wages (PSMW), and the Subcommittee on Technical Affairs and Review (STAR). Despite the introduction of the new system in 1998, no adjustments to minimum-wage levels were made until 2001. In 2008, a new reform (the Labor Protection Act of 2008 [LPA 2551]) further detailed the criteria established for wage adjustments, but in practice it made no major changes to the wage-setting process. Finally, in 2011, the newly elected government announced a unified nationwide policy that, by January 2013, had set minimum wages at 300 baht per day

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[4] This section draws from three main sources: (a) Peetz (1996), a comprehensive analysis of Thailand's minimum–wage-setting system (up to the promulgation of the Labor Protection Act of 1998). This study was sponsored by the International Labour Organization after the Thai government requested its technical assistance; (b) Paitoonpong, Akkarakul and Sukaruji (2005), a study that updates knowledge on the minimum-wage-setting system following the passage of the Labor Protection Act; and (c) our own conversations with Ministry of Labor officials and members of the National Wage Committee.

[5] In 1998, before the passage of the Labor Protection Act, minimum wages were 162 baht per day in Bangkok, Nakhon Pathom, Nonthaburi, Pathum Thani, Samut Sakhon, Samut Prakan, and Phuket; 140 baht per day in Chon Buri, Chiang Mai, Nakhon Ratchasima, Phangnga, Ranong, and Saraburi; and 130 baht per day in the remaining provinces.

(about 9.5 US$ at the time) in all provinces. This drastic increase, however, does not affect our results because it became effective after 2011.

During the period under study, the rounds of negotiations to review the minimum-wage level were typically triggered by trade union demands, NWC or PSMW recommendations, or government order. It is the duty of the PSMW (tripartite subcommittees composed of government, employer, and employee representatives) to recommend minimum-wage adjustments at the provincial level to the NWC, which then sends these recommendations to STAR for technical review. After STAR submits its review, the NWC issues a final recommendation at the central level, which the Ministry of Labor (the final deciding authority) then announces in the *Royal Gazette*. Although the Ministry of Labor may ask the NWC to revise its recommendations, it rarely interferes with the review process beyond its influence on the different committees through its official representatives.

The frequency of minimum-wage adjustments is generally not fixed by law in East Asian countries, but they usually revise them annually. Thailand was no exception to this pattern during the 2000s: minimum-wage adjustments were generally decided by the NWC after the review process in November and became effective on January 1 of the following year. However, there were two adjustments in some years (2005 and 2008) and none in 2009.[6] As a result of these adjustments, Thailand had 28 different minimum wages by the end of 2010— ranging from 151 baht per day (about US$4.80 of 2010) in Phrae, Phayao, Mae Hong Son, and Phichit (in the North region) to 206 baht per day (about US$6.50) in Bangkok and Samut Prakan (in the Central region). As for coverage, Thai minimum wages apply to all full-time private employees regardless of nationality, although they do not apply to government employees, employees in households, employees in the agricultural sector, and part-time or student employees.

In 1998, the LPA 2541 (article 87) also stipulated three main groups of indicators on which to base minimum wage adjustments: cost of living, employers' capacity to pay, and economic conditions. However, no specific guidelines regarding how those indicators should be measured are provided. On paper, the reliance on these criteria would certainly render minimum wage changes at the provincial level endogenous to local labor market conditions. In practice, however, minimum wage negotiations differed widely from the text of the legislation. An important hurdle to conduct the wage negotiations was the unavailability to the parties of suitable data in a timely manner. Although the NWC gives the PSMW written suggestions on data sources for the indicators to be considered for minimum-wage adjustments, it neither provides them with the actual data nor establishes a national minimum wage guideline. Our conversations with PSMW members during a World Bank field mission that took place on February 13-17 2012 suggested that, even though provincial CPI and GDP

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[6] The two micro level datasets used in this paper report the month in which each interview took place. Hence, we can assign to each worker the minimum wage that corresponds to his/her province and month of interview.

indicators are systematically collected in Thailand, these meetings were rather informal, there was no protocol indicating how the relevant and available indicators should reach the negotiating parties, and, in practice, such data were rarely considered and incorporated to the discussion. To the extent of our knowledge, data on other indicators established by the legislations, such as production costs, are not systematically collected in Thailand. Moreover, the last say on provincial minimum wages lied at the NWC. As we shall see, political economy considerations were given much more weight than local labor market conditions in their final considerations.

The NWC was well aware of the difficulties of the PSMW to reach informed decisions about the minimum wage. For this reason, NWC members told us that they often considered another criterion (not stipulated by the legislation) before reaching a final recommendation: the extent of cross-provincial disparities. In particular, the NWC generally tried to avoid exacerbating cross-provincial differences in the minimum wage (which indeed remained fairly stable along our period of analysis, as the standard deviations across provinces in Figure 1 indicate) or, at the minimum, attempted to maintain the status quo in terms of provincial rankings (within regions). To this purpose, the NWC used to compensate provinces that had lagged behind within the region in terms of their previous (nominal) minimum-wage adjustment, while it sets relatively smaller minimum-wage increases in provinces that had previously fared better than the regional average.

[place figure 1 here]

We present evidence supportive of these trend reversals within regions in Table 1, which displays estimates of the determinants of two alternative measures of relative within-region minimum-wage adjustments. The first one (columns 1–2) is an indicator variable that takes the value one if the province's percentage increase in the minimum wage is above the regional average; otherwise, it takes the value zero. The second measure (columns 3–4) is the provincial ranking (within-region) in terms of the minimum-wage percentage increases received. We regress these two indicators on their lagged values, seeking evidence of trend reversals. In all specifications we include year fixed effects, province fixed effects and province-annual trends, as well as provincial inflation and the growth rate of nominal per capita provincial GDP (that is, the main indicators on which data are systematically collected and that should, in theory, be considered when fixing minimum wages according to article 87 of the LPA 2541), Columns (1) and (3) display OLS estimates while columns (2) and (4) present Arellano and Bover (1995)/Blundell and Bond (1998) system GMM estimates that account for the endogeneity of the lagged dependent variable,

Our results from columns (1) and (2) show that the likelihood of getting a minimum-wage increase above the regional average is significantly smaller in provinces where the previous minimum-wage raise was above the regional average, and the extent of mean reversion remains relevant also after accounting for the endogeneity of the lagged dependent variable using system GMM (column 2). Along these lines, we also find that the provincial ranking (within the region) in terms of minimum-wage percentage increases (columns 3 and

4) was significantly higher the lower the province had ranked at the previous minimum-wage change date. It is also worth highlighting that the effects of provincial inflation and GDP growth and their lags are always far from significant at standard levels of testing.

This process of ex-post compensation of the provincial minimum wages that was put in place to guarantee a regional balance introduced exogenous variation in the changes over time of the minimum wage within provinces. Importantly, these changes appear to be driven by political economy factors rather than by supply and demand in the local labor markets. To be sure, wages, employment, and minimum wages are jointly determined at the aggregate level, and the entrenched minimum-wage differences across provinces through 2011 reflected different levels of development. Hence, the identification in the analyses below will rely on time variation of the minimum-wage within provinces, abstracting from permanent differences across provinces and common macroeconomic shocks by introducing year and province dummies as well as province-specific annual trends, yearly provincial CPI and provincial GDP per capita into the regressions. We argue that, in light of the evidence on trend reversals presented here, and given the great deal of arbitrariness in the complex, two-tiered, tripartite system of minimum-wage negotiations, the remaining variation within-province in minimum wage changes is likely exogenous to local labor market conditions, and therefore exogenous to employment, poverty, and wage setting at the provincial level. To be sure, this claim is untestable and may require qualification. Section 4 describes our methods and how we try to deal with possible failures of the exogeneity assumption.

One final issue that requires consideration is compliance. Although the LPA 2541 and the LPA 2551 establish penalties that include fines and in some cases imprisonment, the resources allocated to monitoring are limited in Thailand, and recent data from the Department of Labor Protection and Welfare indicate that employers are seldom penalized over minimum-wage breaches (Leckcivilize, 2013). Weak enforcement may in turn reduce compliance and hence hamper the potential effectiveness of minimum-wage legislation (ILO, 2010). In the next section, we describe our main data sources and empirically assess the extent of non-compliance with Thai minimum wages in the covered sector.

[place table 1 here]

3. DATA AND DESCRIPTIVE EVIDENCE

3.1. Data sources

This paper relies on two main data sources: The Labor Force Survey (LFS), on which we base our individual-level analyses of labor market outcomes, and the Household Socio-Economic Survey (SES), which we use to

study the impact of the minimum wage on household consumption and poverty. Both datasets are cross-sectional.

The National Statistical Office of Thailand (NSO) undertakes the LFS to collect data on the economic activities of the population, including detailed information on employment and unemployment as well as on characteristics of the labor force and economically inactive individuals. The LFS relies on a two-stage stratified sampling design (Thailand's 76 provinces constituted the strata),[7] and it covers the civilian non-institutional population living in private households and special households (which include group households or quarters within a factory compound). LFS data, which are collected monthly and released quarterly, also include information on relevant socioeconomic characteristics such as age, gender, marital status, and education.

To study the impact of the minimum wage on the Thai labor market, we focus on the period 2001–2010 and adapt our sample selection criteria to the specific outcomes under study: wages earned by formal workers and the probability of working in the formal sector.[8] Two samples—working-age (15–60) private sector employees and all working-age private sector workers—serve as the bases for our analyses of wages and the probability of working in the covered vs. uncovered sector, respectively. Regarding wage measurement, since Thai minimum wages are set per day, the wage variable we use is also a daily rate.[9] Since the LFS only collects earnings information for salaried workers, all our wage analyses refer to the formal sector.

Our analyses of poverty and household consumption rely on the SES, a stratified two-stage sampling survey that the NSO typically carries out every two years. The goal of the SES is to collect socioeconomic information on Thai households, such as consumption, characteristics of household members and housing, ownership of selected durable goods, and so forth. We use data from all years available within our period of analysis: that is, 2000, 2002, 2004, 2006, 2007, 2008, 2009, and 2010.

3.2. Who pays and who receives the minimum wage? How binding are Thai minimum wages?

Data on labor inspections conducted by the Department of Labor Protection and Welfare reveal that, on average, 12–13 percent of establishments were inspected every year during 2006–10, but more than 94 percent of the establishments violating any labor law received only a warning, and less than 0.3 percent were penalized or prosecuted (Leckcivilize, 2013). Therefore, non-compliance with Thai minimum wages may be relevant even

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[7] Primary and secondary sample units are blocks (for municipal areas) or villages (for non-municipal areas) and households, respectively.

[8] Wages and hours worked are considered only for the worker's main job.

[9] Many employers in Thailand use the daily minimum wage as a reference to set the wages of workers who are paid monthly. In this case, the most common formula is to multiply the minimum wage by 30. For this reason, monthly wages were converted to a daily rate by dividing by 30.

for formal employees, and the following questions are warranted: Are Thai covered employees actually paid at or above the minimum wage? Who are and who aren't?

To answer these questions, we depart from the sample of workers covered by minimum-wage legislation to characterize those who are paid above and below the minimum wage. Because few workers earn exactly the minimum wage, we define minimum-wage workers (labeled as "At the minimum" in online appendix table A.1) as those for whom the difference between the actual daily wage received and the daily minimum wage in the province where they work does not exceed (in absolute terms) 5 percent. The other two categories, "Below" and "Above", identify workers whose wage is more than 5 percent lower and higher than the minimum wage, respectively.

Summary statistics for these three groups in Table A.1. in the online appendix uncover a significant degree of non-compliance: around 20 percent of Thai employees are paid less than the minimum wage, according to our characterization—a remarkable feature considering that these summary statistics are based on the sample of workers who, in principle, are covered by minimum wages as stipulated by the legislation. This result is broadly consistent with other compliance indicators based on alternative data sources (Paitoonpong, Akkarakul, and Sukaruji, 2005; DLPW, 2002; and Peetz, 1996).

Regarding worker characteristics, younger workers (aged 15–24) are more likely than prime-aged workers (aged 25–49) to be below or at the minimum wage. Because female wages are lower, compliance also varies by gender: 25.9 percent of females earn less than the minimum, against only 17.8 percent of males.[10] As for firm size, large firms are more likely to pay at or above minimum wages, while small firms are more prone to non-compliance. For example, 41.8 percent of individuals working in firms with 1 to 4 employees earn below the minimum wage, against only 5.3 percent of their counterparts working in firms with more than 200 employees. The incidence of and non-compliance with minimum wages also decreases as education increases and is more prevalent among blue-collar workers.[11]

As we stressed earlier, the enforcement of labor legislation in Thailand during the period of observation was weak. Moreover, it placed no emphasis on particular sectors.[12] In this context, it is likely that the level of non-compliance is to some extent linked to the productivity distribution of workers employed in each sector and, if this is the case, minimum wages will be less (more) binding in more (less) compliant sectors. Indeed, as

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[10] For an analysis of the relationship between minimum wages and the gender wage gap see Hallward-Driemeier, Rijkers and Waxman (2016) and the references therein.

[11] Chandoevwit (2010) reports similar patterns of non-compliance across workers and firms based on LFS data.

[12] A labor inspection country profile for Thailand is found here: http://ilo.org/labadmin/info/WCMS_153137/lang--en/index.htm

Table A.1. in the online appendix shows, low-wage sectors such as Agriculture, hunting and forestry, Restaurants and hotels, and Health, social and household services, have higher levels of non-compliance. In contrast, high-paying sectors such as Financial intermediation and real state present low levels of non-compliance. In line with this idea, we will later show that the effect of the minimum wage on wages is larger for young and low educated workers than for their prime-aged and highly educated counterparts.

An alternative way of assessing non-compliance and how binding minimum wages are is to look for spikes in the wage distribution at or around the minimum wage. Because Thai minimum wages during the period analyzed differed across provinces and over time, we define a new variable that measures the difference between the wage of each employee and the minimum wage in the province where he or she works, and we then pool all Thai covered employees by year. Figure 2 displays kernel density estimates of the distribution of the difference between actual daily wages and the minimum wage for each year of our sample period. Two main features are worth noting: First, there is a visible spike at or very close to zero, which is the mode of the wage distribution in all years. Hence, minimum wages are clearly binding. Second, as Table A.1. in the online appendix revealed, there is also a significant fraction of workers who are paid below the minimum wage in the covered sector.

In sum, our evidence indicates that, although compliance is far from perfect, Thai minimum wages are clearly binding. Importantly, the extent of non-compliance appears to vary substantially by socioeconomic characteristics. Hence, the impact of the minimum-wage legislation is likely to vary across groups of employees, a feature we take into account in our subsequent analyses.

[place figure 2 here]

4. ESTIMATION AND RESULTS

4.1. *Empirical model and identification*

We estimate the impact of the minimum wage on various outcomes by relying on minimum wages' variation over time across provinces. In particular, our point of departure is an econometric model that takes the following form:

(1) $$y_{it} = \beta_0 + lnMW_{pt}\beta_1 + X_{it}\beta_2 + \delta_t + \gamma_p + \varepsilon_{it},$$

where y_{it} denotes the outcome of interest (we start by looking at individual nominal (log) daily wages and then we move to the likelihood of working in the covered sector, household consumption, and poverty) and $lnMW_{pt}$ the log of the nominal minimum wage; i stands for individuals (in the labor market outcomes analyses) and for households (in the poverty analyses); t stands for time and p stands for province. The model includes, depending on the outcome, a vector of worker or household-specific characteristics (X_{it}) that control for observable compositional changes in the labor market. Explanatory variables in vector X_{it} change with the specification,

11

but in general include a gender dummy, individual specific human capital (a quadratic term in age, and dummies for the highest level of education obtained), a dummy for married, and a dummy for living in urban areas. When we analyze employed individuals, we further include industry and occupation categories and dummy variables for firm size. All specifications include a full set of year (δ_t) and provincial dummies (γ_p)

The discussion in Section 2 suggested that changes in provincial minimum wages are likely to be exogenous to local labor market conditions. Under the exogeneity assumption, $\hat{\beta}_1$ has a causal interpretation. However, no matter how unlikely, we cannot rule out the presence of provincial factors that may be correlated with provincial minimum wages and some of our variables of interest. Hence, we extend model (1) in two directions to allow for potential province confounding factors. First, we include in the regressions yearly provincial CPI and the log of provincial GDP per capita, the two fundamental aspects that the PMWC should have considered during wage negotiations according to the legislation. Second, we include in the regressions province-specific annual trends $(time_t * \gamma_p)$, which should capture secular movements in unobserved province specific factors that may jointly determine the minimum wage and some of our variables of interest. As a result, the estimated model is:

$$(2) \qquad y_{it} = \beta_0 + lnMW_{pt}\beta_1 + X_{it}\beta_2 + \delta_t + \gamma_p + (time_t * \gamma_p)\beta_3 + CPI_{pt}\beta_4 + GDP_{pt}\beta_5 + \varepsilon_{it}.$$

4.2. The impact of the minimum wage on average wages

We start by assessing the effect of the minimum wage on average (log) wages in the formal sector. Table 2 displays the results of estimating the model previously outlined in (2) and focuses on the parameter of interest, that is, the estimated elasticity of wages to the minimum wage. We proceed parsimoniously. Column 1 includes province dummies, year dummies and province annual trends in the regression. The estimated elasticity of wages to the minimum wage is 0.61 and highly significant. The elasticity is markedly reduced to 0.36 when individual controls (a male dummy, age, age squared/100, married and municipal area indicators, as well as education and occupation categories) are included (column 2). Controlling for industry of employment (column 3) and firm size (column 4) does not substantially alter the results (0.39 and 0.40, respectively).

[place table 2 here]

Our preferred specification is in column 5 of Table 2, which adds to the set of controls two province-level indicators: GDP per capita and the CPI. Interestingly, and in spite of these two indicators being the key ingredients in wage negotiations according to the law, adding these macro variables does not alter the estimated impact of the minimum wage on wage levels. This lends further support to the idea that minimum wage changes are not related to local labor market developments. With this specification, the elasticity of individual wages to the provincial minimum wage amounts to 0.40, and is highly significant at the 1 percent level.

Hence, the regression analysis confirms what previous summary statistics and visual inspection suggested: despite substantial non-compliance, the minimum wage in Thailand is binding, and it has a bearing on actual wages. In particular, a 1% increase in the minimum wage is associated with a 0.40% increase in average wages. Considering that only 20% of formal workers earn the minimum wage (see Table A.1. in the online appendix), our estimated elasticity implicitly suggests that various lighthouse effects affect wages throughout the distribution. Next, we investigate this issue in two ways: by inspecting heterogeneous impacts across different types of workers and by looking directly at the impact of the minimum wage at different points of the wage distribution.

[place table 3 here]

Table 3 moves to the analysis of the heterogeneous impact of the minimum wage on different labor market groups. We follow the Mincerian tradition and differentiate the effects across the two key dimensions of human capital: education and labor market experience (in our case approximated by age). In all cases we allow for a flexible specification by splitting the sample across groups. In panel 1 of Table 3, we show the differential impact of the minimum wage across age groups. Not surprisingly, the wages of young and elderly workers (15–24 and 50-60 years old, respectively) are more affected than the wages of prime-aged employees (25–49 years old), who earn higher wages. Along these lines, panel 2 of Table 3 shows that the impact of the minimum wage steadily decreases with education. The elasticity of wages to minimum wage changes ranges from 0.25 (and not statistically significant) in the case of workers with university education to 0.61 (and statistically significant at the 1 percent level) for workers with less than elementary education.

To investigate directly the presence of lighthouse effects, and whether the minimum wage indeed has a stronger impact on the wages of low-earning workers, we estimate its impact along the wage distribution using unconditional quantile regression methods as proposed by Firpo, Fortin and Lemieux (2009). Unconditional quantile regression methods differ from conditional quantile techniques in that they directly estimate the impact of a marginal change in the minimum wage level throughout the overall wage distribution, without changing the distribution of other (observable) characteristics. This approach is more appropriate in our setting, inasmuch as workers with very different characteristics are located at different points of the distribution, possibly confounding the impact of the minimum wage in traditional quantile regression settings.

Our results, summarized in Figure 3, indicate that the strongest impact does not correspond to those at the very bottom of the distribution (which may reflect non-compliance issues), although the effect of the minimum wage along the low centiles is nonetheless statistically significant and sizeable. Figure 3 also reveals that the effect of the minimum wage varies considerably along the wage distribution: it peaks between centiles 30 and 55 and declines steadily thereafter, but it only becomes non-significant after centile 85. These large lighthouse effects are in line with the idea that, in a context of weak unions, the minimum wage is a relevant

price in the labor market which is often used as a reference in wage negotiations among workers who earn well above the minimum wage (Messina and Sanz-de-Galdeano, 2014). Alternatively, lighthouse effects may occur because minimum wages have positive demand effects and act as a "big push" (Magruder, 2013) coordinating wage setting at a higher wage and employment equilibria, or be induced by significant sorting and composition effects between the formal and the informal sectors in the presence of matching frictions (Boeri, Garibaldi and Ribero, 2011).[13]

We conclude that the minimum wage in Thailand has a large impact on average wages that declines with the level of education, concentrates among the young and the elderly, and fades away for higher earning workers. Minimum wages reduced overall levels of inequality because the estimated impacts on the wage distribution are higher at the bottom that at the top of the wage distribution. However, substantial non-compliance reduces the impact of the minimum wage for the lowest earning workers. Indeed, inequality increased at the bottom half of the wage distribution due to the presence of minimum wages, as their impact peaks around the median wage.

[place figure 3 here]

4.3. Minimum wages and the uncovered sector

Our previous analyses confirmed that the minimum wage in Thailand is binding and showed that it shapes the wage distribution with differential impacts across different categories of workers. The next natural question, on which most of the developed countries literature has focused, would be whether the minimum wage generates unemployment. In the case of Thailand, where unemployment is extremely low—an average of 1.2 percent during the period we are analyzing—, we find that the minimum wage has no statistically significant impact on the probability of being unemployed, neither in general nor for particular subgroups of workers.[14]

[place table 4 here]

Importantly, another relevant mechanism may be at play: in the presence of binding minimum wages, some workers may be forced to move to the uncovered sector (a labor demand effect), which in Thailand and most other Southeast Asian economies is large. About 61 percent of private workers in Thailand are in the uncovered sector; that is, they are either self-employed or working in a family business for no pay. Are changes across provinces in the Thai minimum wage associated with changes in the probability of working in the uncovered sector? The answer to this question is not straightforward. Even if the minimum wage is clearly

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[13] Note that minimum wages may have lighthouse effects impacting the formal sector but also the informal sector (see for instance Maloney and Núñez, 2004).

[14] These results, not reported for the sake of brevity, are available upon request from the authors.

binding in Thailand, we have also documented a high level of non-compliance. Non-compliance with the law is yet another form of informality employers may opt for to pay wages below the provincial minimum. Additionally, even if there was perfect compliance, there is another mechanism through which minimum wage increases may promote (rather than reduce) formal job creation. A higher minimum wage increases the gap between the expected returns to formal versus informal employment, so workers may engage in additional efforts to find a formal job. As the pool of individuals searching for a formal job as well as the intensity of their search increase, the quality of matches between formal employers and employees increases. Hence depending on which channel dominates (the demand-side effects versus the worker-formal firm match quality improvement), increasing the minimum wage may cause declines in formal hiring, have no effect on formal job creation or even promote formal job creation.

Our next set of regressions investigates the role of the minimum wage on the probability of working in the covered sector. We focus on private sector workers and define a dummy variable that takes the value one if the worker is an employee, and the value of zero if he or she is self-employed or an unpaid family worker. As before, our benchmark specification controls for province and year dummies, province-specific trends, yearly province CPI and the log of provincial per capita GDP as well as a quadratic term in age, married and municipal area dummies, and occupation and industry indicators. Because the dependent variable is the probability of working in the covered sector, we estimate logit models and report average partial effects (APEs). Table 4 contains the results on the full sample (panel 1), and includes separate regressions by age group and education, (panels 2 and 3).

Despite the strong impact of the minimum wage on average wages and along the wage distribution, our results show little signs that minimum wage increases are pushing workers into the uncovered sector in Thailand. The estimated average partial effects for all groups are generally small in magnitude and do not achieve statistical significance at standard levels of testing. There is, however, an interesting exception to this pattern: according to the estimates in panel 3 of Table 4, a 10% increase in the minimum wage would decrease the probability of working in the covered sector by 2.2 percentage points for workers with elementary education. Considering that only 43.5 percent of private workers with elementary education are employed in the covered sector, the estimated effect is relatively large: a 10% increase in the minimum wage reduces the probability of being formal by 5% for workers with elementary education, who represent 24 percent of formal employment. Interestingly, the impact of the minimum wage is non-significant and much smaller in magnitude for workers with less than elementary education, possibly because non-compliance is highest among this group (35.5 percent of workers in this group are paid below the minimum, see Table A.1. in the online appendix).

4.4 Dynamic effects

So far we have used static models to study the effects of the minimum wage in Thailand. Employment

outcomes, however, may not respond immediately to minimum wage changes. Indeed, in a recent contribution Meer and West (2016) argue that the minimum wage may impact employment over time through changes in growth rather than affect the level of employment in a discrete manner. The basic analysis of the minimum wage argues for a fast adjustment to a new equilibrium employment level (Stigler, 1946), which is in line with the notion that turnover is less costly for low skilled workers (Card and Krueger, 1995). However, as argued by Hamermesh (1995), while firms may adapt their staffing levels quickly to changes in the minimum wage, adjusting capital takes time, and minimum wage changes may trigger employment responses in the long run through capital/labor substitution. Ultimately, the importance of dynamic effects is an empirical question.

We now extend our previous static analyses of the impact of the minimum wage on covered employment to assess the importance of dynamic effects. Given the cross-sectional nature of the LFS, we aggregate data at the province-year level and construct a province-year panel for this analysis. Following Meer and West (2016), we rely on long-differences specifications to examine whether there are dynamic effects of the minimum wage. We estimate specifications of the following form:

(3) $$\Delta_r lny_{pt} = \tau_t + \gamma_p + \beta \, \Delta_r lnMW_{pt} + \phi \, \Delta_r controls_{pt} + \Delta_r \epsilon_{pt},$$

where lny_{pt} is the log of the covered employment rate for province p in year t, τ_t is a year fixed effect, γ_p is a province fixed effect and $lnMW_{it}$ is the log-minimum wage of province p in t. Finally, r denotes the period over which we differenced the series.

Panel A of Table 5 estimates the model for one-, two-, three- and four-year differences including a full set of control variables in the regression as well as province annual trends. If the minimum wage has a dynamic effect on covered employment, then its effect should be smaller (larger) over shorter (longer) time spans. Our results for Thailand shown in Table 5, however, clearly do not confirm this pattern. Moreover, while the estimated effects of the minimum wage mostly display positive signs, they are far from achieving standard levels of statistical significance.

Importantly, as Meer and West (2016) argue, if dynamic effects of the minimum wage are indeed relevant, the inclusion of location-specific time trends as control variables will attenuate estimates of the effect of the minimum wage and lead to estimating null employment effects. Of course, omitting location-specific trends is also controversial, as they may capture unobserved location patterns correlated with the minimum wage and the outcomes of interest (Allegretto *et al.*, 2017). Reassuringly, our conclusions are not different when province annual trends are excluded (Panel B). Estimates of the impact of the minimum wage on covered employment are never statistically significant, and the exclusion of province trends does not change the estimated coefficients significantly. Hence, one can conclude there is no evidence of dynamic effects of the minimum wage on covered employment in Thailand. We reach the same conclusion when analyzing the impact of the minimum wage on unemployment using the same dynamic specifications (the results are available upon

request).

[place table 5 here]

Also following Meer and West (2016), the province panel constructed to study dynamic effects can be additionally used to produce a falsification exercise. If provinces where covered employment is doing better are more likely to increase the minimum wage more, this could mask a negative relationship between changes in the minimum wage and covered employment. In this case, indicators of future minimum wage changes would show a positive effect on current covered employment. This can be assessed by estimating models of the following form:

(4) $$lny_{pt} = \tau_t + \gamma_p + \sum_{r=0}^{s} \beta_r lnMW_{pt+r} + \phi controls_{pt} + \epsilon_{pt},$$

where lny_{pt} is the log of the covered employment rate for province p in year t, τ_t is a year fixed effect, γ_p is a province fixed effect and $lnMW_{it}$ is the log-minimum wage of province p in t, and s denotes the number of leads included in the model.

Table 6 shows estimates of the effect of the minimum wage on covered employment (both measured in logs) using up to two leads of the minimum wage. As Table 4 showed using individual data, the contemporaneous effects of the minimum wage on covered employment is negative, but not statistically significant. Moreover, the lead terms are statistically insignificant, suggesting that pre-existing trends are unlikely to be a key driver of results. This is reassuring but unsurprising in light of the fact that results in Table 5 (as well as previous static analyses) change little when province trends are added or excluded.

[place table 6 here]

4.5. Minimum wages, poverty, and household consumption inequality

So far we have learned that Thai minimum-wages have a positive impact on the average wages of covered employees, and even workers with secondary education and workers who earn a wage well above the median of the wage distribution benefit from increases in the minimum wage. This suggests that minimum wages represent a social norm that sets the stage for wage negotiations, even among workers who earn wages well above the minimum. We did not find strong effects of the minimum wage on the likelihood of working in the uncover sector, except for a relatively large positive effect for workers with elementary education. These two set of facts suggests that inter-provincial minimum wage increases in Thailand are likely to be beneficial for workers' welfare. However, low compliance with the minimum wage casts doubts on their effectiveness as a poverty alleviating tool.

In this section, we address the overall impact of the minimum wage on welfare from two different angles: the effect of the minimum wage on the probability of being poor and its impact on household per capita consumption. To these purposes we rely on a different data set, the Thai Household Socio-Economic Surveys

(SES), which was collected in the following years: 2000, 2002, 2004, 2006, 2007, 2008, 2009, and 2010. The incidence of poverty is obtained using a consumption approach, and follows official definitions by Statistics Thailand. As such, poor households are those that are not able to fulfill minimum calorie requirements for their members. Adjustments are made to consider the gender and age composition of the household and differences in food prices across regions (see Jitsuchon, Kakwani and Plangpraphan, 2006). The average poverty line in 2002 was 1,190 Baht per person per month (27 US$ of 2002), leaving some 15% of the Thai population in poverty at the time. It is worth stressing that the official poverty line has been constructed using a base year of 2002 (that is, after the 1997 economic crisis, which led to relevant changes in consumption patterns). It is worth noting that this poverty definition does not use equivalence scales. When we analyze the impact of the minimum wage on per capita household consumption and on poverty we control for household size and include indicators for the presence of household members younger than 15 and older than 59 years old, which allows us to control for differences in household composition and potential economies of scale that may affect both outcomes.

Table 7 presents logit estimates of the probability of the household being poor as a function of the minimum wage. In column 1 we only control for province and year dummies, province fixed effects and province annual trends. Column 2 adds household head's characteristics (a male dummy, age and its squared term, a married dummy, education, and labor market status indicators), household-level information (a municipal area dummy, household size, and indicators for the presence of household members younger than 15 and older than 59 years old); and the two provincial indicators we used in previous regressions: the log of per capita GDP and CPI per province and year.

According to the estimates in Table 7, the estimated average partial effects of the minimum wage on poverty are negative and significant at the 5 percent level. According to the estimates in column 1, a 10 percent increase in the minimum wage is associated with a 2.4 percentage point reduction in the probability of a household being poor. Controlling for household characteristics, household's head demographics provincial CPI and GDP per capita does substantially alter the results: the estimated APE is -0.211 and statistically significant at the 5 percent level.

[place table 7 here]

To gain a better understanding of the impact of the minimum wage on the welfare of the population, we now extend the analysis beyond the poor and focus on the responses to minimum-wage changes of household consumption per capita. In developed countries, income per capita at the household level is commonly used as a measure of welfare. In developing countries, consumption per capita is commonly believed to be a better measure to approximate the permanent income of the household. Income in household surveys tends to be severely understated, a problem that is much less common in the case of consumption. Consumption data are expected to be smoother and less prone to underreporting than income data. Moreover,

consumption captures household welfare better than income, as utility depends on consumption. Even if household consumption may not be a perfect proxy for welfare (especially among high-earning households with some saving capacity), the analysis has the potential of capturing some of the general equilibrium effects of the minimum wage.

[place figure 4 here]

We look into the effect of the minimum wage along the per capita household consumption distribution. While LFS wage data are available only for employees, per capita household consumption is available for all households in the SES, which allows us to provide a broader picture of the welfare effects of minimum-wage changes. The analysis mimics the wage analysis before, and is conducted using unconditional quantile regressions. The dependent variable is the log of per capita real household consumption, and explanatory variables are the (log of) the real daily minimum wage; household heads' characteristics (male and married dummy, age and its quadratic term, education, and labor market status indicators); a municipal area dummy; indicators of household composition (household size and indicators for the presence of household members younger than 15 and older than 59 years old); and the log of real per capita GDP per province and year.

Figure 4 reports the results for the impact of the minimum wage along the distribution of household consumption per capita. The minimum wage has a positive impact on per capita household consumption that is statistically significant at all percentiles below the 55th. This effect is fairly uniform along the bottom half of the distribution, with an estimated elasticity that reaches a maximum around the 20th percentile, at 0.5, and slowly declines thereafter until the 55-60th percentile, after which the estimated elasticity declines rapidly, crossing zero at 70th. Hence, we conclude that the minimum wage in Thailand does not only have a role in poverty alleviation, it also helps reducing inequality by lifting consumption per capita at the bottom.

5. CONCLUDING REMARKS

The minimum wage in developing countries is often seen as a fundamental tool for lifting the labor market fortunes of the less favored. However, such a tool may not be effective in the presence of informality. Large fractions of the labor force are employed through informal arrangements in developing countries, and hence not covered by minimum-wage laws. Even among formally registered firms, where one would expect greater enforcement, minimum-wage laws are associated with considerably high levels of non-compliance. Naturally, higher levels of non-compliance and a higher likelihood of working in uncovered sectors are found among those workers who are less productive and more vulnerable, such as the young, the elderly, and the less-educated in general. Hence, it is in principle unclear whether the minimum wage constitutes the right tool for reducing inequality and, ultimately, for alleviating poverty.

This paper examined the impact of the minimum wage on key labor market variables including the likelihood of working in the uncovered sector and formal sector wages, but it also extended the analysis to study the impact on household poverty and consumption inequality during the past decade in Thailand. We find that minimum wage increases actual wages generally, and they do so more for young workers and older workers than for prime-aged employees, and for less educated workers than for highly educated workers. The estimated elasticities are in the range of 0.24–0.61, depending on the subgroup analyzed, and the average elasticity for the general population of full-time formal sector employees is 0.40. The message conveyed by the subgroups analysis is confirmed by unconditional quantile regressions, which show an inverted U-shape in the impact of the minimum wage along the wage distribution, peaking around the 25th to 55th percentile of wages. This is illustrative of the importance of various lighthouse effects in the Thai labor market, where changes in the minimum wage have an impact on workers who are well above the minimum (and to some extent, also for those who are paid below the minimum wage). Importantly, apart from workers who have elementary education, we find little evidence of minimum wage increases pushing workers into the uncovered sector (comprising self-employed and unpaid family workers).

Thus, the labor market analysis suggests that the minimum wage law in Thailand is likely to have a positive effect on individuals' welfare at the bottom of the distribution. This conclusion is confirmed by our analysis of the impact of the minimum wage on consumption per capita at the household level and on household poverty. A 10 percent increase in the minimum wage is associated with a non-negligible poverty reduction of 2.1 percentage points. As for household consumption, minimum wage increases reduce inequality at the bottom-half of the distribution significantly, although the impact of the minimum wage is sizeable up to the 6th decile of the consumption per capita distribution, and declines rapidly thereafter.

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Table 1. Determinants of Relative Minimum-Wage Changes in Thailand

	Minimum-wage growth higher than regional average		Minimum-wage growth ranking	
	(1)	(2)	(3)	(4)
Lag minimum-wage growth higher than regional average	-0.3072***	-0.1230**	-	-
	(0.04144)	(0.04204)	-	-
Lag minimum-wage growth ranking	-	-	-0.2972***	-0.1230***
	-	-	(0.03559)	(0.03668)
Inflation	-0.01145	-0.01852	-0.001245	0.08555
	(0.00798)	(0.01283)	(0.09385)	(0.1351)
Nominal per capita GDP growth	0.2215	-0.06615	1.0732	-0.1364
	(0.505)	(0.4017)	(6.1488)	(4.264)
Lag inflation	0.004265	0.004251	0.0558	0.1883
	(0.01425)	(0.01387)	(0.1471)	(0.1398)
Lag nominal per capita GDP growth	0.3067	0.1962	5.0856	4.5581
	(0.5461)	(0.377)	(5.8351)	(3.9679)

Arellano-Bond test for AR (2) in first differences (p-value)	-	0.7894	-	0.8339
Hansen test (p-value)	-	0.807	-	0.4226
N	684	684	684	684

Notes: In columns (1) and (2), the dependent variable takes the value one if the province's percentage change in the minimum wage is above the regional average, and the value zero otherwise. In columns (3) and (4), the dependent variable ranks each province's minimum-wage percentage increase within the region. In all columns, province fixed effects, year fixed effects and, province-annual trends are included. Columns (1) and (3) display OLS coefficient estimates, while columns (2) and (4) display Arellano and Bover (1995)/Blundell and Bond (1998) system GMM estimates using up to the fourth lag of the dependent variable for the "GMM-style" instrument set. Clustered standard errors at the province level are displayed in parentheses. The analysis considers Thailand's 76 provinces in nine minimum-wage change dates (January 2003, January 2004, January 2005, August 2005, January 2006, January 2007, January 2008, June 2008, and January 2010), which yields a sample of 684 observations. * p < 0.05 ** p < 0.01 *** p < 0.001.

Table 2. Effect of Thai Minimum Wage on Average Wages. OLS Estimates. 2001-2010

	(1)	(2)	(3)	(4)	(5)
(Log) Minimum wage	0.609***	0.356***	0.391***	0.396***	0.405***
	(0.070)	(0.104)	(0.106)	(0.102)	(0.102)
Province dummies	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes
Province annual trends	Yes	Yes	Yes	Yes	Yes
Individual controls	No	Yes	Yes	Yes	Yes
Education	No	Yes	Yes	Yes	Yes
Occupation	No	Yes	Yes	Yes	Yes
Industry	No	No	Yes	Yes	Yes
Establishment size	No	No	No	Yes	Yes
Province (Log) GDP and CPI	No	No	No	No	Yes

Note: The dependent variable (individual daily wages) is measured in logs. Individual controls include a male dummy, age, age squared/100, married, and municipal area indicators. Sampling weights are used, and standard errors, displayed in round brackets, are clustered at the province level. Analyses are based on working-age (15–60 years old), full-time (35+ hours per week), private sector employees. Number of observations: 1,069,134. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 3: Effect of Thai Minimum Wage on Average Wages, by Socioeconomic Group.
OLS Estimates. 2001-2010

	Elasticities and standard errors	Sample size
(1) By age group		
15–23 years	0.5893***	170,691
	(0.1024)	
24–49 years	0.3506***	803,033
	(0.1018)	
50–60 years	0.5758*	95,410
	(0.2566)	
(2) By education		
Less than elementary	0.6123***	277,569
	(0.1385)	
Elementary	0.5475***	247,075
	(0.09368)	
Lower secondary	0.3814***	190,983
	(0.1066)	

Upper secondary	0.2807*	171,032
	(0.1287)	
Tertiary	0.2447	182,475
	(0.2408)	

Note: Both the dependent variable (individual daily wages) and the daily minimum wage are measured in logs. Control variables in all panels include a male dummy, province and year dummies, a province linear trend, age, $age^2/100$, married, and municipal area dummies, occupation, establishment size, and industry indicators as well as the log of per capita provincial GDP and the yearly provincial CPI. Estimations by age group (panel 1) also include educational categories. Sampling weights are used and standard errors, displayed in round brackets, are clustered at the province level. Analyses based on working-age (15–60 years old), full-time (35+ hours per week) private employees. $^* p < 0.05$ $^{**} p < 0.01$ $^{***} p < 0.001$

Table 4. Effect of Thai Minimum Wage on the Probability of Working in the Covered Sector Logit Estimates. 2001-2010

	APEs and standard errors	Sample size
(1) All	-0.04422	3,620,959
	(0.05703)	
(2) By age group		
15–23 years	0.0009928	376,462
	(0.1271)	
24–49 years	-0.07190	2,531,539
	(0.06725)	
50–60 years	0.01658	712,958
	(0.08133)	
(3) By education		
Less than elementary	0.05233	1,429,761
	(0.07076)	
Elementary	−0.2246*	798,673
	(0.1025)	
Lower secondary	0.008650	537,740
	(0.07644)	
Upper secondary	−0.01509	451,126
	(0.1137)	
Tertiary	0.02475	403,659
	(0.1079)	

Note: The dependent variable takes the value 1 if the individual is working in the covered sector (that is, if he or she is a salaried employee in the private sector) and 0 is he or she is self-employed or an unpaid family worker. The daily minimum wage is measured in logs. Analyses are based on 15- to 60-year-old individuals working in the private sector (public employees and unemployed individuals are therefore excluded from the sample). Logit average partial effects (APEs) are displayed, sampling weights are used, and standard errors, displayed in round brackets, are clustered at the provincial level. Control variables in all panels include a male dummy, province and year dummies, a linear province trend, age, $age^2/100$, married and municipal area dummies, and occupation and industry indicators as well as the log of per capita provincial GDP and the yearly provincial CPI. Estimations for all working-age individuals (panel 1) and by age group (panel 2) also include educational categories. $^* p < 0.05$ $^{**} p < 0.01$ $^{***} p < 0.001$.

Table 5. Long-Difference Estimates for the Effect of the Minimum Wage on Log-Covered employment

Number of years of long differences:	1	2	3	4
Panel A. With Province Annual Trends				
Long difference in log-MW	0.4538	0.5992	0.2159	0.2474
	(0.3337)	(0.531)	(0.4723)	(0.5508)
Panel B. Without Province Annual Trends				
Long difference in log-MW	0.428	0.4469	0.01197	-0.02867
	(0.3048)	(0.4386)	(0.4362)	(0.4344)
N	684	608	532	456

Robust standard errors are clustered by province and reported in parentheses. The dependent variable is the first difference in the log of the rate of covered employment over different time spans. The column numbers correspond to the number of years over which the long difference is taken. All specifications include: province and year fixed effects, the log of per capita provincial GDP and the yearly provincial CPI, the share of male individuals, the mean of age, the mean of $age^2/100$, the share of married individuals, the share of municipal areas and the shares of education, industry and occupational categories. Panel A includes province specific annual trends, while Panel B excludes them. Sampling weights (total population in each province per year) are used. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 6. Province-Panel Fixed Effect Estimates for the effect of the Minimum Wage on Log-Covered Employment including Minimum Wage Leads.

	(1)	(2)	(3)	(4)
Log Minimum wage	-0.2819	-0.04051	-0.6550	-0.5388
	(0.5581)	(0.3409)	(0.6788)	(0.3900)
1st lead of Log Minimum wage	-0.1167	-0.08324	-0.05574	0.5690
	(0.4861)	(0.2722)	(0.5057)	(0.3260)
2nd lead of Log Minimum wage	-	-	0.1927	-0.5413
			(0.5904)	(0.3142)
Province dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Additional controls	No	Yes	No	Yes
N	684	684	608	608

Robust standard errors are clustered by province and reported in parentheses. The dependent variable is the log of the rate of covered employment. Additional control variables are: the log of per capita provincial GDP, yearly provincial CPI, the share of male individuals, the mean of age, the mean of $age2/100$, the share of married individuals, the share of municipal areas and the shares of education, industry and occupational categories. Sampling weights (total population in each province per year) are used. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Table 7. Effect of Thai Minimum Wage on Probability of Household Poverty Logit APEs. 2000-2010

	(1)	(2)
Log daily minimum wage	-0.237*	-0.211*
	(0.095)	(0.0916)
Province dummies	Yes	Yes

|		
Year dummies	Yes	Yes
Province annual trends	Yes	Yes
Household head's characteristics	No	Yes
Household characteristics	No	Yes
Province yearly CPI	No	Yes
Log yearly province per capita GDP	No	Yes
N	312,985	312,872

Note: The dependent variable takes the value 1 for poor households and 0 otherwise, and the daily minimum wage is measured in logs. Average partial effects (APEs) are displayed, and standard errors, displayed in round brackets, are clustered at the provincial level. Specification 1 includes only province and year dummies. Specification 2 adds the household head's characteristics (male dummy, age, $age^2/10$, married dummy, education, and labor market status indicators); household information (municipal area dummy, household size, and indicators for the presence of household members younger than 15 and older than 59 years old); the (log of) real per capita GDP per province and year and yearly province CPI. $^* p < 0.05$ $^{**} p < 0.01$ $^{***} p < 0.001$

Figure 1. Nominal Minimum Wage in Thailand, by Region, 1998–2010
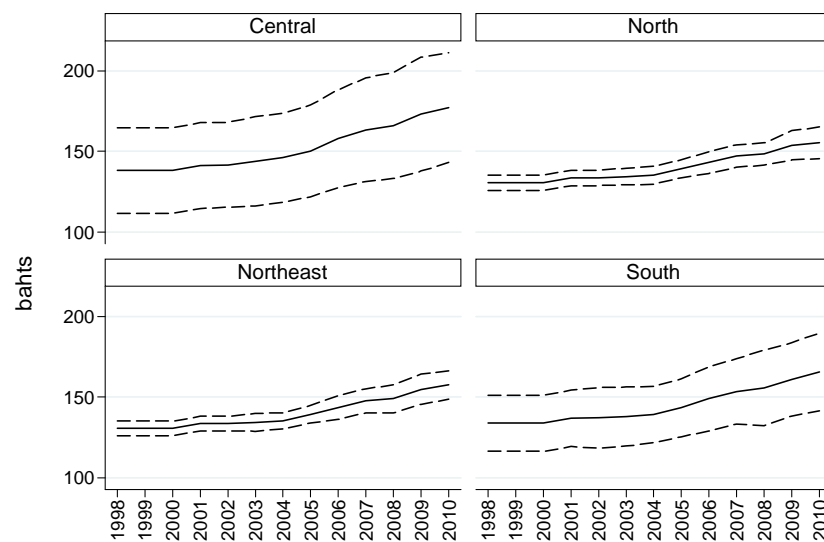

Note: The unit of observation is the provincial minimum wage. The solid line depicts the average minimum wage (measured in current bahts) per region, and the dashed lines represent one standard deviation above and below it.

Figure 2. Kernel Density Functions of the Difference Between Actual Wages and Minimum Wage in Thailand, 2001–10
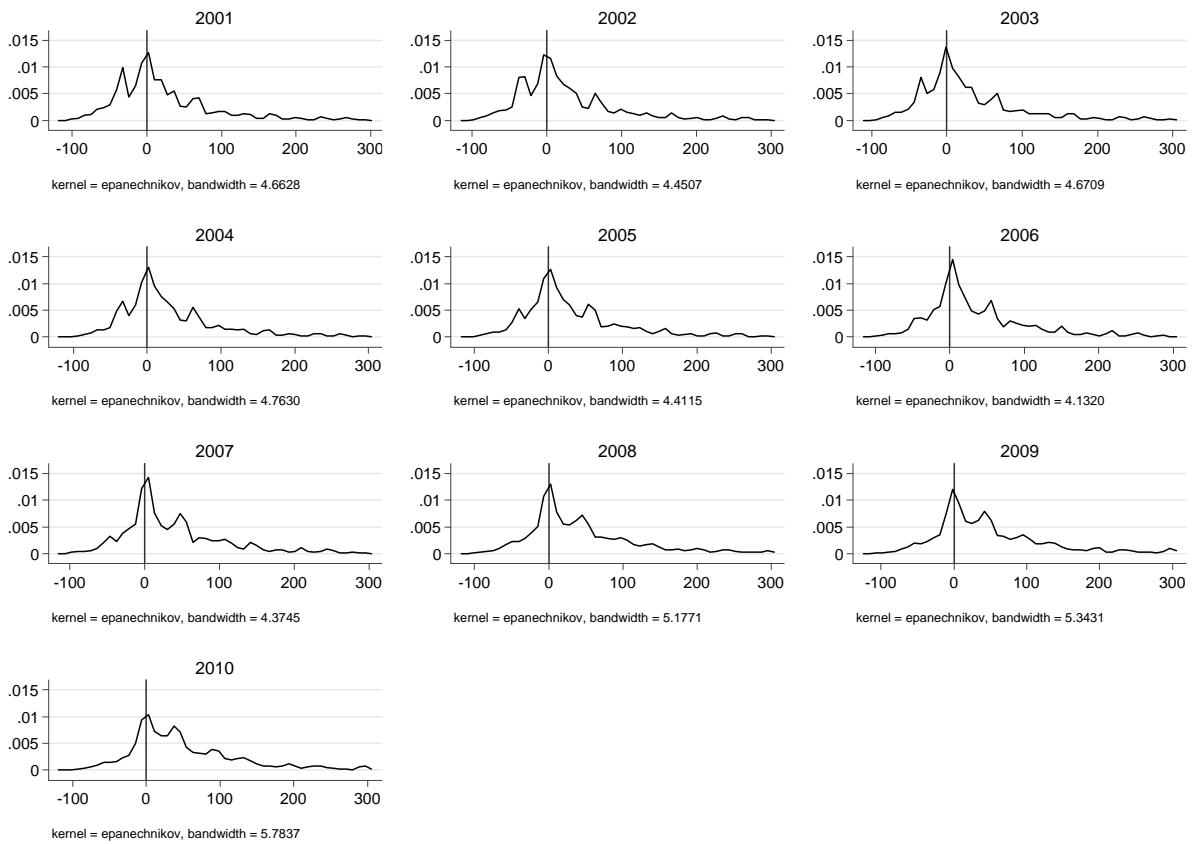

Note: Kernel densities display the log of daily wages of full-time (35+ hours per week) private salaried workers. The sample includes employees who are paid by the day as well as employees who are paid by the month.

Figure 3. The impact of the minimum wage on the distribution of wages. Unconditional Quantile Regressions. 2001-2010
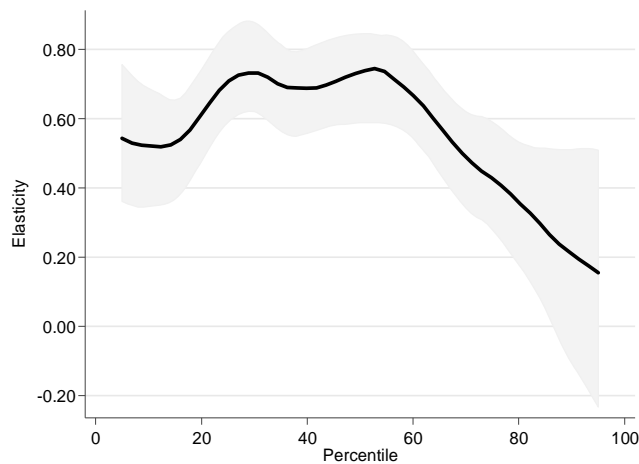
Note: The dependent variable (individual daily wages) is measured in logs. The set of controls included in the regression are the same as those of column 5 in Table 2. The point estimate and 95% confidence bands are built using nonparametric smoothing of all the centiles.

Figure 4: Impact of Thai Minimum Wage along Distribution of Real Per Capita Household Consumption. 2000-2010

Unconditional quantile effects
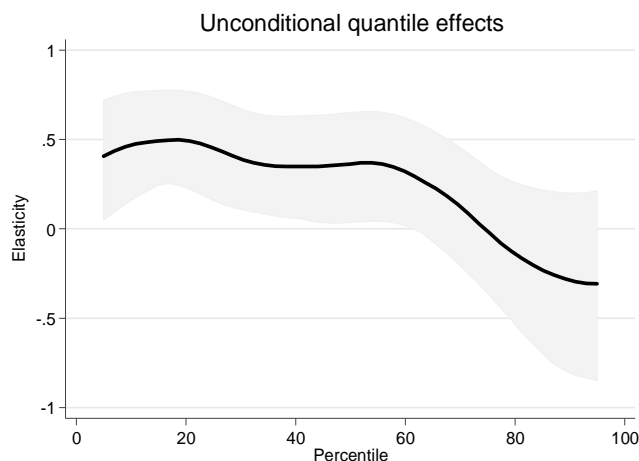
Note: Unconditional quantile regression estimates (solid lines) and their associated confidence intervals (grey area) are plotted. The line is a nonparametric smoothing of all the centiles while the confidence intervals express the intervals of the actual estimates. The dependent variable (per capita real household consumption.) is measured in logs, and so is the daily minimum wage. Control variables include household heads' characteristics (male dummy, age, $age^2/10$, married dummy, education, and labor market status indicators); a municipal area dummy; information on household composition (size and indicators for the presence of household members younger than 15 and older than 59 years old); province and year dummies, province annual trends, yearly province CPI and the log of per capita GDP per province and year.