

The Impact of a Minimum Wage Increase on Hours Worked: Heterogeneous Effects by Gender and Sector

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What we do...

Using administrative earnings data for Ireland, we

1. Examine the impact of three consecutive minimum wage increases on the hours worked of MW workers
2. Test for heterogeneity by sector and gender

Why look at hours?

- Two potential margins of adjustment
 - Number of jobs (extensive margin)
 - Hours worked (intensive margin)
- Vast literature examining the impact of a MW increase on the number of jobs (extensive margin)
 - Difficult to ascertain what the ‘weight of evidence’ says
 - See, e.g., Neumark and Shirley (2021); Dube (2019); Belman and Wolfson (2014); Doucouliagos and Stanley (2009)
- What about the intensive margin?
 - Cuts in hours often reported by minimum wage employers as their main adjustment channel (Metcalf, 2008)
 - While there is a body of evidence, it is less well developed (Wong, 2019)

The evidence on hours worked

- The introduction of a MW in the UK and Germany led to reductions in hours worked
 - For the UK - Stewart and Swaffield (2008)
 - For Germany - Caliendo et al. (2019); Caliendo et al. (2017); Pusch and Rehm (2017)
- For the US...
 - Some find evidence of an hours reduction (Neumark et al., 2004; Couch and Wittenburg, 2001)
 - While others do not (Hirsch et al., 2015)
- Recent work finds hours adjustment in South Korea
 - Kim et al. (2023)

Why examine heterogeneous effects?

Compelling reasons to suspect heterogeneous effects

1. Differences in the type of labour market (monopsony versus perfect competition)

- Variation in monopsony power across sectors (Bachmann and Frings, 2017)

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- MW workers involved in routine tasks are susceptible to automation (Aaronson and Phelan, 2022)

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3. Differences in firms' ability to pass on price increases

- Export-oriented firms face large elasticities and are limited in ability to pass on prices (Link, 2022; Clemens, 2021)
- Non-tradeable firms have more scope for price increases (Clemens, 2021)
- Restaurants often respond to MW increases by raising prices (e.g., Ashenfelter and Jurajda, 2022)

Evidence on heterogeneous effects

- Harasztosi and Lindner (2019)
 - Study a large MW increase in Hungary
 - Negative employment effects in industries where it is difficult to pass on price increases
- Cengiz et al. (2019)
 - No evidence of significant job losses in the US, but manufacturing sector susceptible to adverse impacts
- Neumark and Yen (2022)
 - Low-skilled manufacturing workers in automatable jobs in the US susceptible to negative outcomes

Why look at Ireland?

- An interesting and suitable setting for testing MW effects
 - Long period (pre-2016) where MW was unchanged
 - Consecutive yearly increases post-2016
 - Useful for the application of difference-in-differences
- Data
 - Administrative earnings data linked to LFS
 - Useful for identifying a treatment and control group
 - Neumark and Shirley (2021) argue that this more likely to capture true effects compared to studies of broad groups of workers
- Policy
 - Focus of the Irish Government is on implementing a living wage
 - Important to have evidence on the impact of such policies

Minimum Wage Policy in Ireland

- MW first introduced in 2000 at a rate of €5.58 per hour
- Regular increases in subsequent years
 - By 2007, the MW was €8.65 per hour
- Following onset of global financial crisis in 2008, Ireland experienced a severe and prolonged economic downturn
- No increases in MW for nine years
 - MW in 2015 was still €8.65 per hour
- Low Pay Commission established in 2015
 - Make yearly recommendations to Irish Government on MW

Minimum Wage Policy in Ireland

- Yearly increases since LPC was established

2015 €8.65 per hour

2016 €9.15 per hour

2017 €9.25 per hour

2018 €9.55 per hour

2019 €9.80 per hour

2020 €10.10 per hour

2021 €10.20 per hour

2022 €10.50 per hour

2023 €11.30 per hour

2024 €12.70 per hour

Minimum Wage Policy in Ireland

- Approximately 8 percent of employees in Ireland are on minimum wage
- Ireland has 2nd highest MW in the EU
- 6th highest when measured in purchasing power standard terms
- Sub-minimum youth rates exist
 - Payable to employees aged 19 years or younger
 - Rarely used
 - Vast majority of potentially eligible employees earn either the full-rate minimum wage or higher pay (Redmond et al., 2023)

Data

- We use the *Earnings Analysis Using Administrative Data Sources (EAADS)* data
- Links earnings from administrative tax records to Irish Labour Force Survey (LFS) data
- LFS is quarterly data, but the EAADS combines quarters to create a yearly dataset
 - Only one record of employment per person is taken
 - Respondents with missing LFS data are excluded
 - Excludes employees earning less than €500 per year
 - Very high earners excluded
 - NACE A, T, U excluded

Data

- We use 7 years of cross-sectional data
 - 2012 to 2018
- From 2012-2015, there was no MW change
 - 4 pre-treatment years
- The MW increased from €8.65 to €9.15 per hour in 2016
- Increased to €9.25 in 2017 and to €9.55 in 2018

Identifying MW employees

- A person's hourly wage rate is calculated as
 - Monthly earnings / (4.3 x usual weekly hours worked)
- Minimum wage employee if
 - $Hourly\ Wage \leq Minimum\ Wage$
- We allow for some flexibility (+5 % of MW)
 - MW in 2018 was €9.55 per hour
 - MW employee if $hourly\ wage \leq €10.03$
- Control group
 - $€10.03 \leq hourly\ wage \leq €15$

Descriptive Statistics

Table 1: Descriptive statistics of minimum wage and higher paid (non-MW) employees

	MW Employees			Non-MW Employees		
	A. 2012-2015	B. 2016-2018	Change (B-A)	C. 2012-2015	D. 2016-2018	Change (D-C)
Hours worked	32.0	32.2	0.2	33.0	33.5	0.5
Age	34.5	35.2	0.7	37.6	38.4	0.8
Male (%)	38.7	41.2	2.5	44.7	45.4	0.7
Tertiary Education (%)	28.3	25.3	-3.0	34.4	32.5	-1.9
Married (%)	36.4	34.0	-2.4	45.9	43.6	-2.3
Services sector (%)	46.5	45.0	-1.5	34.8	34.2	-0.6
Observations	8,299	4,723		17,575	11,328	

Source: EAADS. Authors' own calculations.

Methodology

- A fully flexible difference-in-differences estimator (Mora and Reggio, 2015)
- Does not impose common pre-treatment trends
- Slope and intercept are free to vary for all pre- and post-treatment periods
- Mora and Reggio (2015) includes a test for common pre-treatment dynamics

Methodology

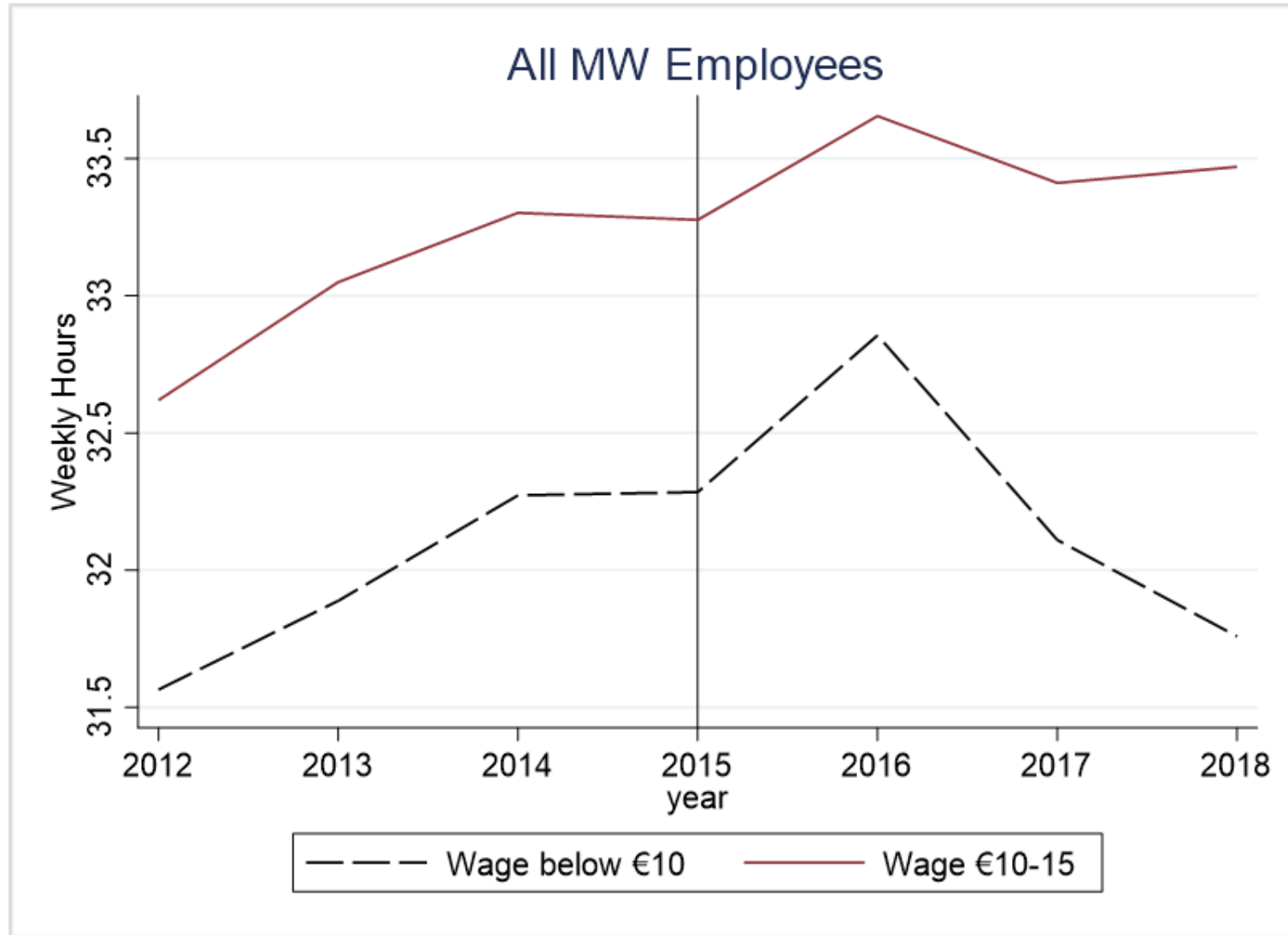
- Involves implementing the following regression

$$E(Y_{it}|D_i, X_i) = \delta + X'_{it}\beta + \sum_{\tau=t_2}^T \delta_{\tau} I_t^{\tau} + \gamma^D D_i + \sum_{\tau=t_2}^T \alpha_{\tau} \cdot I_t^{\tau} \cdot D_i + \varepsilon_{it}$$

- The estimates of interest involve linear combinations of the interaction terms
 - Needs to be taken into account when calculating standard errors (Mora and Reggio, 2015)
- Useful approach for looking at cumulative impacts of policy changes over several years
 - Compared to a series of separate 2x2 d-i-d's

Results – All MW Employees

Figure 1: Average weekly hours worked (2012 to 2018)



Results – All MW Employees

Table 2: Estimates of the impact of a minimum wage increase on hours worked

Variables	Hours
<u>DiD</u> Estimates	
<u>DiD</u> -- 2018	-0.95** (0.46)
<u>DiD</u> -- 2017	-0.59 (0.42)
<u>DiD</u> -- 2016	0.04 (0.08)

Results – All MW Employees

Control Variables	
Male	7.05*** (0.10)
High education	5.16*** (0.16)
Medium education	2.21*** (0.15)
Married	0.41*** (0.11)
Services sector	-2.45*** (0.10)
Irish national	-1.76*** (0.05)
Experience (log years)	1.41*** (0.05)
Firm size (<100 employees)	-3.28*** (0.11)
Dublin region	0.20*** (0.01)
Age	-0.08*** (0.01)

Obs: 38,599

Common pre-treatment dynamics:
Yes

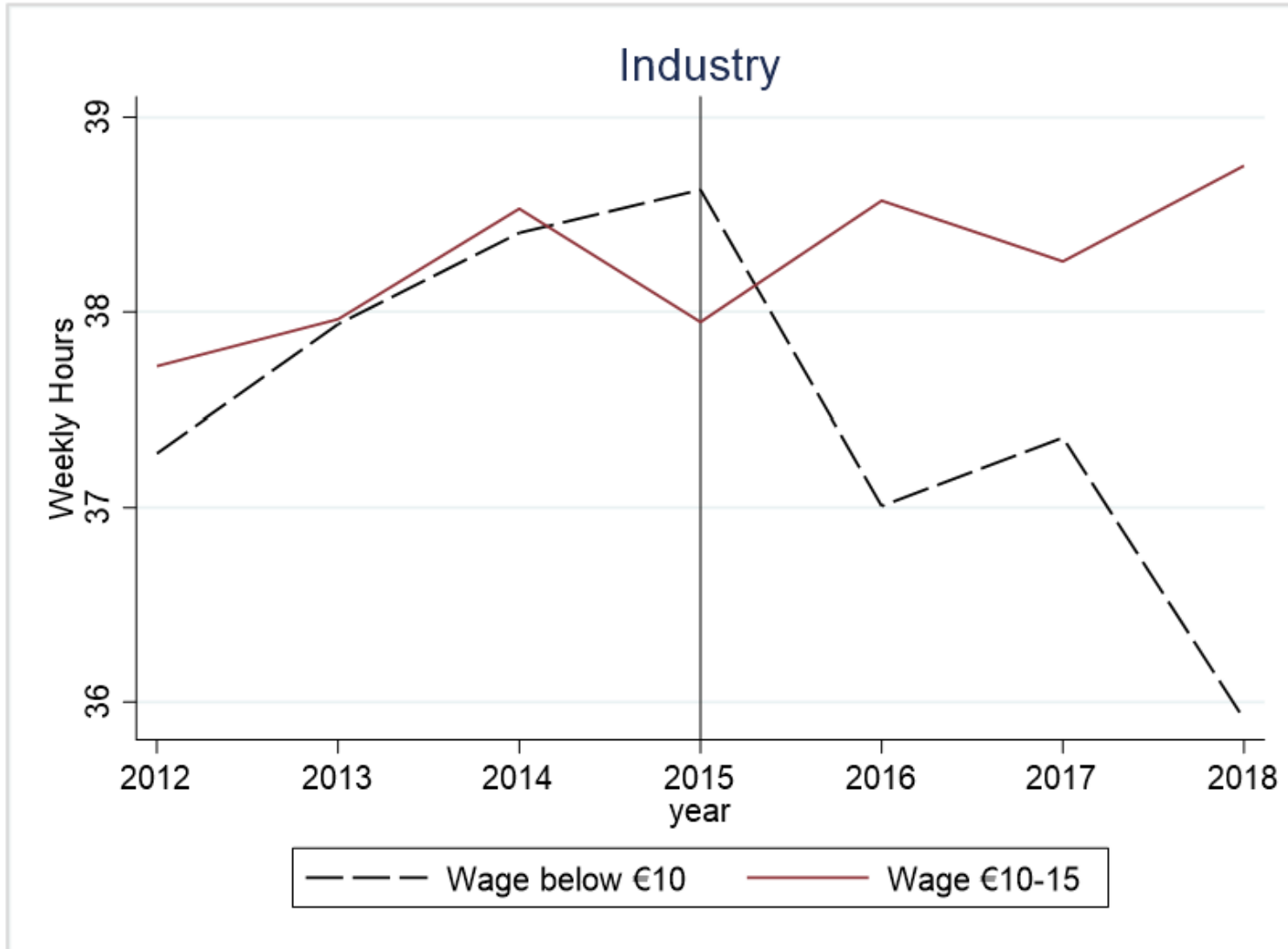
Sectoral Results

We do not detect any statistically significant impact for the following sectors

- Wholesale and Retail
- Administration and Support
- Health and Social Work
- Arts, Entertainment and Recreation

Results – Manufacturing Employees

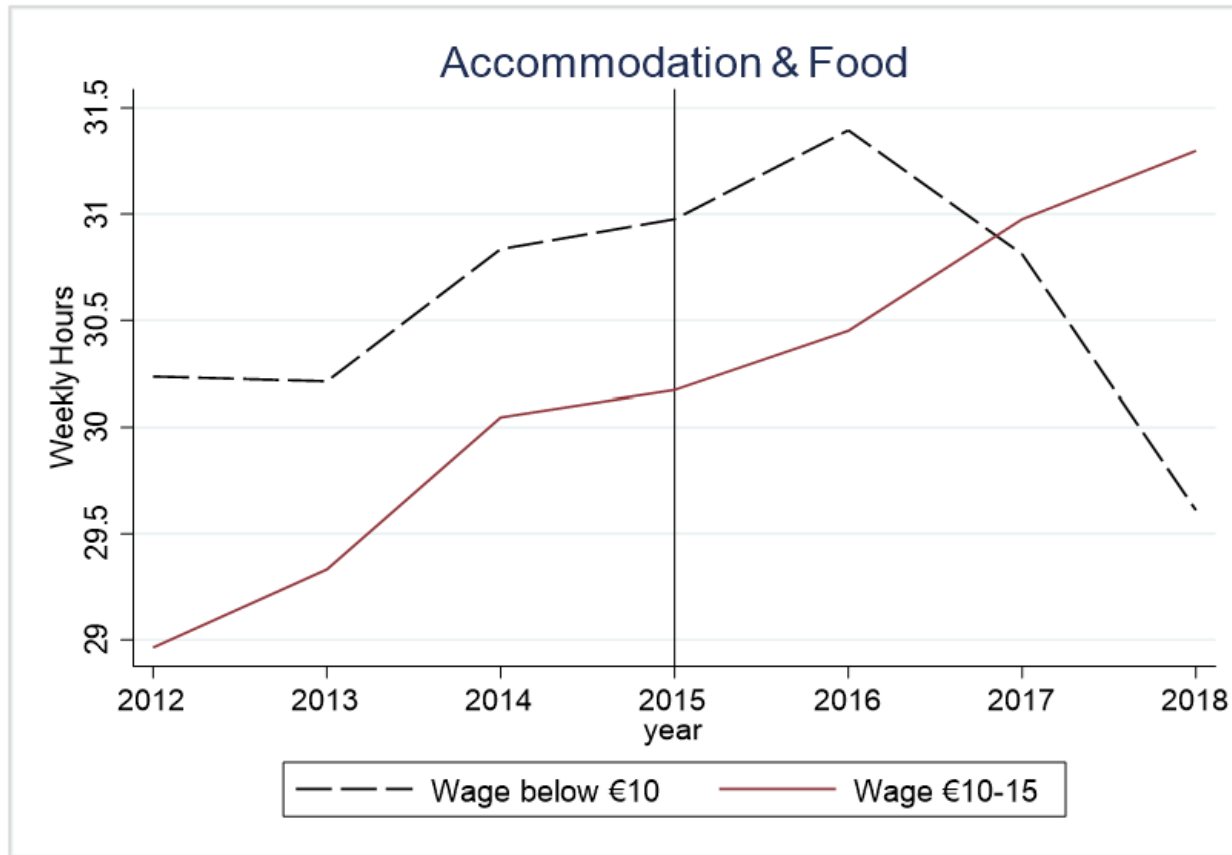
Figure 2: Average weekly hours worked for industry sector employees (2012 to 2018)



2018
-3.02***
(1.18)
N=4,572

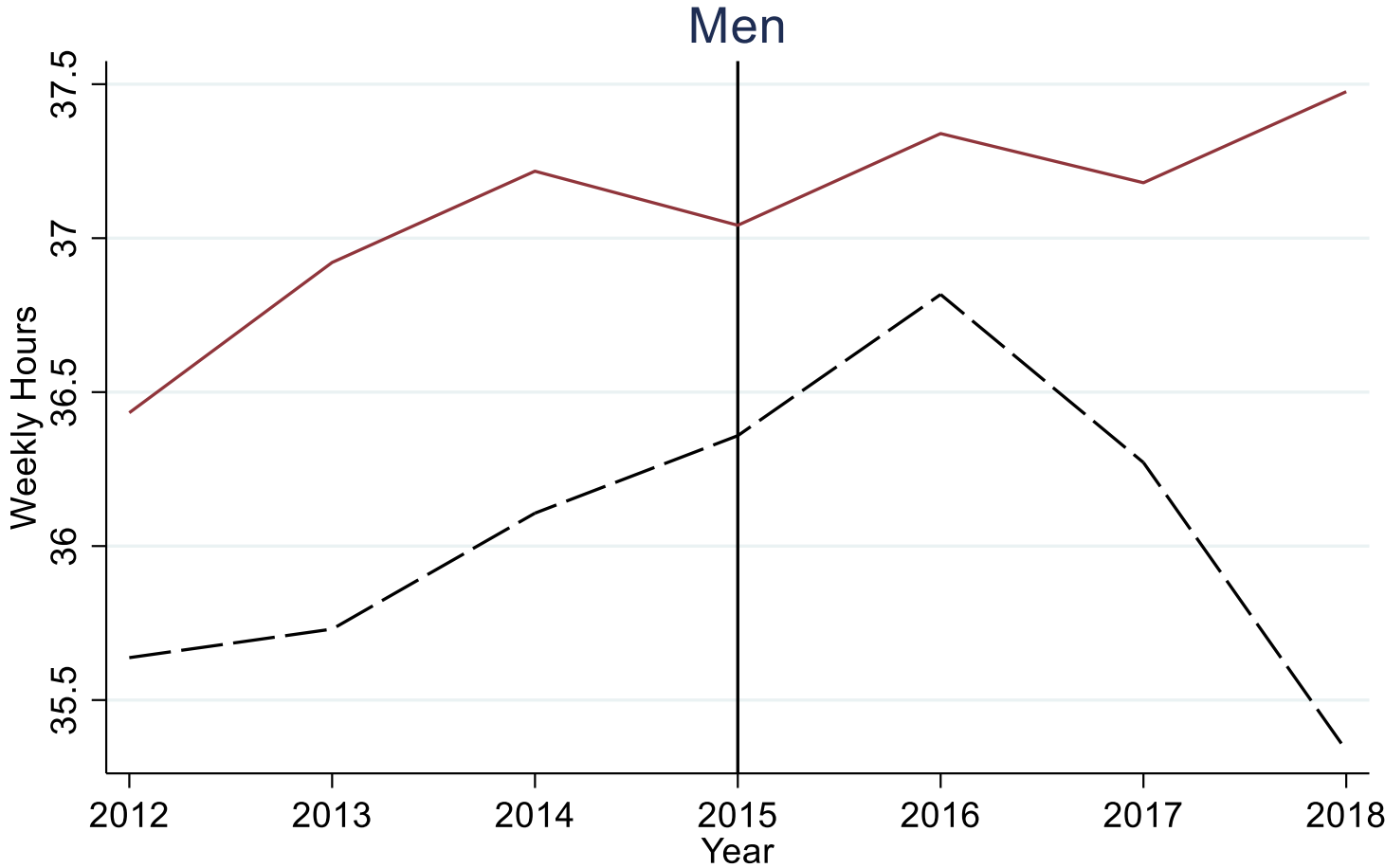
Results – Accommodation & Food

Figure 3: Average weekly hours worked for accommodation & food sector employees (2012 to 2018)



2018
-2.56**
(1.15)
N=5,014

Results – Men



2018
-1.52**
(0.65)
N=18,160

--- Wage below €10 — Wage €10-€15

Results – Women



2018
-0.70
(0.58)
N=23,765

What is driving heterogeneous effects?

- Differences in automatability?
 - Recall Lordan and Neumark (2018): MW workers in manufacturing in the US susceptible to automation
- We look to 2021 European Skills and Jobs Survey (ESJS) for descriptive evidence for Ireland
- Two questions
 - *“To what extent do you think new digital or computer technologies in your company or organisation can or will do part of your main job”*
 - *“Do you think there is any chance of losing your main job in the next twelve months?”*

What is driving heterogeneous effects?

Table 4: Percentage of Employees Susceptible to Technological Replacement

Sector	Susceptible to Technological Replacement (%)
Manufacturing	16% N=77
Accommodation & food	14% N=49
Admin & support	13% N=47
Wholesale & retail	12% N=69
Health & social activities	10% N=102

Source: Cedefop 2021 European Skills and Jobs Survey. Authors' own calculations.

What is driving heterogeneous effects?

- **What about differences in monopsony power?**
- Devereux and Studnicka (2023) measure the degree of monopsony power across sectors in Ireland
- Accommodation and food is the sector that least resembles monopsony
 - Or most closely aligns with a perfectly competitive market
- This is where we would expect to see adverse employment outcomes

What is driving heterogeneous effects?

- **What about differences in ability to pass on price increases?**
- Firms with the ability to pass through price increases in response to a minimum wage rise are less likely to cut jobs (Link, 2022)
- Export-driven firms are less likely to be able to do this (Clemens, 2021)
- Irish manufacturing firms are highly export oriented

What is driving heterogeneous effects?

- **What about the gender differences?**
- It could be compositional (men more likely to work in affected sectors)

Table 5: Distribution of Male and Female Employees by Sector

Sector	Men (%)	Women (%)
Industry	18.05	6.92
Accommodation and Food	12.43	13.70
Wholesale and Retail	26.02	27.73
Admin and Support	9.24	5.81
Health and Social Activities	3.33	16.57
Arts, Entertainment & Recreation	3.89	6.86
Other Sectors	27.04	22.41

What is driving heterogeneous effects?

Table 6: Difference-in-Differences Estimates by Gender

Sector	Men (2018)	Women (2018)
Industry / Accommodation & Food	-2.27** (1.16) N=5086	-2.28* (1.19) N=4500
Other Sectors	-0.51 (0.99) N=7017	-0.28 (0.78) N=12633

Notes: Separate difference-in-differences estimates by gender are shown for those working in industry or accommodation & food, as well as for those working in other sectors (wholesale and retail; admin and support; health and social activities; arts, entertainment & recreation). The estimate relates to the cumulative impact, analogous to the “2018” column in Table 3.

Were MW workers still better off?

- Were the hours reductions in affected sectors enough to offset the potential wage gains from the MW increases?

Table 7: Actual 2015 and adjusted 2018 weekly wages

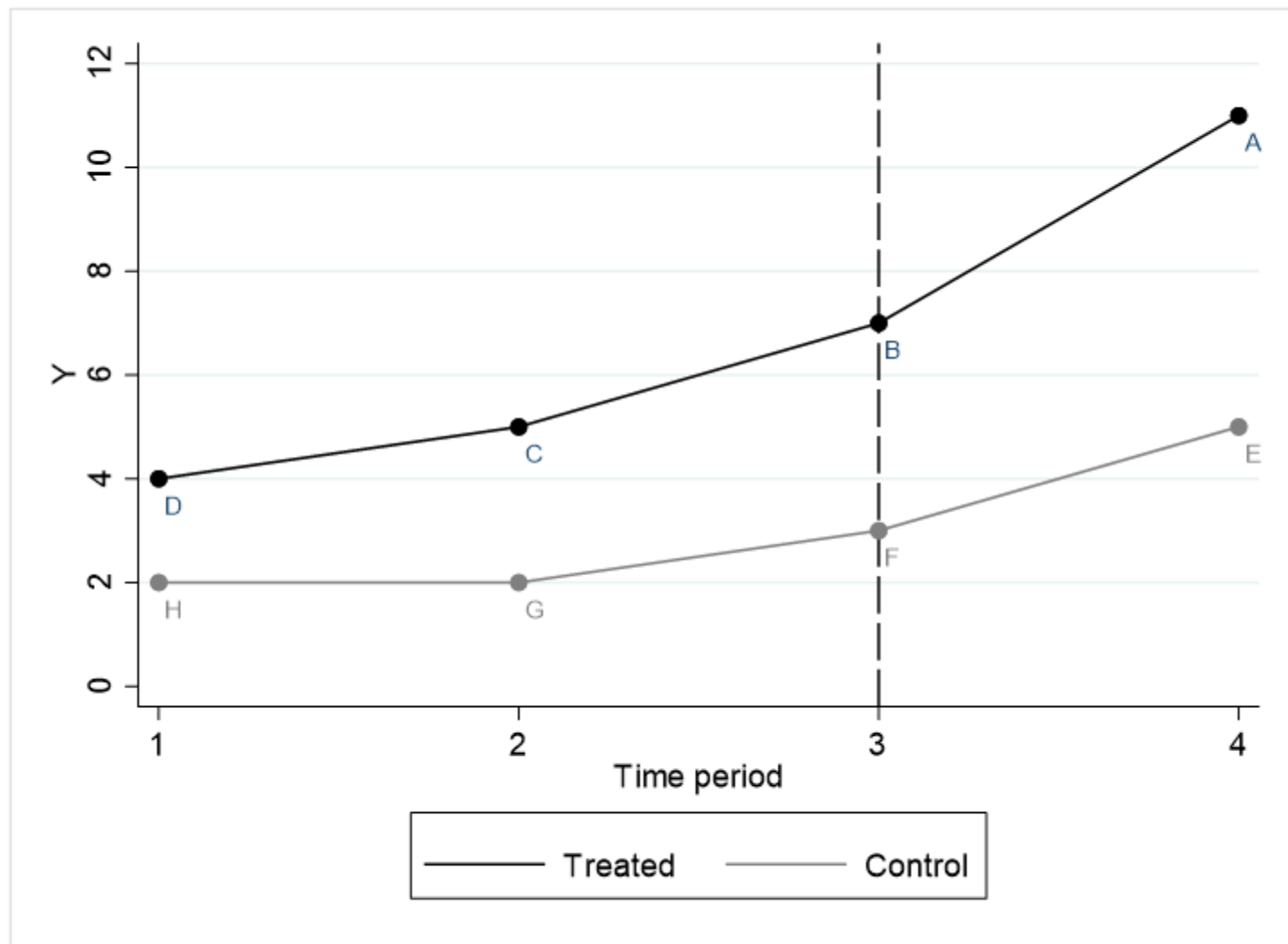
Group	Weekly Wage 2015	Hours Adjusted Weekly Wage 2018	Difference
All MW workers	€277	€297	+€20 (7%)
Industry MW workers	€337	€344	+ €6 (2%)
Accommodation and food MW workers	€268	€272	+ €3 (1%)
Male MW workers	€315	€333	+ €18 (6%)

Notes: Authors' calculations based on LFS Earnings Analysis Using Administrative Data Sources (EAADS) data

Conclusion

- Over three years (2016-2018), the MW increased from €8.65 per hour to €9.55 per hour (10% increase)
- Minimum wage employees experienced a reduction in hours of approximately one hour per week
 - Elasticity of approximately -0.3
- Larger decline in hours for those in manufacturing (-3 hours) and accommodation & food (-2.5 hours)
- Gender differences relate to compositional effects, as men more likely to work in affected sectors
- MW increases were enough to offset negative wage effects from hours reduction

FIGURE A1 ILLUSTRATIVE EXAMPLE OF FULLY-FLEXIBLE DIFFERENCE-IN-DIFFERENCES ESTIMATOR



Source: Authors' analysis.