Do Firms Exit the Formal Economy after a Minimum Wage Hike? Quasi-Experimental Evidence from Turkey

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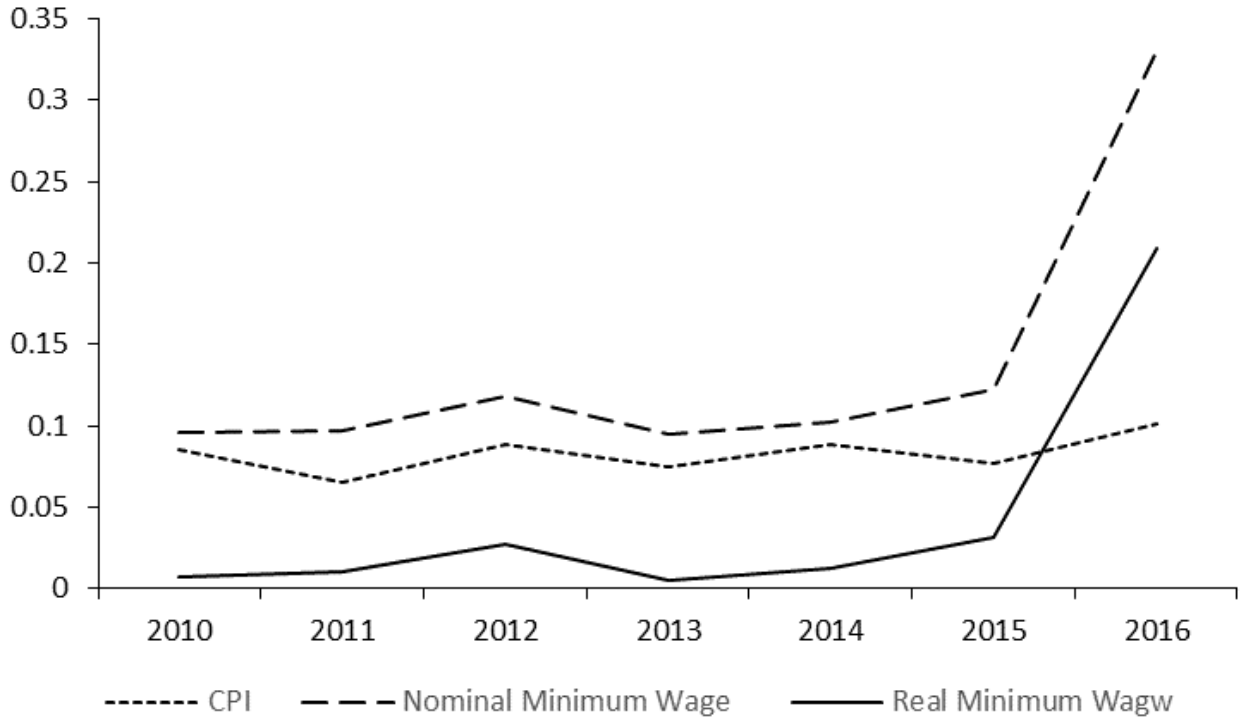
Outline

- Background and motivation
- Data
- Descriptive evidence of the effects of the 2016 Minimum Wage hike
- Methodology and identification strategy
- Results
- Conclusions and policy implications

Background and motivation

In January 2016, the national Minimum Wage increased by 33% in nominal terms (24% in real terms), a sharp increase compared to historical growth

Annual growth rate of the national Minimum Wage and CPI: 2011-2016



Source: Turkish Bureau of Statistics

Background and motivation

- The performance of the Turkish labor market has been strong in the last decade, until 2015
  - Over 1.2 million new firms have been created between 2006 and 2015
  - Employment grew by over 6 million between 2006 and 2015
  - The share of informal employment has been decreasing substantially
- However, rising mandatory labor costs in the form of the minimum wage can limit formal job creation, especially for micro and small firms
- Need for understanding the consequences of increasing mandatory labor costs on formal firms

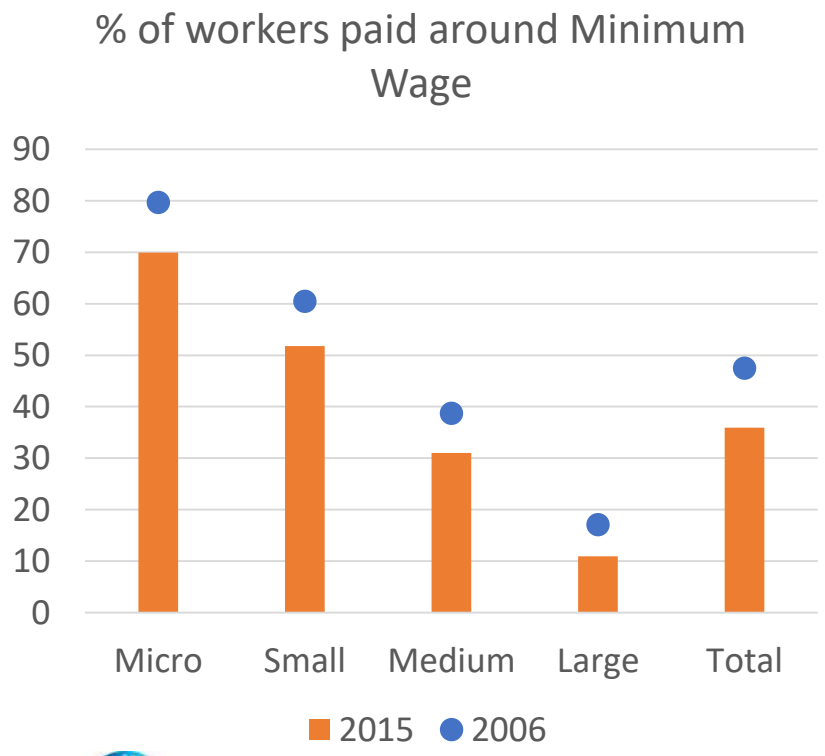
Background and motivation

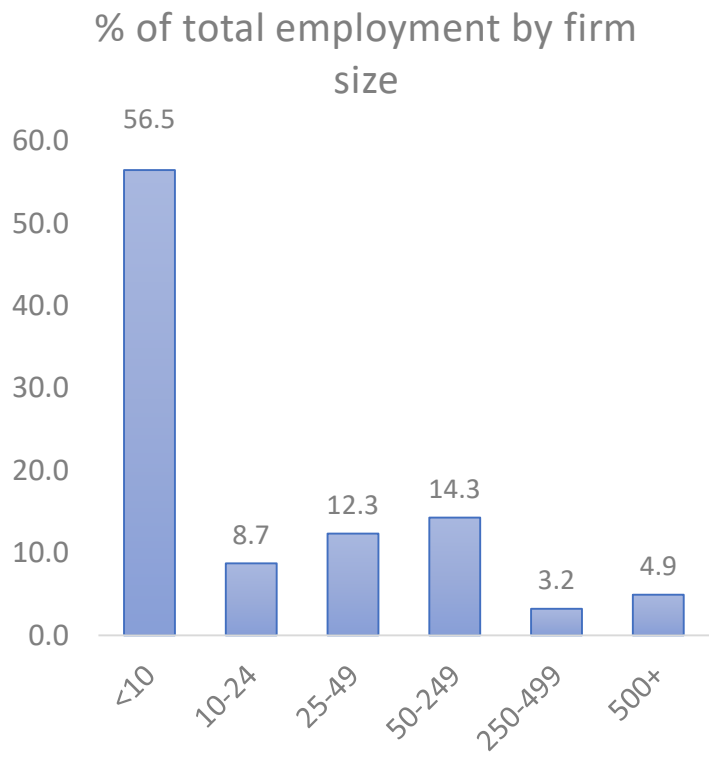
MW increases have potentially important consequences on firms and formal employment since:

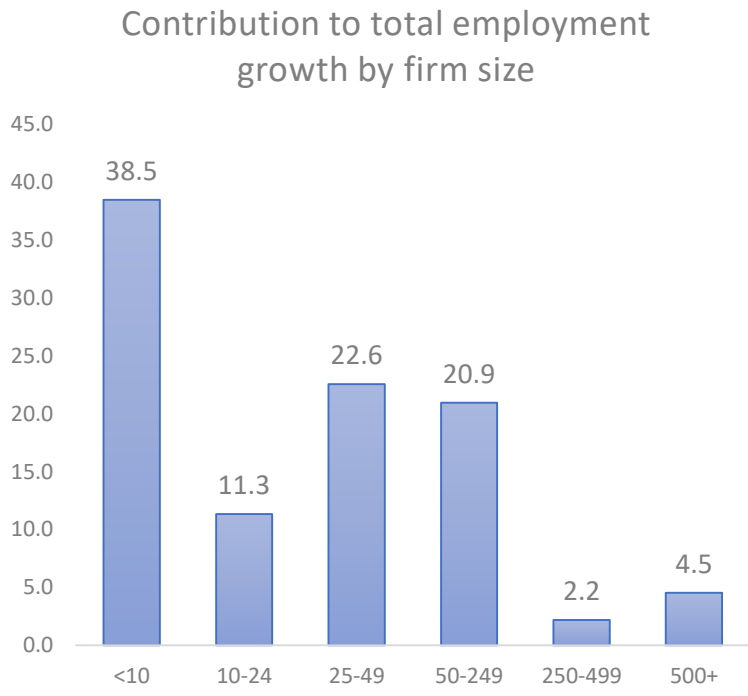
Over 35% of workers are still paid around MW (70% in micro firms)

Small firms employ over 56% of total workers

Micro firms contributed to 40% of job creation between 2006-2013







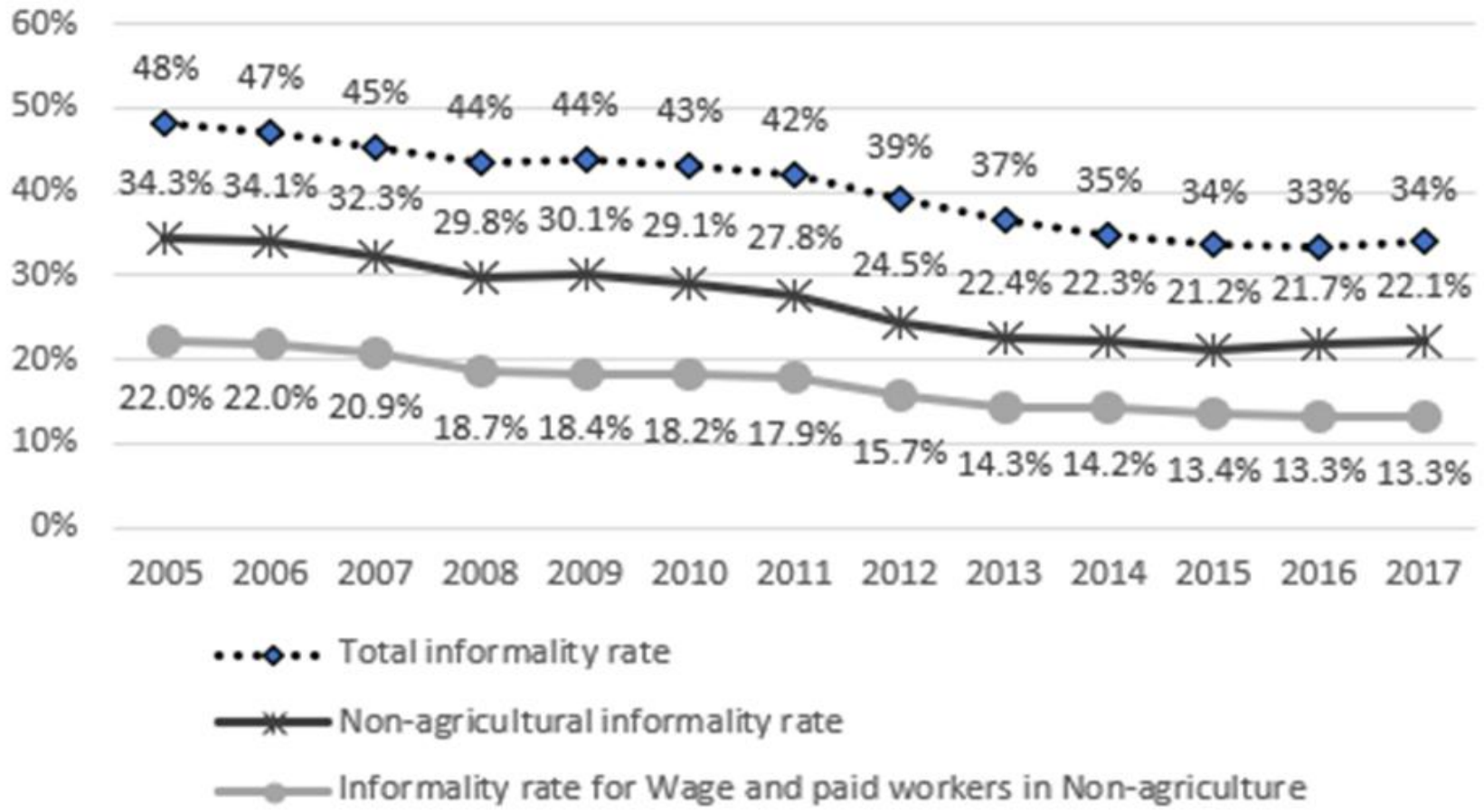
Source: MoSIT

Background and motivation

- Possible responses by firms to a sharp increase in the minimum wage include:
  - Shedding formal labor
  - Altering employment composition (e.g. substituting skilled for unskilled workers)
  - Adjusting the labor/capital ratio and invest in technology
  - Reducing profit margins
  - **Exiting the formal sector (by either operating informally, or by shutting down the business)**
- The results reported in this presentation relate to the last channel, but all the above channels are investigated in our ongoing work program

Background and motivation

- Slowdown in reduction in informality rate in 2016



Data

- Enterprise Information System (EIS)
- Panel data (2006-2016) on the universe of registered firms, matched to employee data
- Different sources
  - 2012-2016 Ministry of Science, Industry and Technology (MoSIT)
  - 2006-2016 Ministry of Customs and Trade (MoCT)
  - 2006-2016 Revenue Administration (GIB)
  - 2006-2016 Social Security Institution (SGK)
  - 2010-2016 Small and Medium Business Development and Support Administration (KOSGEB)
  - 2006-2016 Turkish Statistical Institute (TURKSTAT)
  - 2010-2016 Turkish Patent and Trademark Office (TPE)
  - 2008-2016 Scientific and Technological Research Council of Turkey (TUBITAK)

Data

- Firm characteristics:
  - Firm size (micro, small, medium, large)
  - Sector (4-digit NACE Rev 2)
  - Region (District -> Province (Nuts 3) -> Nuts 2 -> Nuts 1)
  - Firm age

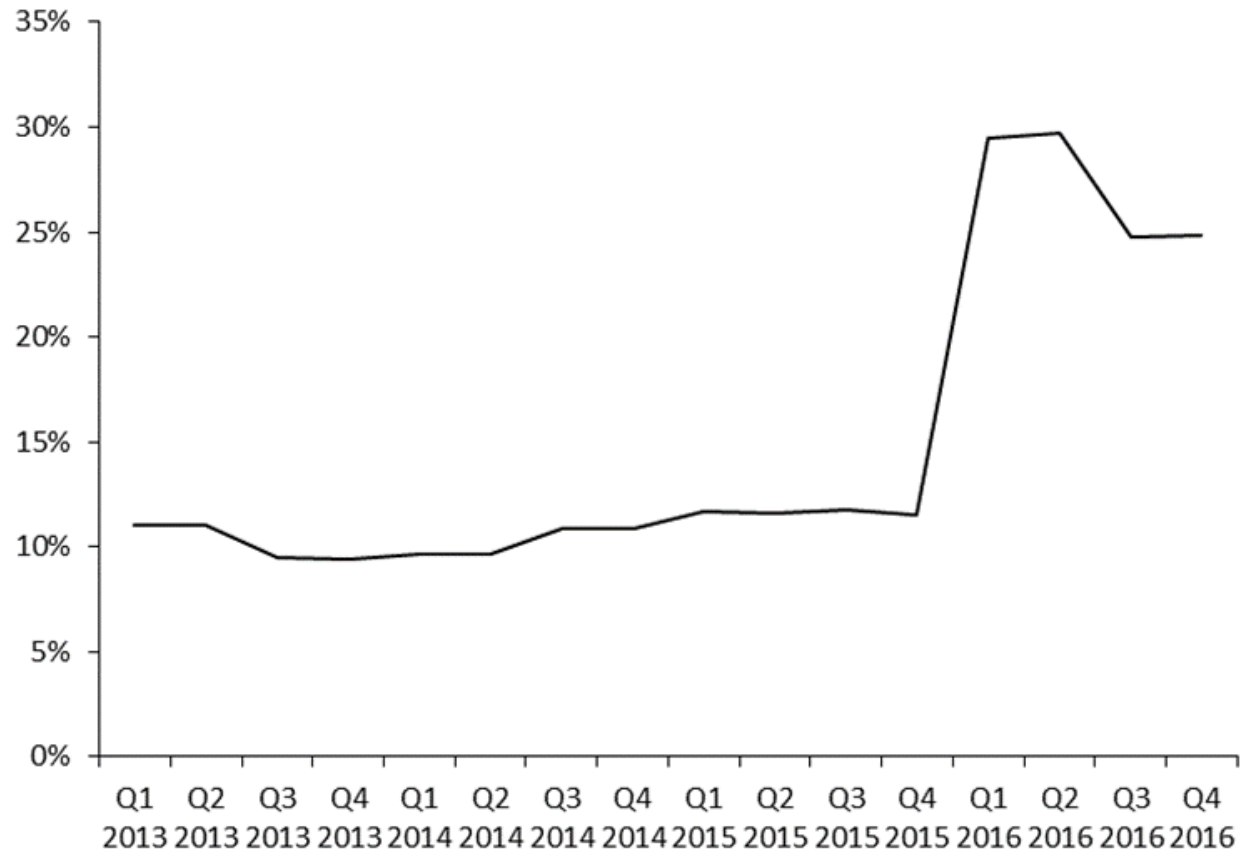
- Employee variables:
  - Daily wage
  - Number of days worked in the month
  - Gender
  - Age
  - Occupation (since 2014)

- Firm outcomes:
  - Net sales and profits
  - Production
  - Assets and liabilities
  - Productivity
  - Capital expenditure

Descriptive evidence of the effects of the 2016 Minimum Wage hike

The 2016 MW Hike resulted in a large increase of average wages in registered firms

Annual nominal wage growth in registered firms

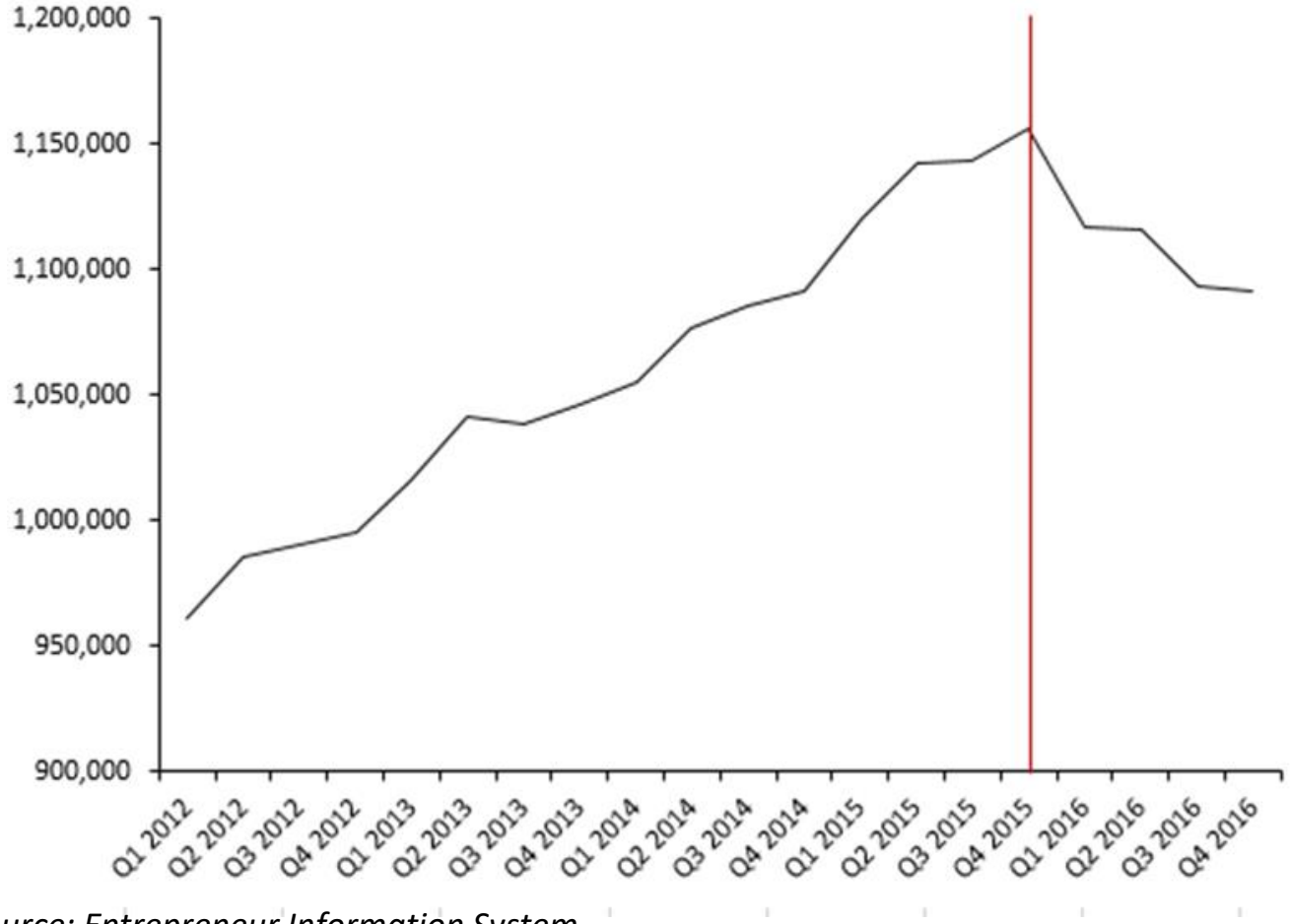


Source. Entrepreneur Information System

Descriptive evidence of the effects of the 2016 Minimum Wage hike

While it had been rising consistently since 2012, the number of registered firms dropped after the minimum wage hike

Number of registered firms with at least one employee: 2012-2016

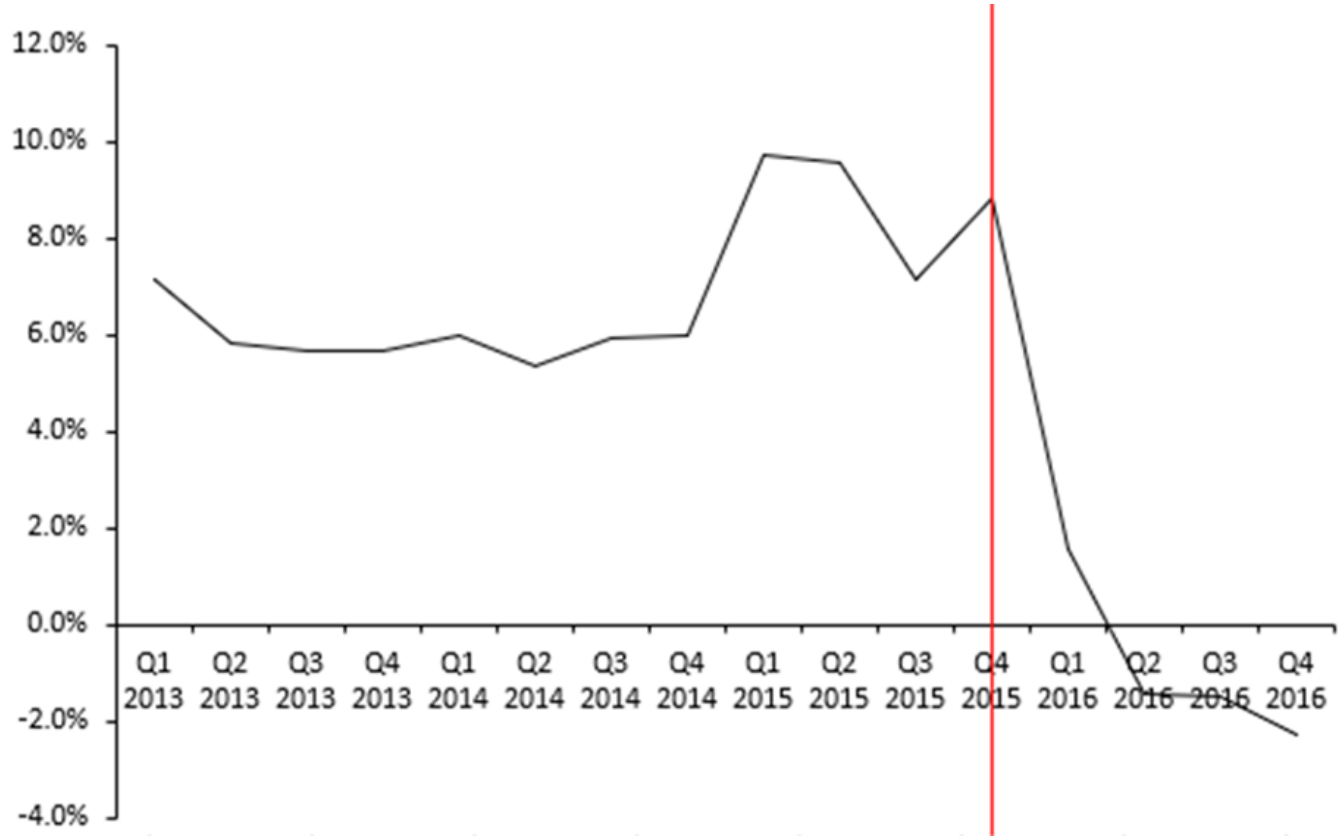


Source: Entrepreneur Information System

Descriptive evidence of the effects of the 2016 Minimum Wage hike

The growth rate of total employment in registered firms also declined substantially after the 2016 Minimum Wage hike

Annual growth rate of registered employment, 2013-2016



Source: Entrepreneur Information System

Methodology and identification strategy

- The main difficulty is to identify a adequate treatment and control group of firms in a context where the MW hike took place nationwide.
- As in Draca, Machin and Van Reenen (2011), we measure treatment intensity I_i, as the expected proportional increase in the wage bill of firm *i* if the wages of all its "affected" workers in 2015 are brought to the 2016 minimum wage:

$$\mathrm{I_i} = \sum_j n_{ij} \max\left(W_{min}^{2016} - W_{ji}^{2015}\right) / \sum_j n_{ji} W_{ji}^{2015}$$

n_{ji} *:* monthly number of days worked by worker *j* in firm i;

W_{ji}^{2015}: daily wage of worker *j* in firm *i* in 2015

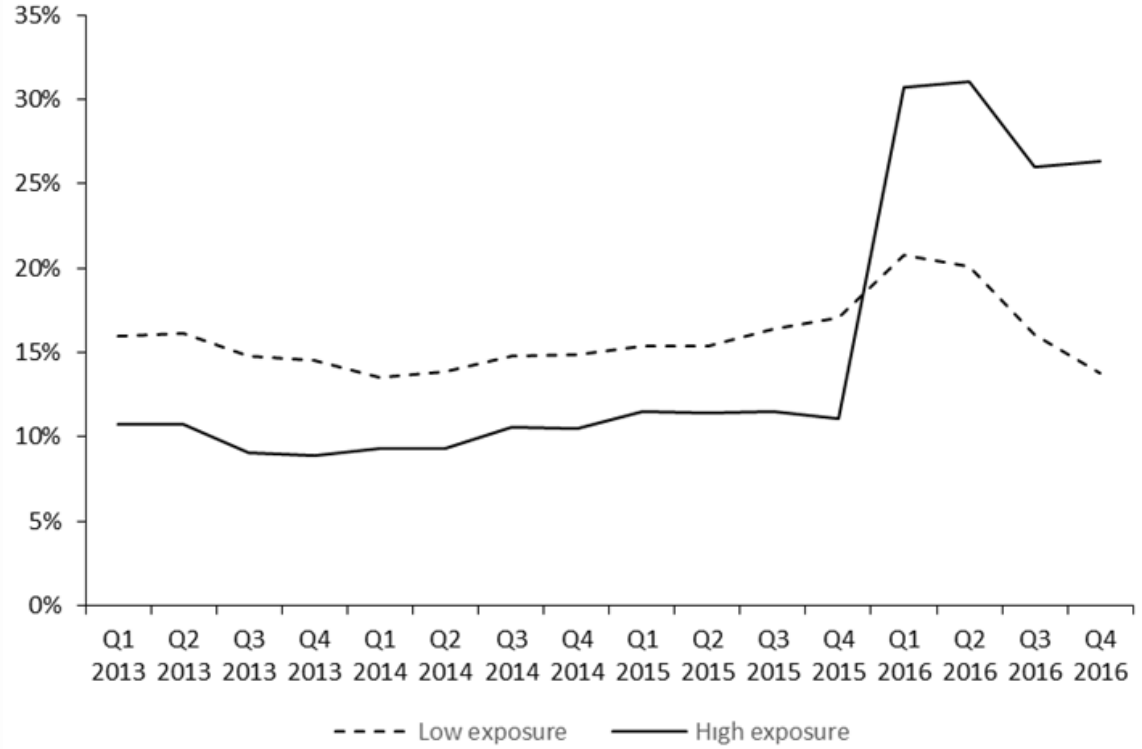
W_{min}^{2016}: the new minimum wage applying to all workers in registered firms.

- $\mathrm{I_i}$ takes into account the MW subsidies received by firms

Methodology and identification strategy

High-exposure firms indeed experienced a larger jump in wages following the minimum wage hike, composed to low-exposure firms

Annual nominal wage growth, by firms' level of exposure to the minimum wage hike



Source. Entrepreneur Information System

High exposure firms: expected increase in wage bill (I_i) > median increase

Methodology and identification strategy

- Based on the value of I_i, we classify firms into two groups: “high exposure firms” (treatment group) and “low-exposure firms”(control group)
- We then estimate the effect of the minimum wage hike on frim exits from the formal sector using a standard Diff-in-Diff estimator:

$$Y_{it} = \alpha + \pi X_{it} + \delta T_t + \theta D(I > I^*) + \beta [D(I > I^*) * T_{2016}] + \varepsilon_{it}$$

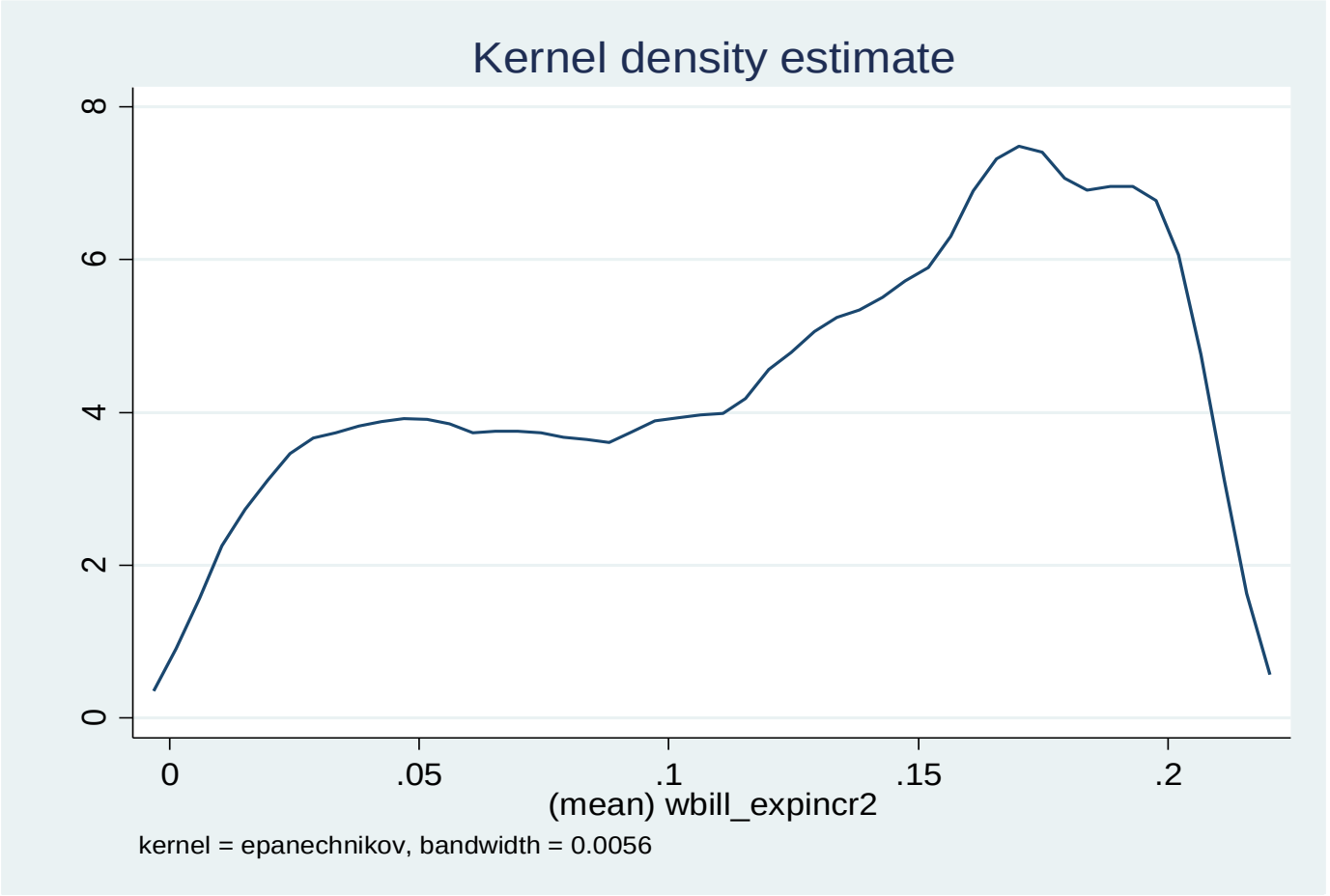
- Where Y_{it} is a binary variables taking the value 1 if firm i exits the database in quarter t, X_{it} are firms’ characteristics, $D(I > I^*)$ is a binary variable for being a high exposure firm
- Intuitively, we are comparing the difference in exit rates between high-exposure and low-exposure firms before and after the 2016 minimum wage hike

Methodology and identification strategy

- Consider “cells” formed by districts x 2-digit NACE economic sectors
- Measure “exposure to the minimum wage increase” at the cell level instead of firm level.
- Exposure to the minimum wage hike is measured in the 4th quarter of 2015 as the proportional increase in the wage bill required to bring all workers in the cell up to the 2016 Minimum Wage.
- Cells are classified as “high exposure” if the cells’ measure of exposure to the minimum wage is above the median for our sample of cells, and as “low exposure” otherwise.

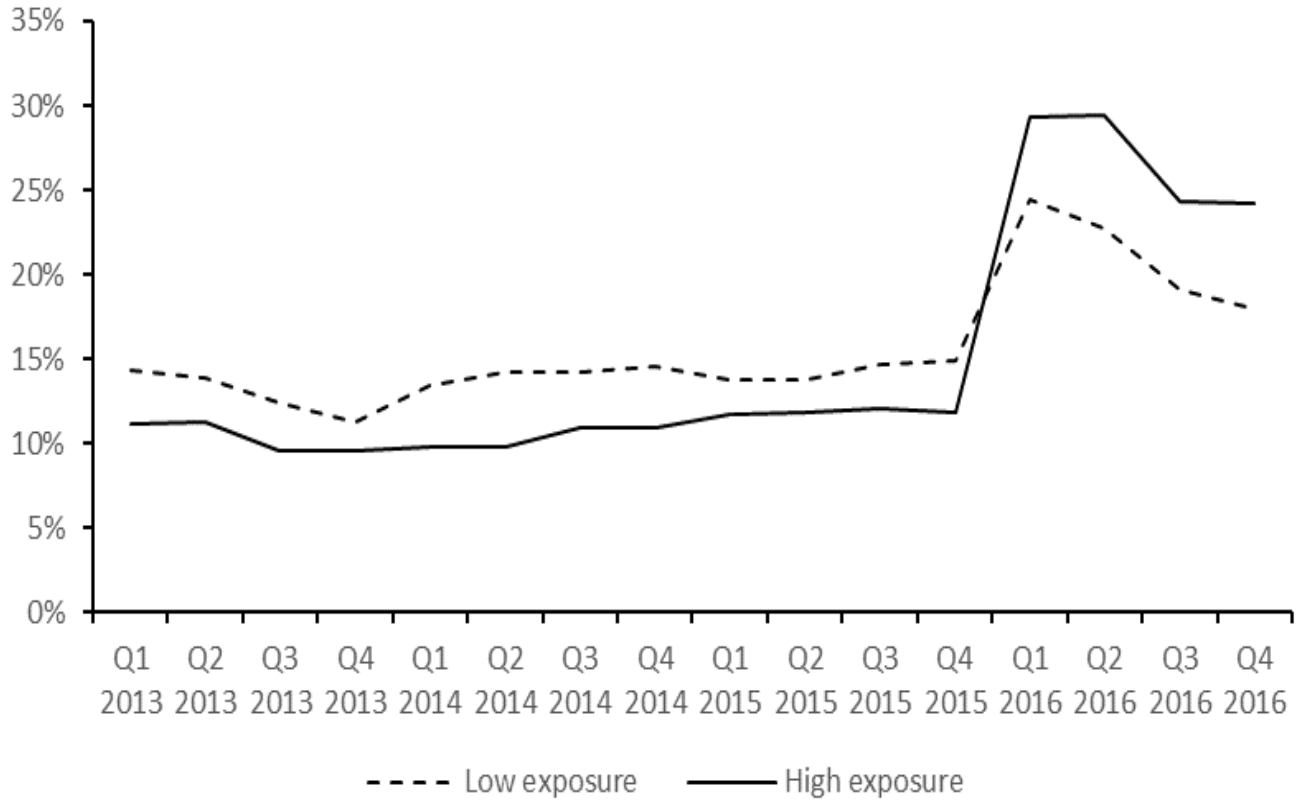
Methodology and identification strategy

Distribution of “Exposure to Minimum Wage hike” (I_i) at the cell level: expected increase varies between 0 and 22%



Methodology and identification strategy

Annual nominal wage growth, by cells' level of exposure to the minimum wage hike



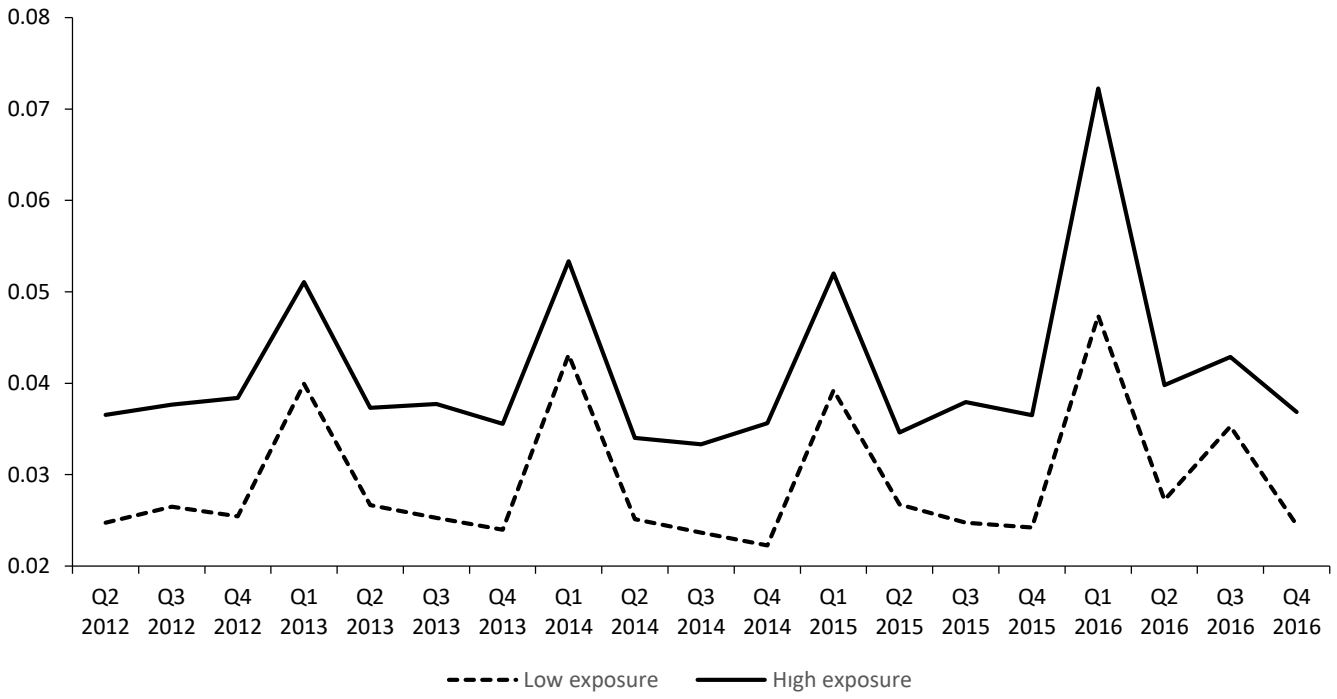
Methodology and identification strategy

- The discrete treatment dummy takes the value one if the cells' continuous measure of exposure to the minimum wage is above the median for our sample of cells.
- Continuous treatment also allowed
- Cells are included in the sample if they consist of at least 50 firms.
- Balanced panel include only cells that have at least 50 firms in all quarters from 2012 to 2016.
- Very low-exposure cells are defined as cells with treatment exposure under 3%.
- Very high exposure cells are defined as cells with treatment exposure over 20%.
- Several breakdowns: sectors, sub-periods, geographic areas, firm size

Results

High-exposure cells indeed saw a much larger jump in wages following the minimum wage hike, compared to low-exposure ones

Cell-level exit rates from the Formal Sector in Periods around the Minimum Wage Hike, by Treatment Status



Source. Entrepreneur Information System (EIS)

Results (summary)

- Positive and statistically significant effect of the minimum wage hike on firms' exit rates from the formal economy
- Results robust to: different sub-periods; continuous vs. discrete treatment measure; fixed effects and additional control specification; exclusion of high-and low-exposure cells.
- Heterogeneous effects: stronger and more significant effects when considering small firms; larger effects in wholesale and retail as well as construction; larger effects in firms belonging to the 2 bottom quintiles of labor productivity prior to the policy change.
- Placebo tests corroborate the causal impact of the Minimum Wage increase by showing no significant effects during "no treatment" years

All firms, discrete treatment

Discrete treatment	Years: 2015-2016							
Dependent variable: exit rate	All cells		Balanced Panel		Excluding very low exposure		Excluding very high exposur	
of firms in the cell	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	0.0018***	0.0020***	0.0014***	0.0016***	0.0019***	0.0020***	0.0017***	0.0020***
(t-stat)	3.73	4.05	3.61	2.73	3.07	3.53	4.58	4.72
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	31,108	30,938	30,982	30,812	28,628	28,475	28,807	28,645

All firms, discrete treatment

Discrete treatment	Years: 2012-2016							
Dependent variable: exit rate	All cells		Balanced Panel		Excluding very low exposure		Excluding very high exposur	
of firms in the cell	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	0.0026***	0.0028***	0.0020***	0.0021***	0.0028***	0.0029***	0.0024***	0.0026***
(t-stat)	6.17	6.67	3.91	4.59	6.4	6.95	5.59	6.05
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	73,729	73,409	73,584	73,264	67,831	67,540	68,592	68,288

All firms, continuous treatment

Continuous treatment	Years: 2015-2016							
Dependent variable: exit rate	All cells		Balanced Panel		Excluding very low exposure		Excluding very high exposure	
of firms in the cell	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	0.0135***	0.0150***	0.0106**	0.0120***	0.0154***	0.0160***	0.0132***	0.0147***
(t-stat)	3.23	3.63	2.39	2.71	3.49	3.71	2.79	3.12
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	31,108	30,938	30,982	30,812	28,628	28,475	28,807	28,645

All firms, continuous treatment

Continuous treatment	Years: 2012-2016							
Dependent variable: exit rate	All cells		Balanced Panel		Excluding very low exposure		Excluding very high exposure	
of firms in the cell	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	0.0214***	0.0242***	0.0201***	0.0214***	0.0244***	0.0270***	0.0204***	0.0229***
(t-stat)	5.98	6.83	5.28	5.64	5.3	6.54	4.95	5.62
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	73,729	73,409	73,584	73,264	67,831	67,540	68,592	68,288

Results by sector, discrete treatment

Discrete treatment	Years: 2015-2016							
Dependent variable: exit rate	All cells							
of firms in the cell	Manufacturing		Other industry		Wholesale& retail		Other services	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	-0.0013	-0.0010	0.0016	0.0015	0.0021**	0.0021**	0.0007	0.0014
(t-stat)	-1.08	-0.89	1.15	1.11	2.72	2.7	0.88	1.77
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	6,966	6,941	3,353	3,347	7,664	7,664	12,999	12,986

Discrete treatment	Years: 2012-2016							
Dependent variable: exit rate	All cells							
of firms in the cell	Manufacturing		Other industry		Wholesale& retail		Other services	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	-0.0004	0.0000	0.0024**	0.0024**	0.0024***	0.0024***	0.0008	0.0016*
(t-stat)	-0.4	-0.1	2.11	2.15	3.64	3.24	1.16	2.17
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	16,146	16,104	7,668	7,659	17,612	17,612	28,743	28,722

Results by sector, continuous treatment

Continous treatment	Years: 2015-2016							
Dependent variable: exit rate	All cells							
of firms in the cell	Manufacturing		Other industry		Wholesale& retail		Other services	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	0.0011	0.0027	0.0051	0.0047	0.0202**	0.0202**	0.0008	0.0066
(t-stat)	0.13	0.3	0.29	0.27	2.5	2.56	0.22	0.99
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	6,966	6,941	3,353	3,347	7,664	7,664	12,999	12,986

Continous treatment	Years: 2012-2016							
Dependent variable: exit rate	All cells							
of firms in the cell	Manufacturing		Other industry		Wholesale& retail		Other services	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
Diff-in-diff coefficient	0.0123*	0.0154**	0.0210	0.0212	0.0248***	0.0243***	0.0022	0.0082
(t-stat)	1.67	2.1	1.52	1.53	3.66	3.55	0.39	1.54
Controls	no	yes	no	yes	no	yes	no	yes
N (sample size)	16,146	16,104	7,668	7,659	17,612	17,612	28,743	28,722

Results by firm size, discrete treatment

Discrete treatment	**Years: 2015-2016**					
Dependent variable: exit rate	**By average firm size in the cell**					
of firms in the cell	**below 5 employees**		**between 5 and 10**		**Above 10**	
	[1]	[2]	[3]	[4]	[5]	[6]
Diff-in-diff coefficient	0.0036***	0.0031***	0.0000	0.0002	0.0017	0.0015
(t-stat)	3.23	2.81	0.05	0.32	1.48	1.38
Controls	no	yes	no	yes	no	yes
N (sample size)	11,143	11,143	9,907	9,907	8,941	8,941

Discrete treatment	**Years: 2012-2016**					
Dependent variable: exit rate	**By average firm size in the cell**					
of firms in the cell	**below 5 employees**		**between 5 and 10**		**Above 10**	
	[1]	[2]	[3]	[4]	[5]	[6]
Diff-in-diff coefficient	0.0027***	0.0028***	0.0007	0.0009	0.0022**	0.0020**
(t-stat)	2.82	2.97	0.098	1.26	2.2	2.06
Controls	no	yes	no	yes	no	yes
N (sample size)	27,117	27,117	23,214	23,214	20,331	20,331

Results by firm size, continuous treatment

Continous treatment	Years: 2015-2016					
Dependent variable: exit rate	By average firm size in the cell					
of firms in the cell	below 5 employees		between 5 and 10		Above 10	
	[1]	[2]	[3]	[4]	[5]	[6]
Diff-in-diff coefficient	0.0247*	0.0183	-0.0084	-0.0073	0.0195**	0.0192**
(t-stat)	1.87	1.41	1.9	1.97	2.43	2.43
Controls	no	yes	no	yes	no	yes
N (sample size)	11,143	11,143	9,907	9,907	8,941	8,941

Continous treatment	Years: 2012-2016					
Dependent variable: exit rate	By average firm size in the cell					
of firms in the cell	below 5 employees		between 5 and 10		Above 10	
	[1]	[2]	[3]	[4]	[5]	[6]
Diff-in-diff coefficient	0.0195*	0.0206*	-0.0009	0.0013	0.0238**	0.0237**
(t-stat)	0.97	1.71	-0.11	0.16	3.38	3.46
Controls	no	yes	no	yes	no	yes
N (sample size)	27,117	27,117	23,214	23,214	20,331	20,331

Results by productivity level, discrete treatment

Discrete treatment	Years: 2015-2016									
Dependent variable: exit rate	All cells									
of firms in the cell	Q1		Q2		Q3		Q4		Q5	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Diff-in-diff coefficient	0.0034**	0.0036***	0.0016	0.0014	0.0018	0.0019	0.0014	0.0015	0.0018	0.0019
(t-stat)	2.34	2.49	1.1	0.09	1.29	1.4	1.17	1.21	1.37	1.34
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N (sample size)	3,598	3,598	3,619	3,619	3,504	3,504	3,512	3,512	3,441	3,441

Discrete treatment	Years: 2012-2016									
Dependent variable: exit rate	All cells									
of firms in the cell	Q1		Q2		Q3		Q4		Q5	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Diff-in-diff coefficient	0.0046***	0.0047***	0.0030**	0.0029**	0.002	0.0019	0.0019	0.0018	0.0018	0.0020*
(t-stat)	3.59	3.71	2.5	2.44	1.62	1.55	2.24	2.18	1.56	2.78
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N (sample size)	8,343	8,343	8,307	8,307	8,367	8,367	8,311	8,311	8,075	8,075

Results by productivity level, discrete treatment

Continous treatment	**Years: 2015-2016**									
Dependent variable: exit rate	**All cells**									
of firms in the cell	**Q1**		**Q2**		**Q3**		**Q4**		**Q5**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Diff-in-diff coefficient	0.0282**	0.0308**	0.0289**	0.0279**	0.0133	0.0120	0.0231**	0.0237**	0.0052	0.0080
(t-stat)	1.84	1.9	2.26	2.18	1.08	0.99	2.35	2.41	0.34	0.52
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N (sample size)	2,967	2,962	3,383	3,380	4,578	4,577	4,872	4,865	2,444	2,441

Continous treatment	**Years: 2012-2016**									
Dependent variable: exit rate	**All cells**									
of firms in the cell	**Q1**		**Q2**		**Q3**		**Q4**		**Q5**	
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
Diff-in-diff coefficient	0.0384***	0.0413***	0.0481***	0.0505***	0.0246**	0.0211**	0.0185**	0.0181**	0.0103	0.0129
(t-stat)	2.75	2.96	4.1	4.34	2.47	2.14	2.19	2.15	0.8	0.96
Controls	no	yes	no	yes	no	yes	no	yes	no	yes
N (sample size)	6,705	6,696	7,614	7,610	10,388	10,386	11,191	11,184	5,554	5,546

Placebo tests

Discrete treatment	**Years: 2012-2013**		**Years: 2013-2014**		**Years: 2014-2015**	
Dependent variable: exit rate	**All cells**		**All cells**		**All cells**	
of firms in the cell	[1]	[2]	[3]	[4]	[5]	[6]
Diff-in-diff coefficient	0.0006	0.0005	0.0004	0.0004	0.0002	-0.0001
(t-stat)	1.17	0.341	0.89	0.346	0.44	-0.13
Controls	no	yes	no	yes	no	yes
N (sample size)	24,471	24,393	29,085	28,966	30,522	30,363

Continous treatment	**Years: 2012-2013**		**Years: 2013-2014**		**Years: 2014-2015**	
Dependent variable: exit rate	**All cells**		**All cells**		**All cells**	
of firms in the cell	[1]	[2]	[3]	[4]	[5]	[6]
Diff-in-diff coefficient	0.0032	0.0024	0.0020	0.0023	0.0044	0.0031
(t-stat)	0.73	0.55	0.49	0.57	1.03	0.75
Controls	no	yes	no	yes	no	yes
N (sample size)	24,471	24,393	29,085	28,966	30,445	30,286

Policy implications

- The MW hike was estimated to increase firms' exit rates by about 12% in the one year period following the minimum wage
- This represents a loss of about 130,000 formal jobs (about 1% of total formal employment) due to exits. This is equivalent to around 30% of total reduction in formal job creation between 2015 and 2016
- Initial complementary analysis of the LFS suggests that exiting firms and workers transitioned from formal to informal status, instead of pure job destruction
- These negative effects must however be weighted against the large positive effects of the MW hike on wages

Next steps (on going analysis)

- Look at allocative efficiency: do workers from “exiting firms” move to higher-productivity firms?
- How firms cope with increases in minimum wage and other legally mandated costs, by:
  - Substituting formal with informal workers or shedding labor
  - Changing the composition of their workforce by skill/age groups/gender
  - Adjusting the labor/capital composition with new capital investments
  - Adopting new technologies
  - Any other outcome that the Ministry in interested in?

THANK YOU!

QUESTIONS?

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