Tax Evasion and the Minimum Wage: Evidence from Hungary

Anikó Bíró (Centre for Economic and Regional Studies)
Dániel Prinz (Harvard University)
László Sándor (Luxembourg School of Finance)

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Research Question

Can tax evasion around the minimum wage be a rationale for substantial taxation of minimum wage earners?
Lee and Saez (2012) “In a model with extensive labor supply responses only, a binding minimum wage associated with a positive tax rate on minimum wage earnings is second-best Pareto inefficient.”
But Minimum Wage Taxed in Most Developed Countries

<table>
<thead>
<tr>
<th>Country</th>
<th>% Employer + Employee Tax and Social Contributions on Minimum Wage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ireland</td>
<td>13</td>
</tr>
<tr>
<td>New Zealand</td>
<td>14</td>
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<tr>
<td>United Kingdom</td>
<td>16</td>
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<tr>
<td>Korea</td>
<td>19</td>
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<td>Canada</td>
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<td>Chile</td>
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<td>Australia</td>
<td>23</td>
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<tr>
<td>Mexico</td>
<td>23</td>
</tr>
<tr>
<td>Luxembourg</td>
<td>28</td>
</tr>
<tr>
<td>United States</td>
<td>28</td>
</tr>
<tr>
<td>Japan</td>
<td>32</td>
</tr>
<tr>
<td>Portugal</td>
<td>34</td>
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<tr>
<td>Spain</td>
<td>36</td>
</tr>
<tr>
<td>France</td>
<td>40</td>
</tr>
<tr>
<td>Slovenia</td>
<td>40</td>
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<tr>
<td>Netherlands</td>
<td>40</td>
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<tr>
<td>Belgium</td>
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<tr>
<td>Turkey</td>
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<tr>
<td>Greece</td>
<td>41</td>
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<tr>
<td>Czech Republic</td>
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<td>Germany</td>
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<td>Poland</td>
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<td>Estonia</td>
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<td>Slovak Republic</td>
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</tr>
<tr>
<td>Latvia</td>
<td>51</td>
</tr>
<tr>
<td>Hungary</td>
<td>55</td>
</tr>
</tbody>
</table>

Source: OECD FOCUS on Minimum wages after the crisis: Making them pay (May 2015)
This Paper

- Leverage a tax reform in Hungary that increased audit threat for wages below a specific level (double minimum wage).
- Exploit detailed administrative data: track employment, earnings, worker and firm characteristics.
- Examine impact of reform on reported earnings and formal employment.
- Develop a model of tax evasion around the minimum wage.
This Paper

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Contributions

1. Quasi-experimental evidence on reporting and informality responses to audit threats
   ▶ Incentives: Allingham and Sandmo (1972)
   ▶ Causal impact of enforcement strategies: Slemrod (2019)
   ▶ Random audits: Bergolo et al. (2019), Kleven et al. (2011)
   ▶ Audit avoidance: Almunia and Lopez-Rodriguez (2018)

2. New evidence on tax evasion at the minimum wage

3. Discuss theory of minimum wage taxation in the presence of underreporting
   ▶ Lee and Saez (2012)
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Background

Evidence on Tax Evasion and Reporting Response

Evidence on Formal Employment Response

Model

Discussion
Background
Hungarian Double Minimum Wage Reform

- Between September 2006 and December 2010, employers had to pay social security contributions based on the double of minimum wage
- They could request exemptions for lower wages through a separate form
- Increased threat of audit for companies below this threshold
- (Higher minimum wage for skilled jobs introduced in 2006)
Data and Sample

- Use administrative data from Hungary
- Covers 2003-2011
- 50% sample of 2003 population aged 5-74
- Links employment, tax, pension, health, labor, etc.
- Use data for a representative month (March)

- Restrict to sample aged 18-65
- Drop cases where an individual has more than one job
- Separate private sector employees, public sector employees, and self-employed
Evidence on Tax Evasion and Reporting Response
Evidence of Bunching: Private Sector Employees

- **Earnings Distribution in 5,000 HUF Bins**

  - Monthly Earnings (Thousand HUF)
  - Share Earning in 5,000 HUF Bin

- **Graph Parameters**
  - 2005 vs. 2007
  - Monthly Earnings Range: 0 to 300 Thousand HUF
  - Share Earnings Bins: M5, M7, G7, D7

- **Notable Observations**
  - Peak earnings concentration at specific intervals.
Evidence of Bunching: Self-Employed
Evidence of Bunching: Public Sector Employees

The chart shows the distribution of monthly earnings for public sector employees in two different years, 2005 and 2007. The x-axis represents monthly earnings in thousands of HUF, while the y-axis represents the share of employees earning in specific 5,000 HUF bins.

Key observations:
- There is noticeable bunching at specific earnings levels, particularly around M5, M7, G7, and D7.
- The distribution appears more spread in 2007 compared to 2005, indicating a possible change in earnings distribution over time.
Transitions: Private Sector Employees 2003 → 2005

Note: M stands for the minimum wage.
Transitions: Private Sector Employees 2005 → 2007

Note: M stands for the minimum wage, G for the guaranteed minimum wage and D for the double minimum wage.
Transitions: Self-Employed 2003 → 2005

Monthly Earnings, March 2005 (Thousand HUF)

Monthly Earnings, March 2003 (Thousand HUF)

Note: M stands for the minimum wage.
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Summary of Main Results

<table>
<thead>
<tr>
<th></th>
<th>Private Employee</th>
<th>Self-Employed</th>
<th>Public Employee</th>
</tr>
</thead>
<tbody>
<tr>
<td>MW 2005</td>
<td>18.26%</td>
<td>68.53%</td>
<td>1.13%</td>
</tr>
<tr>
<td>DMW 2005</td>
<td>2.11%</td>
<td>0.32%</td>
<td>2.57%</td>
</tr>
<tr>
<td>MW 2007</td>
<td>5.77%</td>
<td>30.89%</td>
<td>1.14%</td>
</tr>
<tr>
<td>GMW 2007</td>
<td>6.41%</td>
<td>3.51%</td>
<td>0.75%</td>
</tr>
<tr>
<td>DMW 2007</td>
<td>5.14%</td>
<td>16.28%</td>
<td>2.51%</td>
</tr>
</tbody>
</table>

% MW 2005
→ DMW 2007 10.26% 19.16% 2.04%

<table>
<thead>
<tr>
<th></th>
<th>2005</th>
<th>2007</th>
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<tbody>
<tr>
<td>N</td>
<td>1,099,336</td>
<td>1,150,817</td>
</tr>
<tr>
<td></td>
<td>117,991</td>
<td>134,268</td>
</tr>
<tr>
<td></td>
<td>299,819</td>
<td>286,386</td>
</tr>
</tbody>
</table>

Note: MW (GMW, DMW) earners are defined as earning between the MW (GMW, DMW) plus 5,000 HUF.
Regression Framework

Event study:

\[ DMW_{it} = \beta_0 + \sum_{t=2003}^{2011} \beta_{1t} PE_{it} + \sum_{t=2003}^{2011} \beta_{2t} SE_{it} + \alpha_E + \tau_t + \varepsilon_{it} \] (1)

where

- \( i \) indexes workers
- \( PE_{it} \) is an indicator for private sector employee
- \( SE_{it} \) is an indicator for self-employed
- \( \alpha_E \) are sector fixed effects (public sector employee vs private sector employee vs self-employed)
- \( \tau_t \) are year fixed effects
Event Study Estimates: Reporting Response

![Graph showing the share of workers reporting the double minimum wage over years for private sector employees, self-employed, and public sector employees.]

- **Private Sector Employees**
- **Self-Employed**
- **Public Sector Employees**
Event Study Estimates: Reporting Response

Private Sector Employees
Event Study Estimates: Reporting Response

Self-Employed

<table>
<thead>
<tr>
<th>Year</th>
<th>Percent DMW Relative to Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.05</td>
</tr>
<tr>
<td>2004</td>
<td>0.1</td>
</tr>
<tr>
<td>2005</td>
<td>0.15</td>
</tr>
<tr>
<td>2006</td>
<td>0.2</td>
</tr>
<tr>
<td>2007</td>
<td>0.15</td>
</tr>
<tr>
<td>2008</td>
<td>0.2</td>
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<tr>
<td>2009</td>
<td>0.15</td>
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<tr>
<td>2010</td>
<td>0.2</td>
</tr>
<tr>
<td>2011</td>
<td>0.2</td>
</tr>
</tbody>
</table>

No Controls | With Controls

- No Controls
- With Controls

Pooled Version 25 / 48
Heterogeneity: Worker Characteristics

Private Employees

By Gender

- Female
- Male

By Age

- Age 18-30
- Age 31-40
- Age 41-50
- Age 51-63

By Education

- Primary
- Lower Secondary
- Upper Secondary
- Tertiary

Heterogeneity: Firm Characteristics

Private Employees

By Ownership
By Size
By Industry
Heterogeneity: Firm Quality

Private Employees

By Export

By Revenue

By Labor Productivity

By TFP
Evidence on Formal Employment Response
Regression Framework

Event study:

\[ Exit_{it} = \beta_0 + \sum_{t=2004}^{2011} \beta_t MW_{it} + \alpha_B + \tau_t + \varepsilon_{it} \]  

where

- \( i \) indexes workers
- \( MW_{it} \) is an indicator for being in the minimum wage bin (vs in the control wage bin)
- \( \alpha_B \) are wage bin fixed effects (minimum wage vs control wage bin)
- \( \tau_t \) are year fixed effects
Raw Trends: Private Sector Employees

Share of Workers Reporting in Wage Bin Leaving Formal Employment

Year

Minimum Wage

Bin 2

Bin 3

Bin 4
Regression Estimates: Private Sector Employees

Share of Workers Reporting the Minimum Wage vs Other Bin Leaving Formal Employment

<table>
<thead>
<tr>
<th>Year</th>
<th>Relative to Bin 2, No Controls</th>
<th>Relative to Bin 2, With Controls</th>
<th>Relative to Bin 3, No Controls</th>
<th>Relative to Bin 3, With Controls</th>
<th>Relative to Bin 4, No Controls</th>
<th>Relative to Bin 4, With Controls</th>
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<td>2011</td>
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</tbody>
</table>
Regression Estimates: Private Sector Employees

Share of Workers Reporting the Minimum Wage vs Other Bin Leaving Formal Employment

Year

2004 2005 2006 2007 2008 2009 2010 2011

Relative to Bin 2, No Controls Relative to Bin 2, With Controls
Relative to Bin 3, No Controls Relative to Bin 3, With Controls
Relative to Bin 4, No Controls Relative to Bin 4, With Controls
Raw Trends: Self-Employed

Share of Workers Reporting in Wage Bin Leaving Formal Employment

Year

Minimum Wage
Bin 2
Bin 3
Bin 4

2004
2005
2006
2007
2008
2009
2010
2011
Regression Estimates: Self-Employed

Share of Workers Reporting the Minimum Wage vs Other Bin Leaving Formal Employment

Year

2004 2005 2006 2007 2008 2009 2010 2011

Relative to Bin 2, No Controls
Relative to Bin 3, No Controls
Relative to Bin 4, No Controls
Relative to Bin 2, With Controls
Relative to Bin 3, With Controls
Relative to Bin 4, With Controls
Regression Estimates: Self-Employed

The graph shows the share of workers reporting the minimum wage vs other bin leaving formal employment over the years 2004 to 2011. The data is presented relative to different bins with and without controls.

- **Relative to Bin 2, No Controls**
- **Relative to Bin 2, With Controls**
- **Relative to Bin 3, No Controls**
- **Relative to Bin 3, With Controls**
- **Relative to Bin 4, No Controls**
- **Relative to Bin 4, With Controls**
Regression Estimates: Self-Employed

Share of Workers Reporting the Minimum Wage vs Other Bin Leaving Formal Employment

-0.5 0 0.5 1

Year

2004 2005 2006 2007 2008 2009 2010 2011

Relative to Bin 2, No Controls
Relative to Bin 2, With Controls
Relative to Bin 3, No Controls
Relative to Bin 3, With Controls
Relative to Bin 4, No Controls
Relative to Bin 4, With Controls

Pooled Version
Raw Trends: Public Sector Employees

![Graph showing trends in share of workers reporting in wage bin leaving formal employment over years 2004 to 2011.](Image)
## Regression Estimates: Public Sector Employees

<table>
<thead>
<tr>
<th>Year</th>
<th>Relative to Bin 2, No Controls</th>
<th>Relative to Bin 2, With Controls</th>
<th>Relative to Bin 3, No Controls</th>
<th>Relative to Bin 3, With Controls</th>
<th>Relative to Bin 4, No Controls</th>
<th>Relative to Bin 4, With Controls</th>
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<tbody>
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<td>2004</td>
<td>-0.1</td>
<td></td>
<td>-0.1</td>
<td></td>
<td>-0.1</td>
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<tr>
<td>2005</td>
<td>-0.05</td>
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<td>-0.05</td>
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<td>-0.05</td>
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<tr>
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<tr>
<td>2007</td>
<td>0.05</td>
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<td>0.05</td>
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<td>0.05</td>
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<tr>
<td>2008</td>
<td>0.1</td>
<td></td>
<td>0.1</td>
<td></td>
<td>0.1</td>
<td></td>
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<tr>
<td>2009</td>
<td>0.05</td>
<td></td>
<td>0.05</td>
<td></td>
<td>0.05</td>
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</tr>
<tr>
<td>2010</td>
<td>0.1</td>
<td></td>
<td>0.1</td>
<td></td>
<td>0.1</td>
<td></td>
</tr>
<tr>
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<td>0.05</td>
<td></td>
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Share of Workers Reporting the Minimum Wage vs Other Bin Leaving Formal Employment

Year

Relative to Bin 2, No Controls
Relative to Bin 2, With Controls
Relative to Bin 3, No Controls
Relative to Bin 3, With Controls
Relative to Bin 4, No Controls
Relative to Bin 4, With Controls
Regression Estimates: Public Sector Employees

Share of Workers Reporting the Minimum Wage vs Other Bin Leaving Formal Employment

Year

-0.1 -0.05 0 0.05 0.1

Relative to Bin 2, No Controls  Relative to Bin 2, With Controls
Relative to Bin 3, No Controls  Relative to Bin 3, With Controls
Relative to Bin 4, No Controls  Relative to Bin 4, With Controls

Pooled Version
Heterogeneity: Worker Characteristics

Private Employees


- By Gender
- By Age
- By Education
Heterogeneity: Firm Characteristics

Private Employees


By Ownership
By Size
By Industry
Heterogeneity: Firm Quality

Private Employees

![Graph showing the change in probability of leaving formal employment 2005-2006 vs 2006-2007 for various factors such as export share, revenue per employee, labor productivity, and total factor productivity.](image)
Model
Simple Model

- Initial income tax rate $\tau_0$ (assume optimal without evasion)
- Initial gross minimum wage $W^{m0}$ and net minimum wage $W^{m,\text{net}} = W^{m0}(1 - \tau_0)$
Simple Model

- Follow Butcher, Dickens and Manning (2012) and Tonin (2011)
- Consider a case where monopsonistic employers set wages
- Employers differ in their marginal products of labor (productivity is denoted by \( A \)) and they compete over a fixed supply of workers \( L \)
- Optimal wage:
  \[
  W_i^* = \frac{\varepsilon}{1 + \varepsilon} A_i < A_i,
  \tag{3}
  \]
  where \( \varepsilon \) is the wage elasticity of labour supply to the firm
- Introduction of a minimum wage \( W^{m0} \) has three implications:
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  2. Firms with $W_i^* > W^{m0}$ continue to pay the same wage as before;
  3. Firms with $A_i > W^{m0} > W_i^*$ will pay the minimum wage, creating a spike at the minimum wage. (Mass B)
Consider a reform that raises the tax rate to $\tau_1 > \tau_0$ and leaves the net minimum wage unchanged, resulting in a new gross minimum wage of $W^{m1} = \frac{W^{m,\text{net}}}{1-\tau_1} > W^{m0}$.

Three implications:
Simple Model

- Consider a reform that raises the tax rate to $\tau_1 > \tau_0$ and leaves the net minimum wage unchanged, resulting in a new gross minimum wage of $W^{m1} = \frac{W^{m,net}}{1-\tau_1} > W^{m0}$

- Three implications:
  1. Firms with $A_i < W^{m1}$ exit the market (Mass $\beta B$);
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Three implications:
1. Firms with $A_i < W^{m1}$ exit the market (Mass $\beta B$);
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Simple Model

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Loss of tax revenue due to mass $\beta B$ leaving the labor market:

$$L = \tau_0 W^{m0} \times \beta B$$  \hspace{1cm} (4)
Simple Model

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Loss of tax revenue due to mass $\beta B$ leaving the labor market:

$$L = \tau_0 W^{m0} \times \beta B \quad (4)$$

Gain of tax revenue due to higher tax rate:

$$G = \tau_1 W^{m0} \times (1 - \beta)B + \int_{W^{m0}}^{W^{top}} (\tau_1 - \tau_0)wf(w)dw, \quad (5)$$

where $W^{top}$ is the highest gross wage to which the analyzed tax applies.
Number of workers

\[ C = D + (1 - \beta)B \]
Simple Model

- Assume that there is tax evasion: $f(w)$ is the true wage distribution, $g(w)$ is the observed/reported wage distribution.
- Since the minimum wage is binding, tax evaders also bunch at $W^m_0$.
- When increasing the tax, the government realizes an additional net gain ($NG$) as a result of the tax increase:

\[
NG = F \times \tau_1 W^{m1} - E \times \tau_0 W^{m0} = E \times (\alpha \tau_1 W^{m1} - \tau_0 W^{m0}).
\]

(6)

- $NG$ is positive if:

\[
\frac{W^{m1}}{W^{m0}} = \frac{1 - \tau_0}{1 - \tau_1} > \frac{\tau_0}{\alpha \tau_1}.
\]

(7)
Discussion
Discussion

Empirical results suggest substantial tax evasion around the minimum wage in Hungary. Large reporting response to increase in audit threat, but also increase in probability of leaving formal employment. Implies important trade-off for tax policy. In the presence of evasion in the form of underreporting at the minimum wage, may want to tax the minimum wage.
Empirical results suggest substantial tax evasion around the minimum wage in Hungary.
Discussion

- Empirical results suggest substantial tax evasion around the minimum wage in Hungary
- Large reporting response to increase in audit threat
Discussion

- Empirical results suggest substantial tax evasion around the minimum wage in Hungary
- Large reporting response to increase in audit threat
- But also increase in probability of leaving formal employment
Empirical results suggest substantial tax evasion around the minimum wage in Hungary

Large reporting response to increase in audit threat

But also increase in probability of leaving formal employment

Implies important trade off for tax policy
Discussion

- Empirical results suggest substantial tax evasion around the minimum wage in Hungary
- Large reporting response to increase in audit threat
- But also increase in probability of leaving formal employment
- Implies important trade off for tax policy
- In the presence of evasion in the form of underreporting at the minimum wage
  - may want to tax the minimum wage
## Summary Statistics

<table>
<thead>
<tr>
<th></th>
<th>Priv Sector Emp Mean</th>
<th>Self-emp Mean</th>
<th>Public Sector Emp Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>38.89</td>
<td>41.93</td>
<td>42.17</td>
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<tr>
<td>Share Male</td>
<td>0.56</td>
<td>0.65</td>
<td>0.27</td>
</tr>
<tr>
<td>Monthly Earnings (HUF)</td>
<td>155,165</td>
<td>72,932</td>
<td>191,774</td>
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<tr>
<td>Education Level</td>
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<tr>
<td>Primary</td>
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<td>Lower Secondary</td>
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<td>Upper Secondary</td>
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<td>Tertiary</td>
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<td>Person-Year Observations</td>
<td>10,221,529</td>
<td>960,638</td>
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<td>Unique Individuals</td>
<td>2,119,527</td>
<td>273,879</td>
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Summary Statistics of Firm Indicators

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<th></th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Median</th>
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<tbody>
<tr>
<td>Observed Firm Size</td>
<td>1,417</td>
<td>4,471</td>
<td>43</td>
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<tr>
<td>Foreign Ownership</td>
<td>0.29</td>
<td>0.45</td>
<td>0</td>
</tr>
<tr>
<td>Export Share of Revenue</td>
<td>0.3</td>
<td>0.38</td>
<td>0.05</td>
</tr>
<tr>
<td>Annual Revenue per Employee (HUF)</td>
<td>28,929</td>
<td>201,476</td>
<td>11,764</td>
</tr>
<tr>
<td>Annual Labor Productivity (HUF)</td>
<td>6,270</td>
<td>37,666</td>
<td>3,024</td>
</tr>
<tr>
<td>Total Factor Productivity</td>
<td>0.86</td>
<td>1.04</td>
<td>0.86</td>
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</table>
### Pooled Regression: Reporting Response

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Post × Private Sector Employee</strong></td>
<td>0.022***</td>
<td>0.022***</td>
</tr>
<tr>
<td></td>
<td>[0.002]</td>
<td>[0.002]</td>
</tr>
<tr>
<td><strong>Post × Self-Employed</strong></td>
<td>0.114***</td>
<td>0.115***</td>
</tr>
<tr>
<td></td>
<td>[0.001]</td>
<td>[0.001]</td>
</tr>
<tr>
<td>Controls</td>
<td></td>
<td>×</td>
</tr>
<tr>
<td><strong>N</strong></td>
<td>12,333,359</td>
<td>12,276,191</td>
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</tbody>
</table>

Robust standard errors clustered at the firm level in brackets

*** p<0.01, ** p<0.05, * p<0.1
Pooled Regression: Reporting Response

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post × Private Sector Employee</td>
<td>0.022***</td>
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</tr>
<tr>
<td></td>
<td>[0.002]</td>
<td>[0.002]</td>
</tr>
<tr>
<td>Post × Self-Employed</td>
<td>0.114***</td>
<td>0.115***</td>
</tr>
<tr>
<td></td>
<td>[0.001]</td>
<td>[0.001]</td>
</tr>
<tr>
<td>Controls</td>
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<td>×</td>
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<tr>
<td>N</td>
<td>12,333,359</td>
<td>12,276,191</td>
</tr>
</tbody>
</table>

Robust standard errors clustered at the firm level in brackets

*** p<0.01, ** p<0.05, * p<0.1
Heterogeneity: By Gender

Private Employees

<table>
<thead>
<tr>
<th>Year</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>2004</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>2005</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>2006</td>
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<td>0.06</td>
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<td>2007</td>
<td>0.06</td>
<td>0.07</td>
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<td>2008</td>
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<tr>
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<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>2010</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>2011</td>
<td>0.10</td>
<td>0.11</td>
</tr>
</tbody>
</table>
Heterogeneity: By Age

Private Employees

![Graph showing the share of workers reporting the double minimum wage by age group (18-30, 31-40, 41-50, and 51-65) from 2003 to 2011. The graph illustrates the variation in the share of workers reporting the double minimum wage across different age groups and years.]
Heterogeneity: By Ownership

Private Employees

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>2004</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>2005</td>
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<td>0.03</td>
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<td>0.02</td>
<td>0.03</td>
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<td>2007</td>
<td>0.02</td>
<td>0.03</td>
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<td>2008</td>
<td>0.02</td>
<td>0.03</td>
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<tr>
<td>2009</td>
<td>0.02</td>
<td>0.03</td>
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<tr>
<td>2010</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>2011</td>
<td>0.02</td>
<td>0.03</td>
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</table>
Heterogeneity: By Industry

Private Employees

Graph showing the share of workers reporting the double minimum wage for different industries over the years 2003 to 2011. The industries include Agriculture, Mining & Manufacturing, Construction, Trade, Transportation, Accommodation & Food, and others.
Heterogeneity: By Export Share in Revenues

Private Employees

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>2004</td>
<td>0.03</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
</tr>
<tr>
<td>2005</td>
<td>0.04</td>
<td>0.05</td>
<td>0.06</td>
<td>0.07</td>
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<tr>
<td>2006</td>
<td>0.05</td>
<td>0.06</td>
<td>0.07</td>
<td>0.08</td>
</tr>
<tr>
<td>2007</td>
<td>0.06</td>
<td>0.07</td>
<td>0.08</td>
<td>0.09</td>
</tr>
<tr>
<td>2008</td>
<td>0.07</td>
<td>0.08</td>
<td>0.09</td>
<td>0.10</td>
</tr>
<tr>
<td>2009</td>
<td>0.08</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
</tr>
<tr>
<td>2010</td>
<td>0.09</td>
<td>0.10</td>
<td>0.11</td>
<td>0.12</td>
</tr>
<tr>
<td>2011</td>
<td>0.10</td>
<td>0.11</td>
<td>0.12</td>
<td>0.13</td>
</tr>
</tbody>
</table>
Heterogeneity: By Revenue Per Employee

Private Employees

<table>
<thead>
<tr>
<th>Year</th>
<th>Q1</th>
<th>Q2</th>
<th>Q3</th>
<th>Q4</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2004</td>
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<td>2005</td>
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</tr>
<tr>
<td>2011</td>
<td></td>
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</tr>
</tbody>
</table>
Heterogeneity: By Labor Productivity

Private Employees

Share of Workers Reporting the Double Minimum Wage

Year

Q1
Q2
Q3
Q4
Heterogeneity: By Total Factor Productivity

Private Employees

Share of Workers Reporting the Double Minimum Wage

Year

Q1 Q2 Q3 Q4

2003 2004 2005 2006 2007 2008 2009 2010 2011
## Regression Estimates: Private Sector Employees

<table>
<thead>
<tr>
<th>Reference bin:</th>
<th>(1) Bin 2</th>
<th>(2) Bin 2</th>
<th>(3) Bin 3</th>
<th>(4) Bin 3</th>
<th>(5) Bin 4</th>
<th>(6) Bin 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post × Min. W.</td>
<td>0.048*** [0.002]</td>
<td>0.048*** [0.002]</td>
<td>0.037*** [0.002]</td>
<td>0.038*** [0.002]</td>
<td>0.049*** [0.005]</td>
<td>0.050*** [0.005]</td>
</tr>
<tr>
<td>Controls</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>2,044,434</td>
<td>2,031,259</td>
<td>2,042,056</td>
<td>2,029,208</td>
<td>1,886,220</td>
<td>1,874,220</td>
</tr>
</tbody>
</table>
## Regression Estimates: Self-Employed

<table>
<thead>
<tr>
<th>Reference bin:</th>
<th>(1) Bin 2</th>
<th>(2) Bin 2</th>
<th>(3) Bin 3</th>
<th>(4) Bin 3</th>
<th>(5) Bin 4</th>
<th>(6) Bin 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post × Min. W.</td>
<td>0.021*** [0.003]</td>
<td>0.021*** [0.003]</td>
<td>0.018*** [0.004]</td>
<td>0.017*** [0.004]</td>
<td>0.021*** [0.005]</td>
<td>0.020*** [0.005]</td>
</tr>
<tr>
<td>Controls</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
</tr>
<tr>
<td>N</td>
<td>479,548</td>
<td>476,796</td>
<td>488,175</td>
<td>485,364</td>
<td>457,234</td>
<td>454,569</td>
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</table>
## Regression Estimates: Public Sector Employees

<table>
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<tr>
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<th>(1) Bin 2</th>
<th>(2) Bin 2</th>
<th>(3) Bin 3</th>
<th>(4) Bin 3</th>
<th>(5) Bin 4</th>
<th>(6) Bin 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post $\times$ Min. W.</td>
<td>0.013 [0.011]</td>
<td>0.010 [0.009]</td>
<td>0.019** [0.009]</td>
<td>0.018** [0.009]</td>
<td>0.020** [0.009]</td>
<td>0.018** [0.009]</td>
</tr>
<tr>
<td>Controls</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
<td>×</td>
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<tr>
<td>N</td>
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<td>90,136</td>
<td>175,770</td>
<td>175,233</td>
<td>194,230</td>
<td>193,722</td>
</tr>
</tbody>
</table>

Robust standard errors, clustered at the firm level in brackets

*** $p<0.01$, ** $p<0.05$, * $p<0.1$
Heterogeneity: By Gender

Private Employees

<table>
<thead>
<tr>
<th>Year</th>
<th>Female</th>
<th>Male</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
<td></td>
<td></td>
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<tr>
<td>2005</td>
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<td>2010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
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<td></td>
</tr>
</tbody>
</table>

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

- Female
- Male
Heterogeneity: By Age

Private Employees

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

Year
2004 2005 2006 2007 2008 2009 2010 2011
Age 18-30 Age 31-40 Age 41-50 Age 51-65

-0.02 0.02 0.04 0.06 0.08

-0.02 0 0.02 0.04 0.06 0.08

Age 18-30 • Age 31-40 • Age 41-50 • Age 51-65
Heterogeneity: By Education

Private Employees

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

Year

2004 2005 2006 2007 2008 2009 2010 2011

Primary
Lower Secondary
Upper Secondary
Tertiary
**Heterogeneity: By Ownership**

**Private Employees**

<table>
<thead>
<tr>
<th>Year</th>
<th>Domestic</th>
<th>Foreign</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004</td>
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<td>2005</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td></td>
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</tr>
</tbody>
</table>

**Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment**

- **Domestic**
- **Foreign**

![Graph showing the share of workers reporting the minimum wage versus bin 3 leaving formal employment from 2004 to 2011 for domestic and foreign employees.](image-url)
Heterogeneity: By Industry

Private Employees

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

Year

Agriculture
Mining & Manufacturing
Construction
Trade
Transportation
Accommodation & Food
Heterogeneity: By Export Share in Revenues

Private Employees

Graph showing the share of workers reporting the minimum wage vs. Bin 3 leaving formal employment from 2004 to 2011, with different markers for each quarter (Q1, Q2, Q3, Q4) and error bars indicating variability.
Heterogeneity: By Revenue Per Employee

Private Employees

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

Year

Q1  Q2  Q3  Q4

2004  2005  2006  2007  2008  2009  2010  2011
Heterogeneity: By Labor Productivity

Private Employees

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

Year

2004 2005 2006 2007 2008 2009 2010 2011

Q1 Q2 Q3 Q4
Heterogeneity: By Total Factor Productivity

Private Employees

Share of Workers Reporting the Minimum Wage vs Bin 3 Leaving Formal Employment

Year

Q1  Q2  Q3  Q4