Hours worked, Wages and Productivity (very preliminary)

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Outline

Extensive vs Intensive Margin

- In Turkey, labor market adjustments are mainly discussed at the extensive margin, e.g., labor market participation, employment generation...
- Adjustments on the intensive margin (hours worked) also attracted interest in many other countries (more stable labor force and employment?)
- There are interesting questions to be asked about the adjustments on the intensive margin in Turkey

Observed Hours vs Regulation

- In Turkey hours worked on the job is quite high in average and widely dispersed
- In 2011 (2005) average weekly hours worked by the wage earners was 50.8 (52.1) with a standard deviation of 13.5 (13.9) hours
- The law says that maximum working week is 45 hours for employees
- No daily standard workday has been established by law, only a maximum of 11 hours per day (Art. 63, Labor Law, 2003)
- Large flexibility on hours worked

Non-compliance with the Regulation

Non-compliance with the working hours regulation can bring about several negative outcomes

- Increased risk of accidents (Polat 2014)
- Implicit non-compliance with minimum wage
- Fall in the support of productivity distribution and consequently average productivity

Outline

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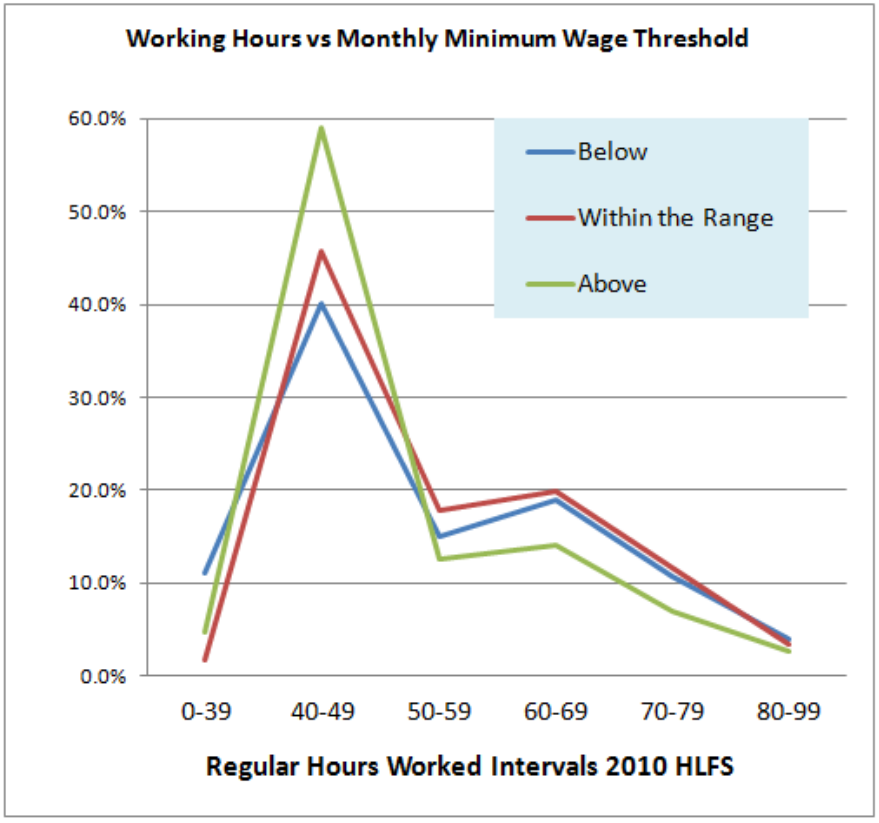
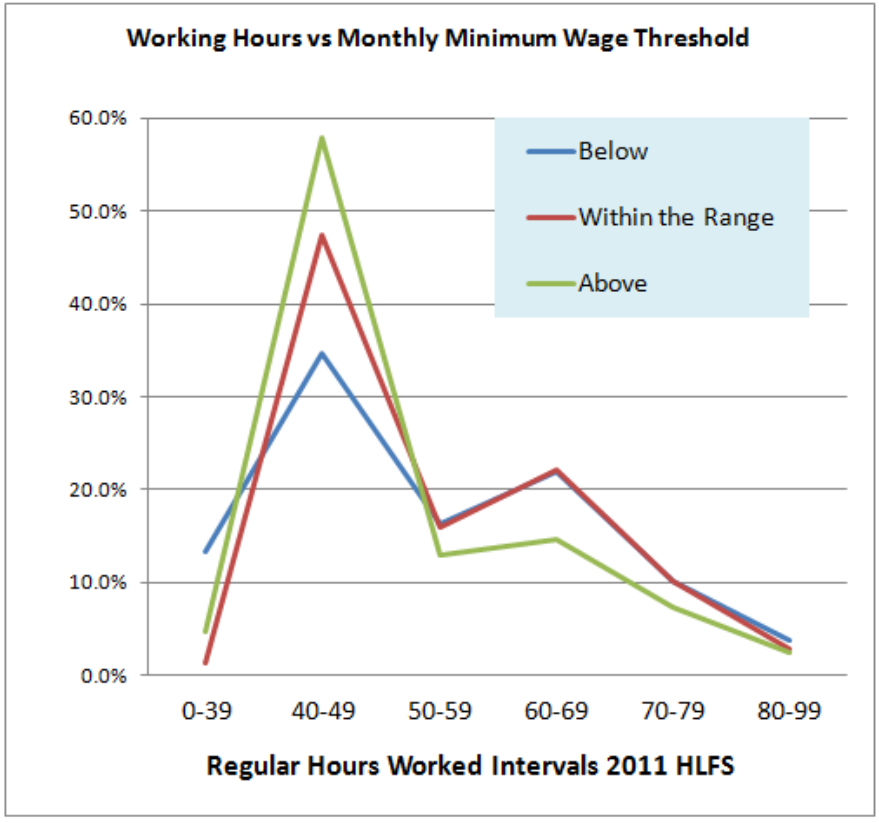
Regulation of Working Hours and Minimum Wages

- In Turkey minimum wages are set monthly
- Hourly minimum wages can be indirectly obtained using 45 hours working week
- Non-compliance with working hours regulation implies non-compliance with minimum wages
- Regulation of working hours and minimum wages are closely related

Working Hour Intervals and Monthly Minimum Wage





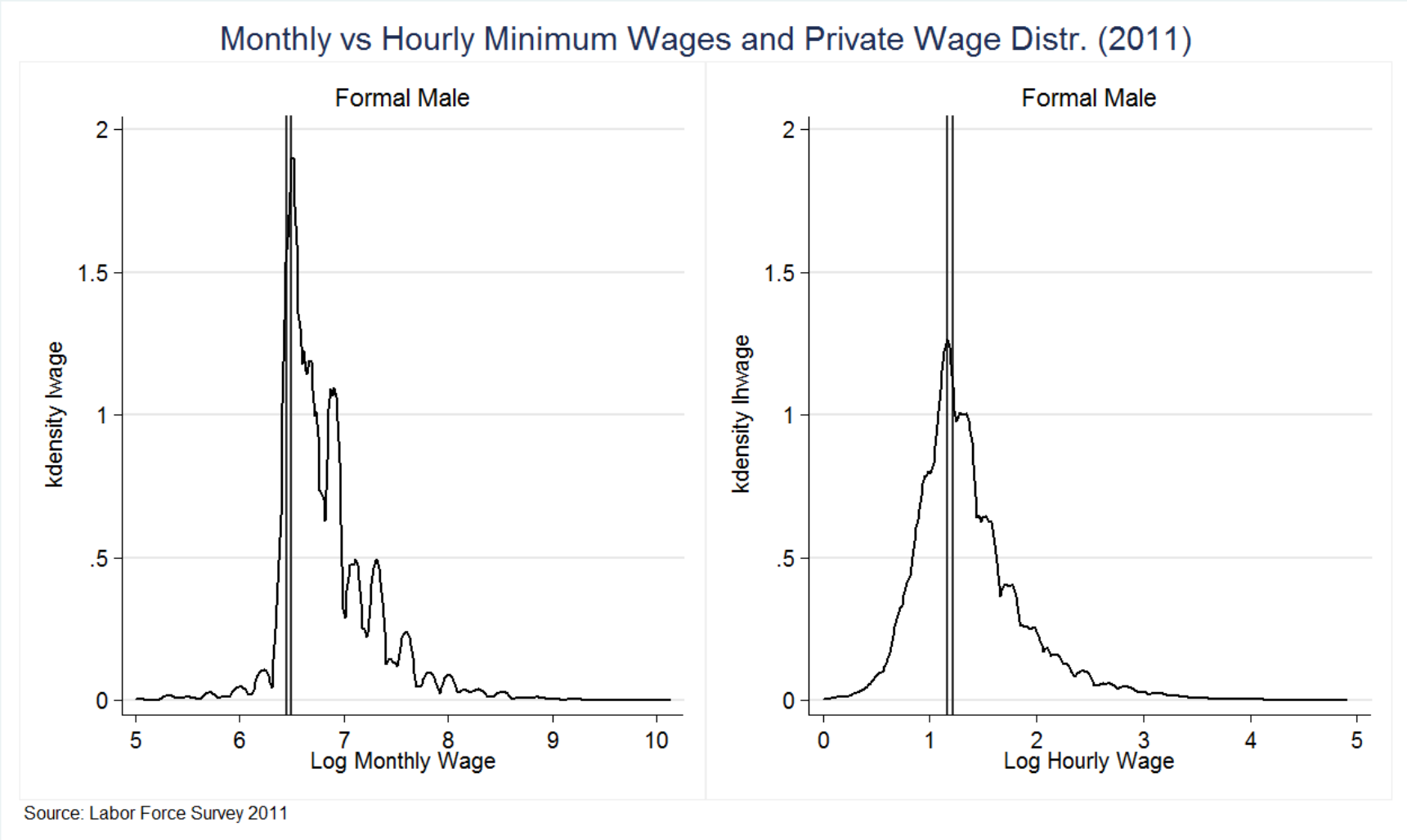


Figure : How binding is the minimum wage for Private Formal Male Workers

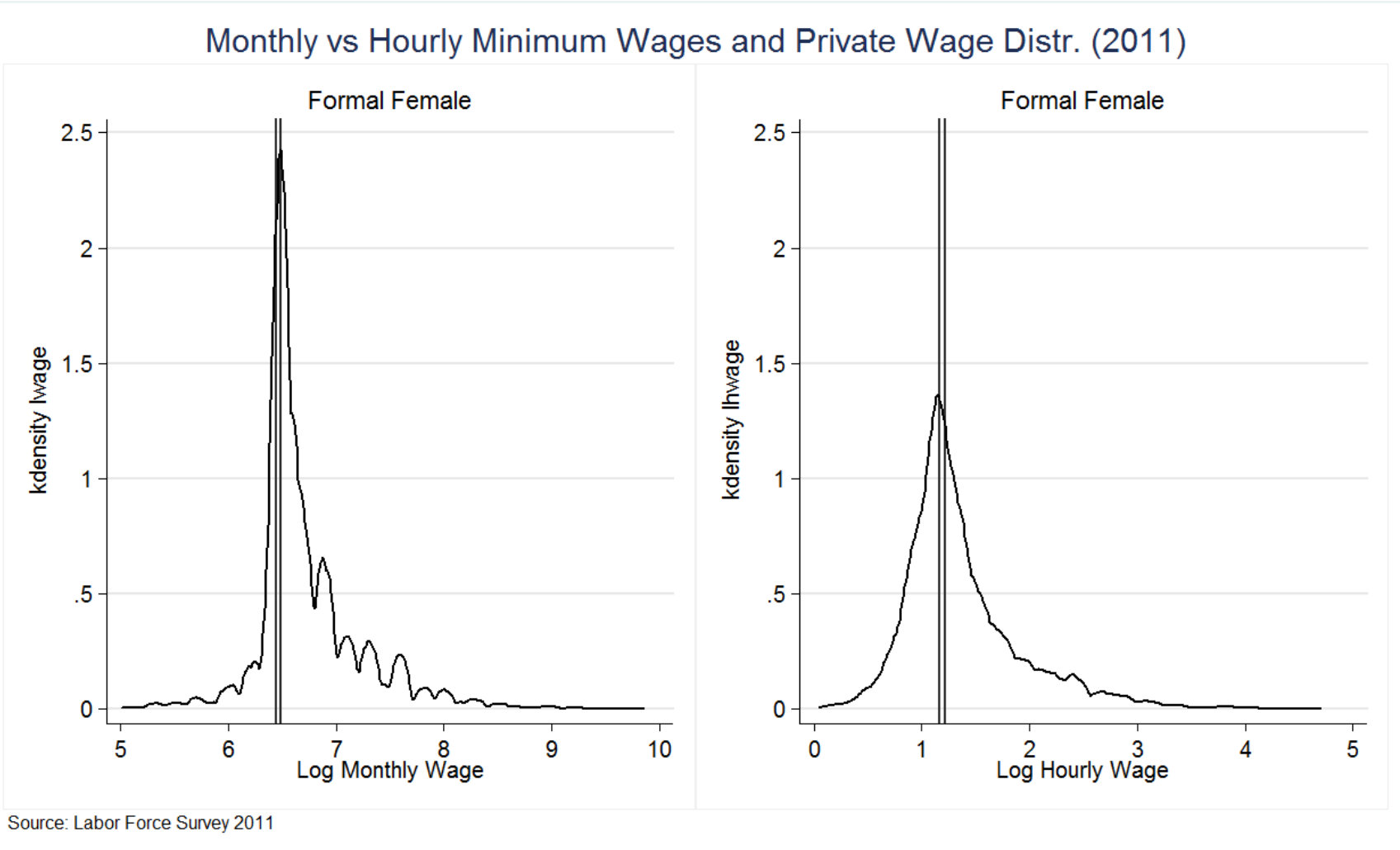


Figure : How binding is the minimum wage for Private Formal Female Workers

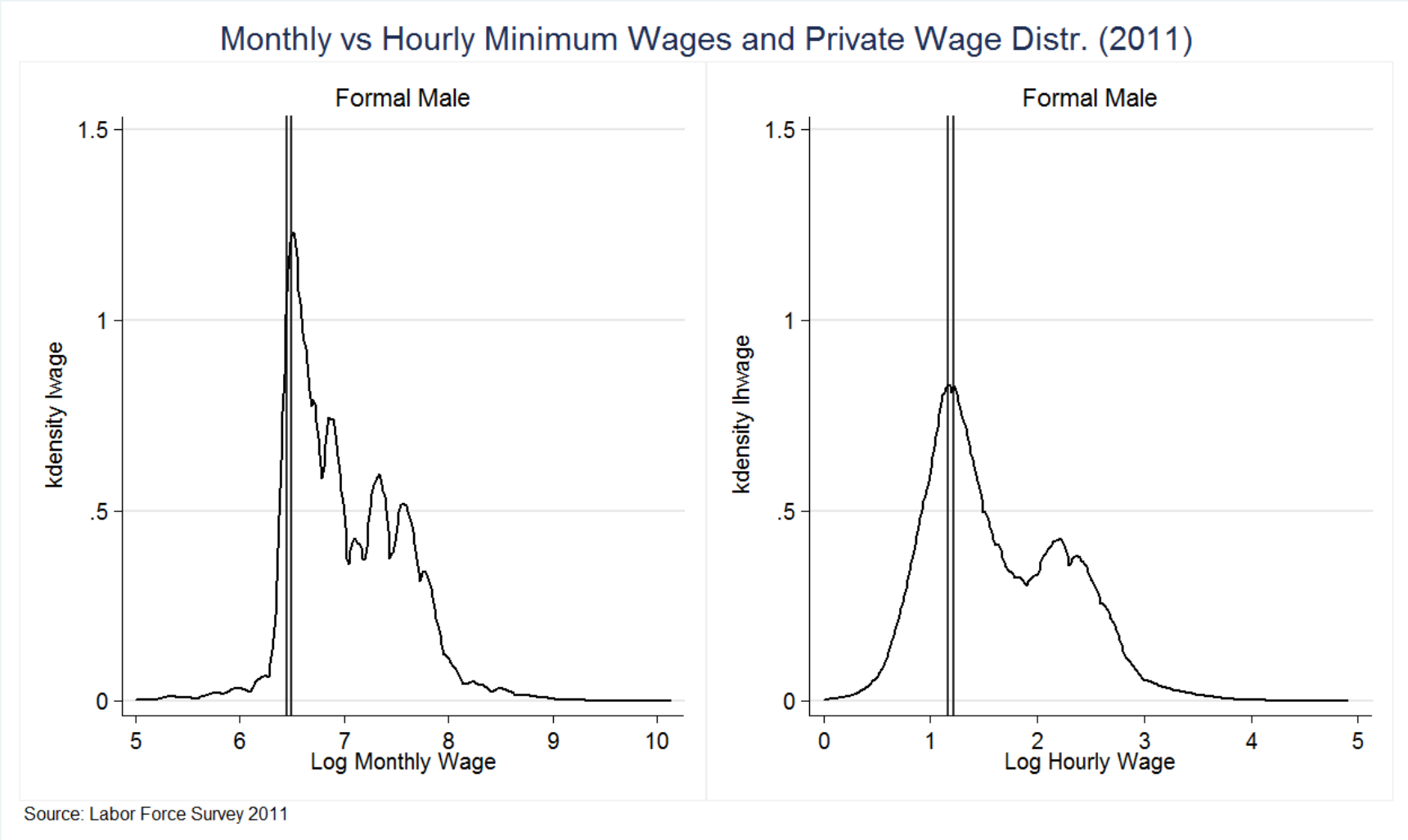


Figure : How binding is the minimum wage for Formal Male Workers Workers

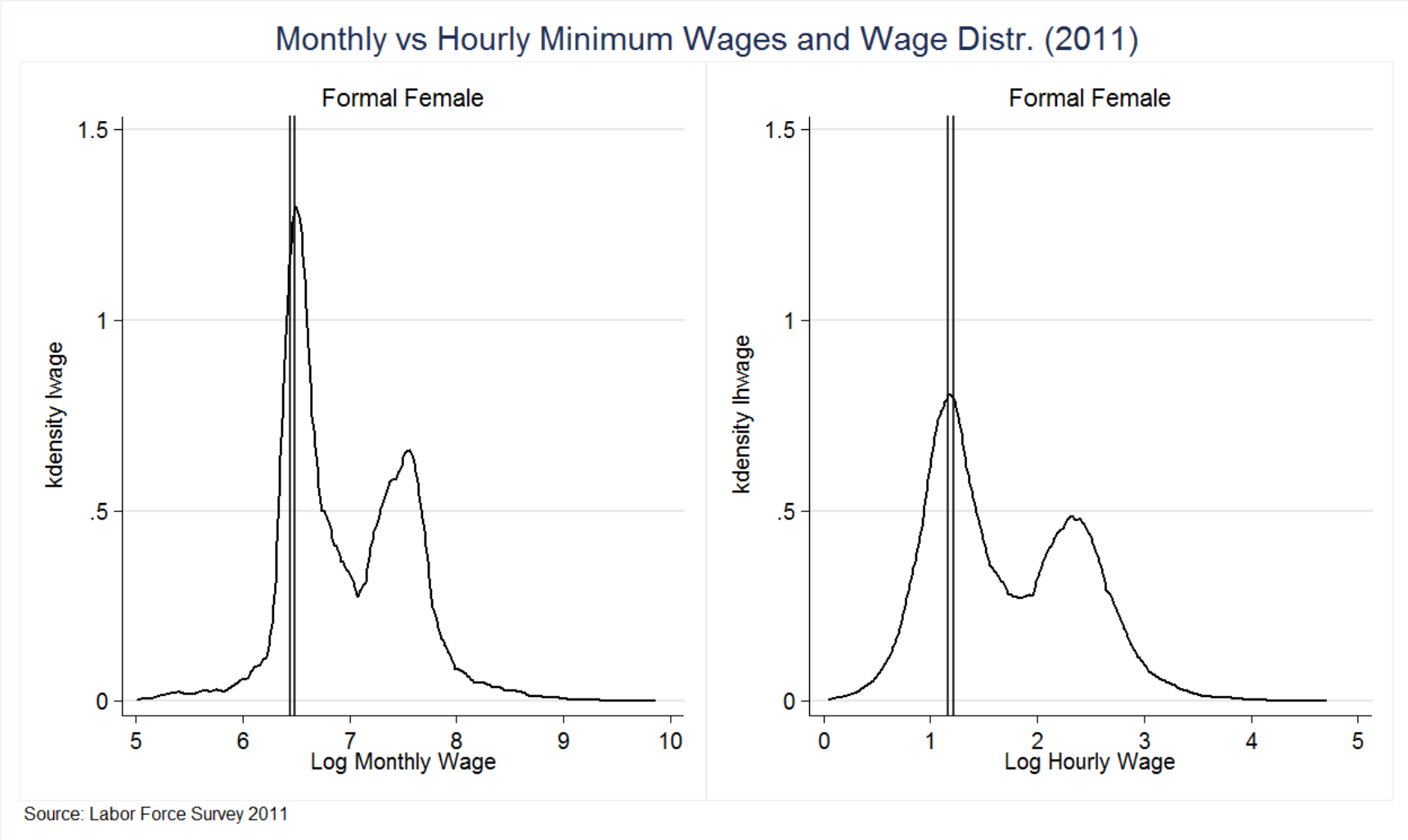


Figure : How binding is the minimum wage for Formal Female Workers Workers

Outline

Hours Worked and Productivity

- Correlation between productivity and hours worked?
- Wage differentials by firm size and sector as a proxy for productivity
- Impact of working hours on wage differentials gives some clues about the hours-productivity relation.
- Endogeneity problem (efficient workers select sectors with higher wage premium)
- 2 stage estimation partly solves endogenity problem arising from sorting

Data Description

- Household Labor Survey Data
- Time span: 2005-2011
- Wage earners in the formal manufacturing sector (18 sub-sector)
- Only hours worked $<=$ 84 and $>=$ 8 (some trimming)
- Sector and firm specific wage differentials to be estimated
- Composition of the cells: 18 manufacturing subsectors x 4 firm size x 7 years= 504 cells

Data and Composition of Firm-Sector Specific Cells

	18 Manufacturing subsectors
10	food products
13	textiles
14	wearing apparel
15	leather and related products
16	wood and of products of wood and cork
17	paper and paper products
18	eproduction of recorded media
20	chemicals and chemical products
22	rubber and plastic products
23	other nonmetallic mineral products
24	basic metals
25	fabricated metal products, except machinery
26	computer, electronic and optical products
27	electrical equipment
28	machinery and equipment n.e.c.
29	motor vehicles, trailers and semitrailers
31	furniture
32	Other manufacturing

	6 Manufacturing subsectors excluded
33	Repair and installation of machinery and equipment
30	other transport equipment
21	basic pharmaceutical products
19	coke and refined petroleum products
11	beverages
12	tobacco products

	Firms size of the worker
1	less than 25
2	25-50 employees
3	50-249 employees
4	250 and more

Some Evidence from Manufacturing Sector I

First step regression is estimated using standard OLS at the individual level.

$$log(w_{ifst}) = \beta X_{ifst} + \alpha_{fst} C + u_{ifst} \quad (1)$$

where w_{isft} stands for real hourly wage of individual i at the specific firm (size) f in sub-sector s at year t. X_{ifst} is the set of individual characteristics, α_{fst} denotes an sector-by-firm size-by-year dummy variable (C) vector that is obtained by interacting sector dummies, Z_s firms size dummies, F_f , and year dummies, T_t. We control for age, tenure and their squares, education level, 7 occupations, 12 nuts1 regions and an urban dummy.

Some Evidence from Manufacturing Sector II

Second stage, wage differentials (Eq.2) are regressed over cell means(firm and sector specific averages) like average working hours, average tenure or education

$$\hat{\alpha}_{fst} = \gamma H_{fst} + \phi Z_s + \rho F_f + \mu T_t + v_{fst} \tag{2}$$

where H_{fst} is the firm and sector specific averages. Sector dummies, Z_s firms size dummies, F_f , and year dummies, T_t control for sector, firms size and year fixed effects in the second stage. v_{fst} is the error term.

Results

Table : Second Stage Regression for Wage Differentials and Average Sector-Firm Size Characteristics (2005-2011)

	(1)	(2)	(3)
Average Working Hours	-0.023***	-0.021***	-0.020***
	(0.002)	(0.002)	(0.002)
Share of Unqualified Workers		-0.170***	-0.161***
		(0.052)	(0.051)
Average Job Tenure			0.005
			(0.004)
Constant	1.491***	1.505***	1.430***
	(0.112)	(0.114)	(0.132)
No. Obs.	504	504	504
R-squared	0.782	0.790	0.791

In the second stage, we control firm size, industry and years effects but coefficients are not reported but given as a distribution (kernel density) in figure 1.
*** p<0.01, ** p<0.05, * p<0.1. Robust standard errors in parentheses.

Correlation and Graphical Representation

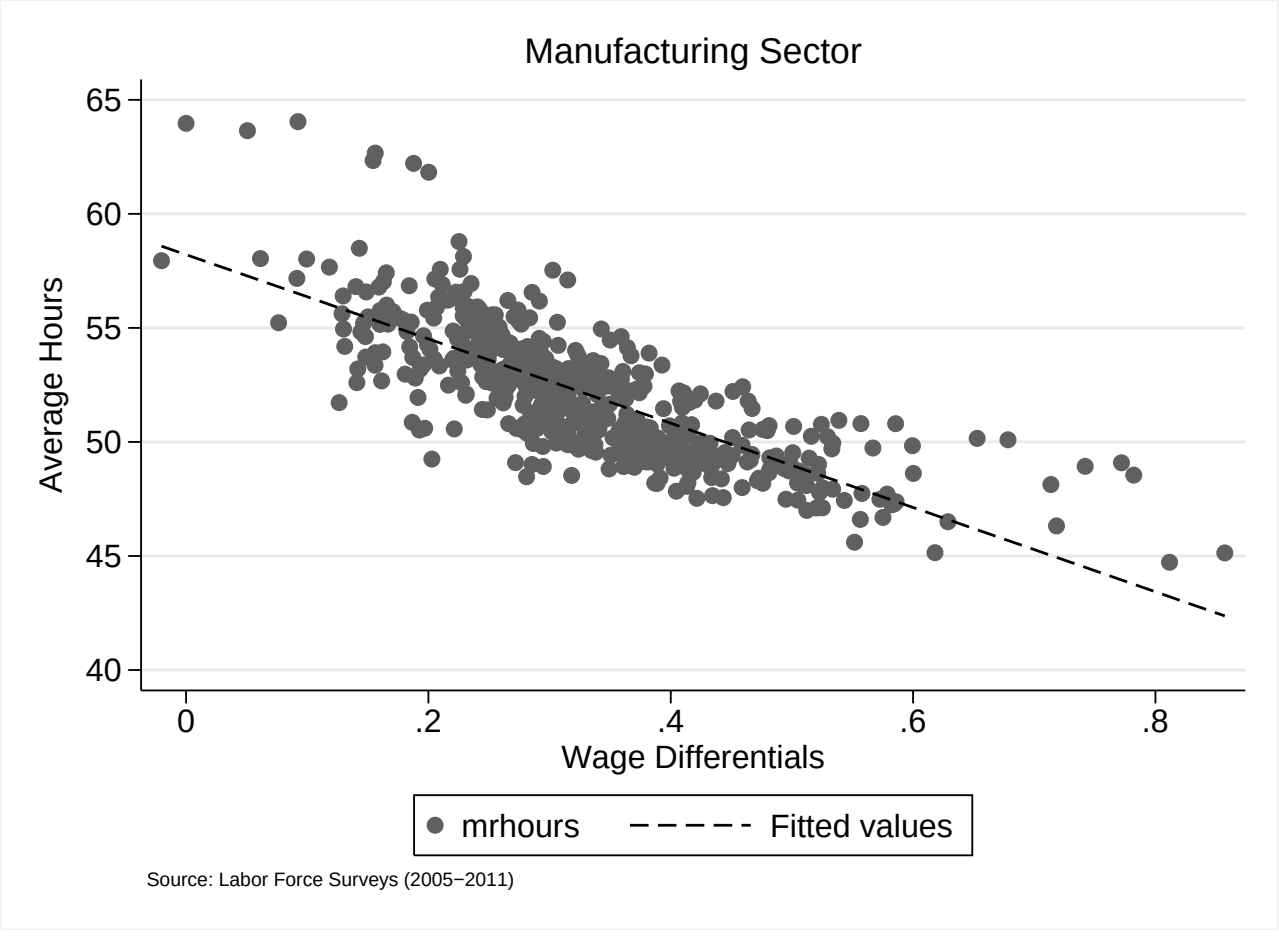


Figure : Wage Differentials and Average Hours Worked

Outline

Compensating Wage Differentials

Perfectly competitive framework

- More demanding jobs are more productive and pay higher wages
- Workers are heterogeneous wrt. their aversion to effort
- Workers choose optimally among jobs according to their effort aversion
- In other words the marginal return to effort is equal to the disutility that it gives rise to
- Accordingly wage increase with effort (hours worked)

However...

Unobserved Individual Characteristics (talent, motivation...)

- Good working conditions are likely to be normal goods, the consumption of which increases as income rises
- If the income effect is sufficiently strong,then the most efficient individuals choose the less laborious jobs, which entails a negative relation between wages and the laboriousness of jobs

This can partly explain the observed heterogeneity in the dispersion of wages and hours.

Yet, it will be hardly convincing to explain the whole story

Heterogeneous Productivity

One alternative could be to assume varying productivity of firms

But in this case competitive market and perfect information assumptions should fail as all workers would prefer highest productivity firms

Then, we must incorporate search frictions in order to have a dispersion

Outline

Labor Market

The labor market is subject to matching frictions where vacant jobs ($\mathcal{V}$) and unemployed workers (U) coexist.

- Matching technology is represented with a customary (CRS) matching function $\mathcal{M} \equiv \mathcal{M}(\mathcal{V}, U)$ satisfying standard properties:
  - it is increasing and continuously differentiable in each of its arguments
  - homogeneous of degree one and yields no hiring if the mass of the unemployed workers or the mass of vacant jobs is nil
- It is possible to express contact rates for firms and workers as a function of a single variable, $\theta \equiv \mathcal{V}/U$, the so-called labor market tightness.
- On average, a vacancy meets a worker at rate $q(\theta) \equiv \mathcal{M}(\mathcal{V}, U)/\mathcal{V} = \mathcal{M}(1, 1/\theta)$, with $q'(\theta) < 0$
- An unemployed finds a job at rate $\mathcal{M}(\mathcal{V}, U)/U_k = \mathcal{M}(\theta, 1) = \theta q(\theta)$, an increasing function of θ.

Workers

- There is a continuum of infinitely-lived identical workers and their measure is normalized to 1
- Workers' preferences are represented by a modified Stone-Geary utility function (with additively seperable utility functions wages are not allocative over hours)

$$v(C, h) = \alpha ln(C - \overline{C}) + (1 - \alpha) ln(T - h) \tag{3}$$

where C denotes the consumption which is equal to the instantaneous earnings of the workers and $\overline{C}$ is the subsistance consumption level. T denotes the total available time and h denotes the hours worked.

Jobs

- Jobs are either vacant or filled
- A job is described by its productivity
- The productivity of the match is discovered by the two parties once they meet and then they bargain over wages and hours
- We assume an exogenous two point productivity distribution. A fraction ϕ of the jobs has the high productivity level and a fraction $1 - \phi$ of the jobs has the low productivity level.
- We also assume constant hourly productivity such that $y_H > y_L$

Population

Workers can be employed in either a high-productivity or a low productivity job; or can be unemployed

$$N = L_H + L_L + U = 1 \tag{4}$$

where

- L_H: number of workers at high productivity jobs
- L_L: number of workers at low productivity jobs
- U: number of unemployed

Unemployment

- The flow into unemployment is exogenous and results from match-specific shocks that occur at Poisson rate δ.
- We assume that the job destruction rate is the same both for high and low productivity jobs.
- The law of motion for the number of unemployed satisfies:

$$\dot{U} = \underbrace{N(1-u)\delta}_{\text{number of separations}} - \underbrace{Nu\theta q(\theta)}_{\text{number of hires}} \tag{5}$$

- Steady state unemployment rate:

$$u = \frac{\delta}{\delta + \theta q(\theta)} \tag{6}$$

Workers' Gains

- Discounted value of unemployment

$$rU = v(z, T) + \theta q(\theta)\left[\phi E_H + (1-\phi)E_L - U\right] \tag{7}$$

- Discounted value of working at a high productivity job

$$rE_H = v(w_H, T - h_H) + \delta[U - E_H] \tag{8}$$

- Discounted value of working at a low productivity job

$$rE_L = v(w_L, T - h_L) + \delta[U - E_L] \tag{9}$$

where $r > 0$ is the common discount rate; z is the unemployment income, w_k is the wage for the productivity $k = \{H, L\}$

Firms' Gains

- Expected discounted value of a vacancy

$$rV = -\gamma + q(\theta)\left[\phi J_H + (1-\phi)J_L - V\right] \tag{10}$$

- Discounted value of a high-productivity job

$$rJ_H = y_H h_H - w_H + \delta[V_H - J_H] \tag{11}$$

- Discounted value of a low-productivity job

$$rJ_L = y_L h_L - w_L + \delta[V_L - J_L] \tag{12}$$

where γ is the cost of posting a vacancy

Job Creation

Free entry and Labor Demand. In equilibrium, free entry onto the labor market implies the expected value of a vacancy V is zero. Thus using (10), (11) and (12) one can write:

$$\frac{\gamma}{q(\theta)} = \frac{\phi\left(y_H h_H - w_H\right) + \left(1-\phi\right)\left(y_L h_L - w_L\right)}{r+\delta}. \qquad (13)$$

Bargaining

Wages and hours are both negotiated between workers and firms. If we assume Nash bargaining for both types of jobs $k = \{H, L\}$

$$\max_{h_k, w_k} (E_k - U)^{\beta} (J_k - V)^{1-\beta}, \tag{14}$$

we obtain F.O.C's as follows:

$$\frac{\beta}{E_k - U} v_1(w_k, T - h_k) - \frac{1-\beta}{J_k - V} = 0$$

$$-v_2(w_k, T - h_k) \frac{\beta}{E_k - U} + y_k \frac{1-\beta}{J_k - V} = 0$$

which yields:

$$(E_k - U) = (J_k - V) \frac{\beta}{1-\beta} v_1(w_k, T - h_k) \tag{15}$$

$$(E_k - U) = (J_k - V) \frac{\beta}{1-\beta} \frac{v_2(w_k h_k, T - h_k)}{y_k} \tag{16}$$

Contract Curve, Hours and Wages

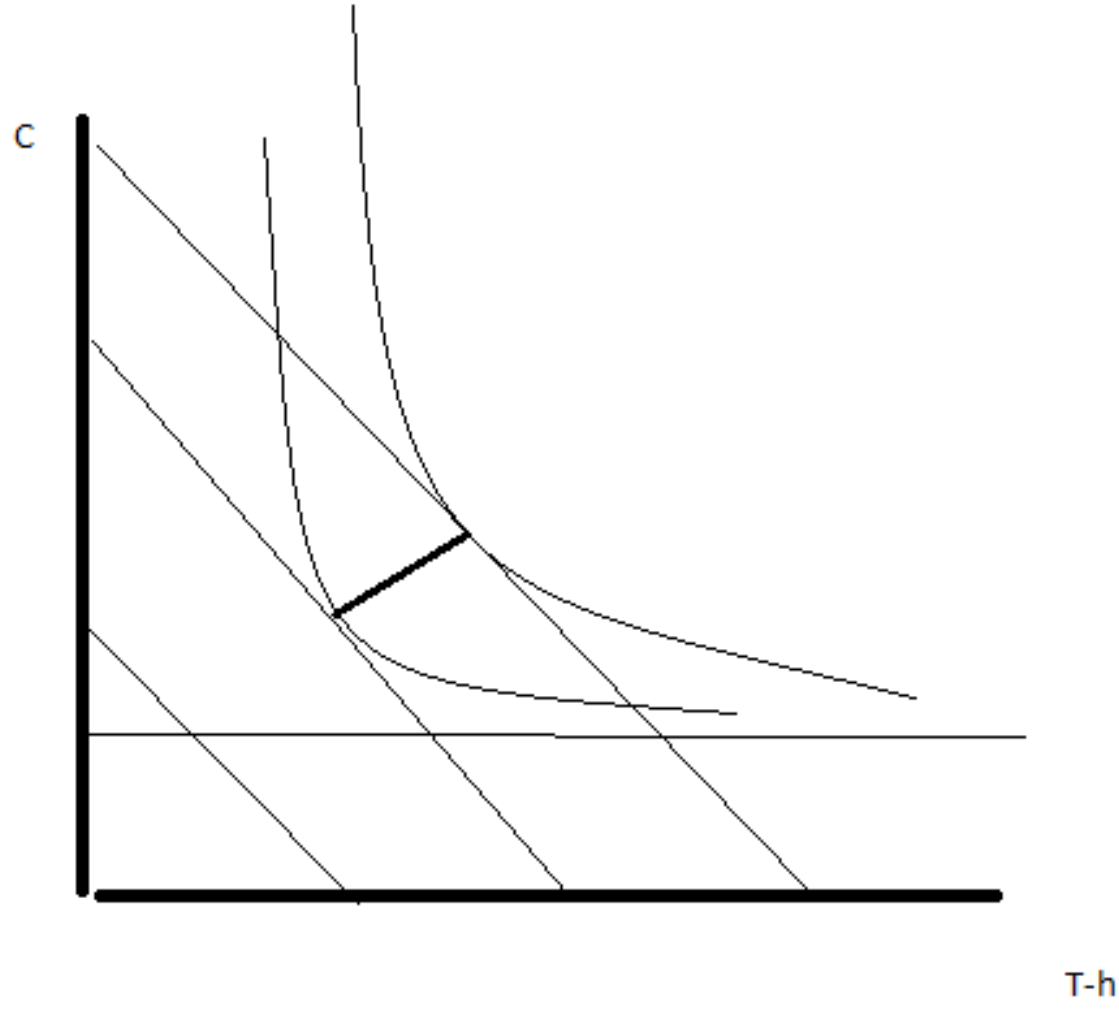
Equations (15) and (16) gives

$$y_k = \frac{v_2(w_k, T - h_k)}{v_1(w_k, T - h_k)} \tag{17}$$

Equation (17) defines the contract curve between firms and workers. There is no combination of (w_k, h_k) along this contract curve which makes one side better off without making the other worse off. Using the utility function:

$$y_k = \frac{1 - \alpha}{\alpha} \frac{w_k - \overline{C}}{T - h_k} \tag{18}$$

This equation gives a negative relationship between hours and wages for given productivity.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Wages

Replacing the hours from (18) and using (15) we implicitly obtain the wage equations:

$$\frac{v\left(w_k, T-h_k\right)-rU}{\frac{\alpha}{w_k-\overline{C}}}=\frac{\beta}{1-\beta}\left(y_k T-\overline{C}-\frac{1}{\alpha}\left(w_k-\overline{C}\right)\right) \quad (19)$$

Closing the Model

Equilibrium of the model is recursive. Two wage equations (19) and job creation condition (13) determines the labor market tightness (θ) and wages (w_H, w_L). Then hours and unemployment follows.

Outline

Impact of Productivity

Comparative statics of the model indicates that

- For $k = \{H, L\}$, a rise in productivity increases the firms profit but at the same time increases the wages and reduces the hours.
- Accordingly, an increase in ϕ increase the average wages and reduce the average hours.
- A more general distribution of productivity can account for the observed wage and hours dispersion

Further Implications

- A binding minimum wage which is not hourly determined together with loose enforcement of working hours regulation can increase the hours worked.
- Enforcement of regulations can be welfare improving inasmuch as average productivity increases (we need endogenous distribution of productivity), *i.e.*, can lead the economy to a better equilibrium.
- If good working conditions are normal goods, non-wage income should be negatively correlated with working hours.
- Higher subsistance level of consumption reduce the supernumerary income and the income effect, which leads to higher hours worked.