

# Do delayed admissions to nursing homes increase hospital utilization?

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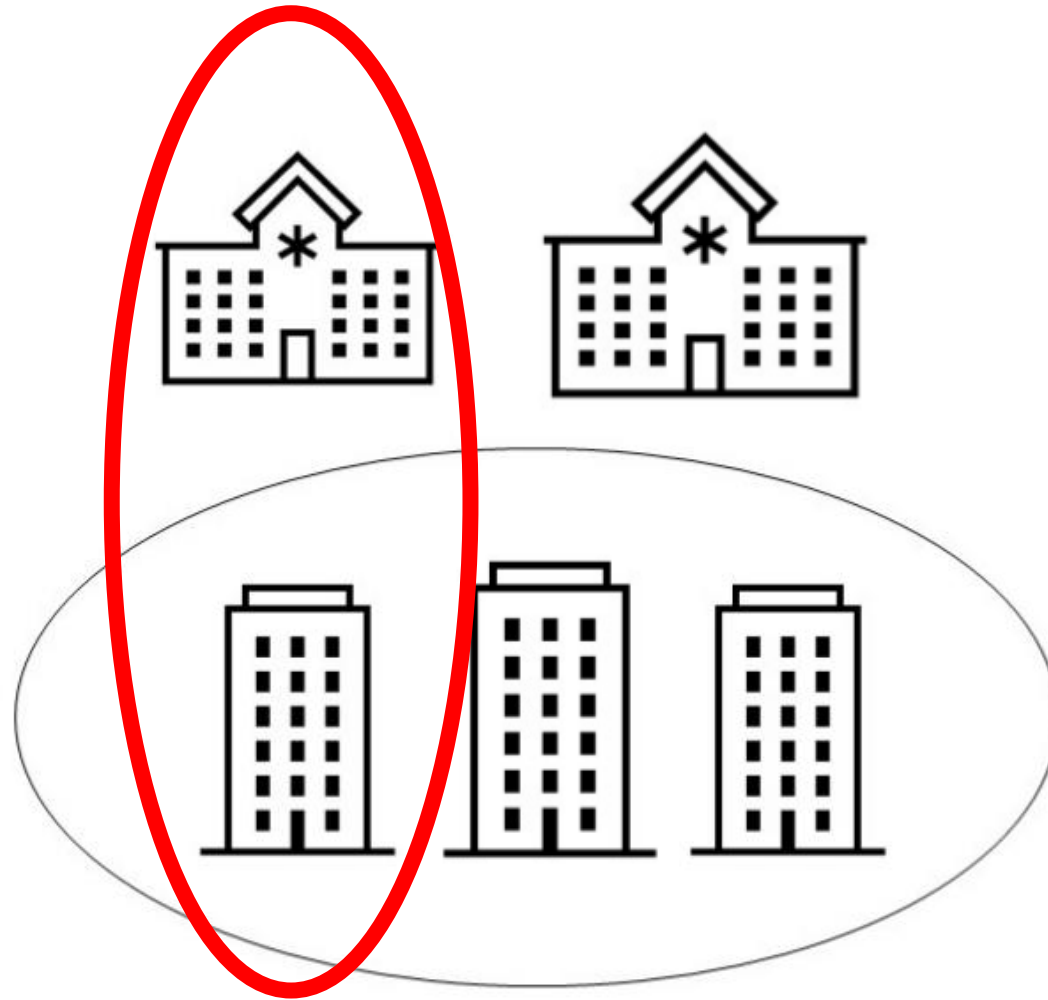
# Outline

- Introduction
- Literature
- Institutional background
- Data
- Methods
- Results
- Conclusion

# Introduction

- **Ageing population** increases demand for nursing homes
- In publicly funded systems, limited supply combined with insurance generates an **excess demand**
  - leading to long waiting lists for a place in a nursing home
- **Waiting / delays for nursing homes** generates dissatisfaction for individuals and could worsen health and puts pressure on providers
- It can therefore generate (negative) **spillover effects to health care sector**
  - Higher hospitalisations

# Spillovers within and across sectors



Health care

Long term care

# This paper

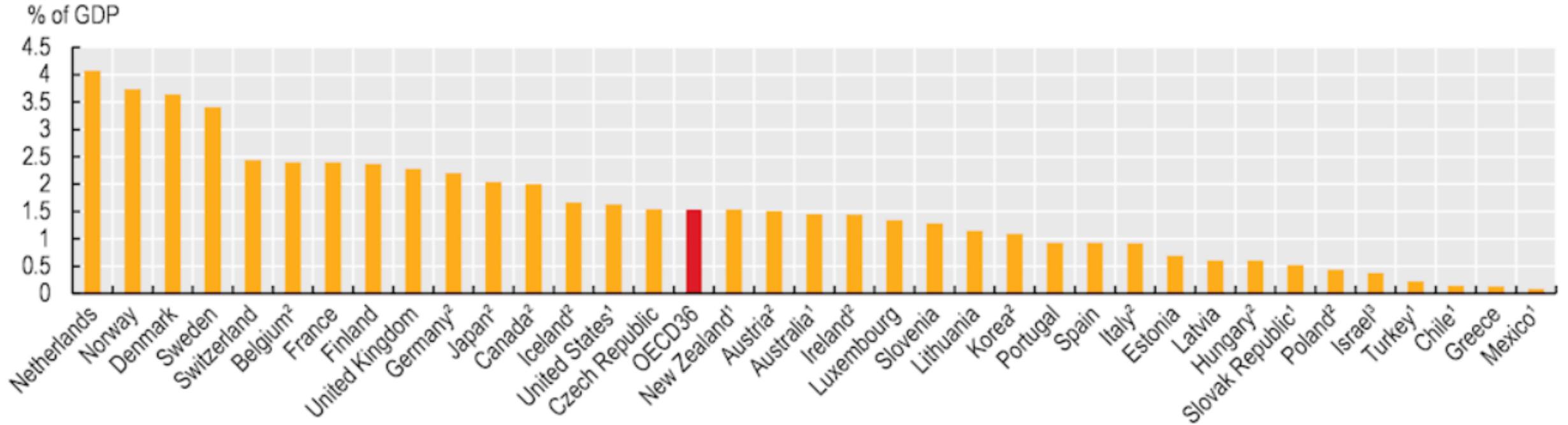
- **Do delays in admission to a nursing home in the Netherlands increase the probability of an urgent hospitalisation?**
- One additional month of wait increases the probability to be hospitalised by 1.4 percentage points or 10%
  - Individuals with **dementia** care needs
  - Hospitalisations after a **fall**
- Administrative linked data in 2015-2018
- Instrumental variable approach based on “congestion”

# Literature

- Spillover effects from **long term care to health care**
  - Moura (2022) for Portugal, Gaughan et al (2015) in England on **bed blocking**
  - Forder (2009), Crawford et al (2021) on LTC spending and healthcare utilisation
  - Bakx et al (2020) in the Netherlands on **eligibility** of LTC benefits on hospitalisation and survival; Serrano-Alarcon et al (2022) for Spain
- Effect of **healthcare waiting** times on **health** or **labour** market outcomes
  - Godoy et al (2023) for Norway, Hoe (2022) for England, Prudon (2023) on mental health using an instrumental variable approach
  - Moscelli et al (2016) on coronary bypass, Nikolova et al (2016) on hip replacement, Reichert and Jacobs (2018) for mental health

# Long term care spending as % of GDP (2019)

Figure 10.24. Total long-term care spending as a share of GDP, 2019 (or nearest year)



(OECD, 2021)

# Institutional background

- Care provided by nursing homes is covered by **social insurance**
  - Covers all costs **including room & board**
  - Recipients pay an income and wealth dependent (low) **co-payment**
- Individuals apply for **eligibility** at an independent agency
  - Long Term Care Act
- If granted, individuals have a choice of
  - Nursing home (within region)
  - Receiving care in nursing home or in community
  - **Home care** requires more coordination (e.g. municipalities responsible for adaptation of the house and aids such as wheelchair)



# Institutional background

- Nursing homes are private non-profit
  - Limited capacity: personal and real estate shortages
- Reimbursed by per diem, adjusted for intensity of care
  - Not by income or wealth of residents
- Eligibility criteria by independent agency
  - requires “round-the-clock” supervision and care
  - Intensity of care = **care profile**
  - Can choose between in-kind or in-cash benefit, but in practice in-kind
  - Admission to a nursing home is often a “permanent” transition

# Institutional background

## Care profiles

1. High care needs
  - Can include severe dementia (but less than 4%)
2. Moderate need with dementia or related conditions
3. Moderate need for somatic care
  - Physical impairment or multiple chronic conditions requiring medical supervision

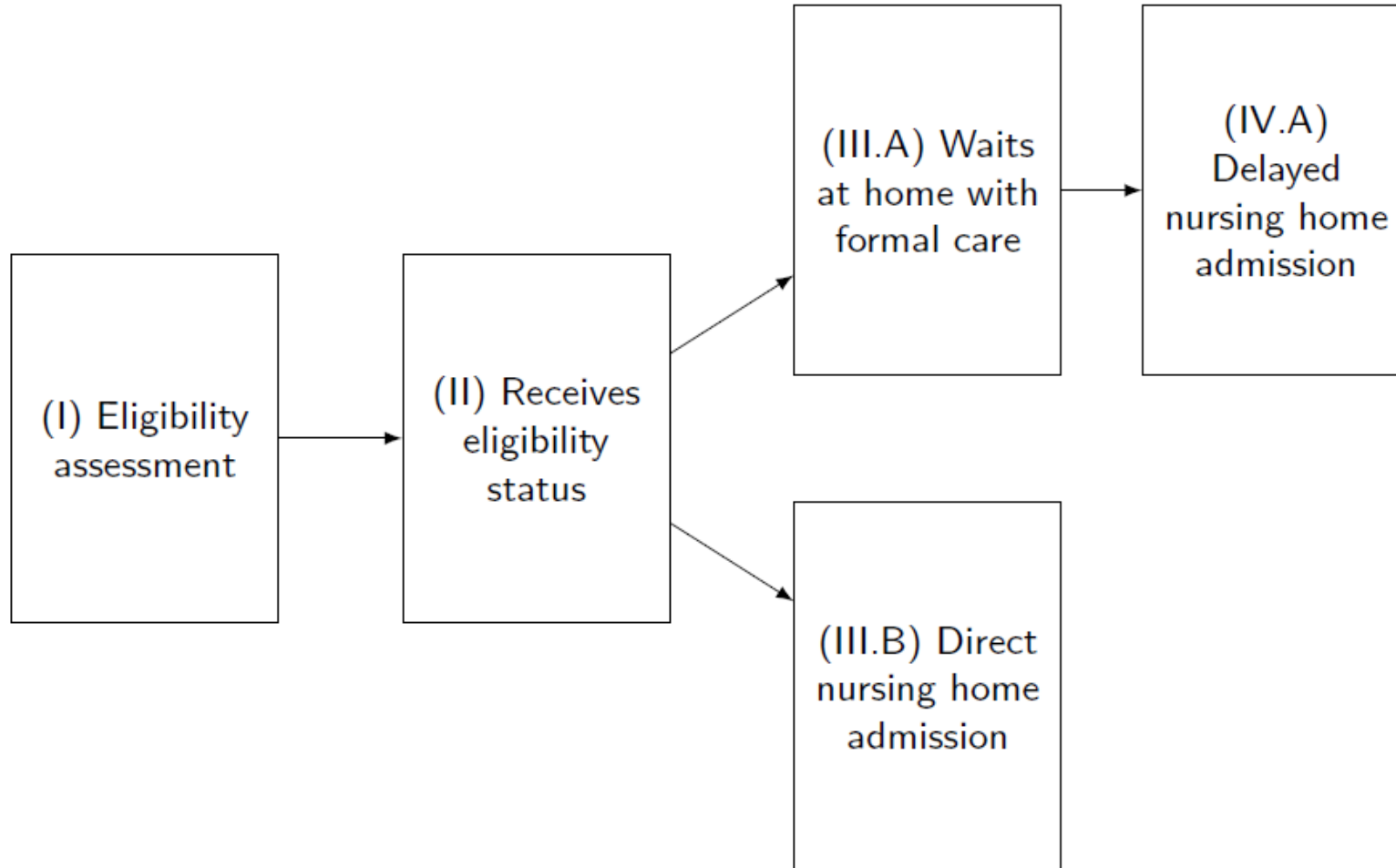
# Data

- Individuals eligible for nursing home admission ( 24/7 supervision )
  - 1 April 2015 – 31 December 2018
  - Sample of 72,762 individuals
- Linked administrative data from Statistics Netherlands
  - Individual eligibility for nursing home care (Central assessment agency)
  - Utilisation of long-term care (Central administrative office)
  - Hospital care (Dutch hospital data)

# Data

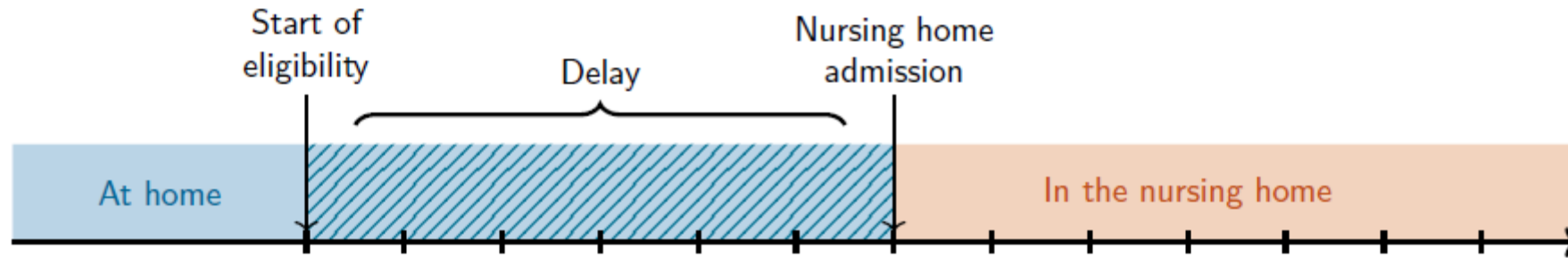
- Sample exclusion restrictions
  - < 65 years old
  - Rehab or palliative care
  - Moved out of nursing home or died within a year
  - Delayed by (waiting time) more than a year
  - Purchased care with personal budget
  - Received eligibility status in the hospital
- Three groups
  - High care needs (21%)
  - Moderate dementia care needs (52%)
  - Moderate somatic care needs (27%)

# 3-step process / individual pathway



# Data

- **Key regressor:** delay (**waiting time**) between eligibility decision and the nursing home admission



Care at home versus  
Nursing home



# Data

- **Dependent variable:** risk for **urgent hospitalisation** within one year after eligibility for nursing home admission
  - Injuries to hip and thigh (15%)
  - Heart disease (8.9%), Influenza and pneumonia (8%)
  - Urinary system (6.9%), cerebrovascular diseases, e.g. stroke (4.6%)
  - Urgent hospitalisations from a **fall** (as a separate outcome)
- Expenditure
  - Nursing home expenditure (LTC)
  - Formal care at home expenditure (LTC)
  - Hospital care expenditure

Table 1: Descriptive statistics of study sample, total and by care profile

	By care profile							
	Full sample		Moderate dementia care needs		Moderate somatic care		High care needs	
	mean	sd	mean	sd	mean	sd	mean	sd
<b>Outcomes:</b>								
Urgent hospitalisation (%)	15.9	36.5	12.9	33.5	19.9	39.9	18.1	38.5
Non-urgent hospitalisation (%)	5.8	23.4	3.4	18.1	8.0	27.2	9.1	28.8
Urgent hospitalisation - fall (%)	4.3	20.4	5.1	22.0	4.0	19.5	2.9	16.7
Urgent hospital days	1.3	4.7	1.1	4.3	1.5	4.6	1.7	5.8
<b>Variable of interest:</b>								
Delays (in days)	63.6	89.4	73.0	95.3	64.9	86.0	38.4	71.9
<b>Instrumental variable:</b>								
Within region and care profile variation in delays (in days) congestion	52.5	21.0	60.6	17.9	54.6	18.6	29.2	12.7
Observations	72,762		38,125		19,556		15,081	
(%)	100		52.4		26.9		20.7	



# Control variables

- Sex and age
- Three eligibility profiles
- Hospitalisation in the month before eligibility for nursing home
- Primary and secondary expenditure in the year prior eligibility
- (17) Charlson co-morbidities following a hospitalisation in the year prior to eligibility
- Medicines used in the year prior to eligibility
- Year and region dummies

Covariates (excl. medication and Charlson comorbidity dummies)								
Women (%)		68.6		67.9		72.5		65.1
Age-group (%)								
	65-69 years	3.5		3.1		2.0		6.4
	70-74 years	7.5		7.9		4.7		9.9
	75-79 years	14.6		16.2		10.9		15.2
	80-84 years	25.1		27.0		23.5		22.2
	85-89 years	28.9		28.9		32.6		24.0
	90-94 years	16.4		14.0		20.9		16.8
	95+ years	4.1		2.9		5.3		5.5
Healthcare exp. on GP care (x1000€)		0.4	0.2	0.3	0.2	0.4	0.3	0.4
Healthcare exp. on hospital care (x1000€)		3.8	8.6	2.6	5.7	4.2	8.4	6.4
Hospitalization in last 30 days		4.4		3.3		4.8		6.3
Wealth (%)								
	<€5,000	21.5		20.1		22.5		23.5
	€5,000-€20,000	25.9		25.0		28.8		24.7
	€20,000-€50,000	23.9		24.2		24.2		22.7
	>€50,000	28.7		30.7		24.4		29.1
Home ownership (%)		34.4		37.4		28.6		34.4
Eligibility in flu season (%)		29.5		30.1		29.1		28.7
Year of eligibility (%)								
	2015	16.5		16.6		15.7		17.3
	2016	24.9		24.7		24.6		25.8
	2017	27.5		27.5		28.1		26.8
	2018	31.1		31.3		31.6		30.0

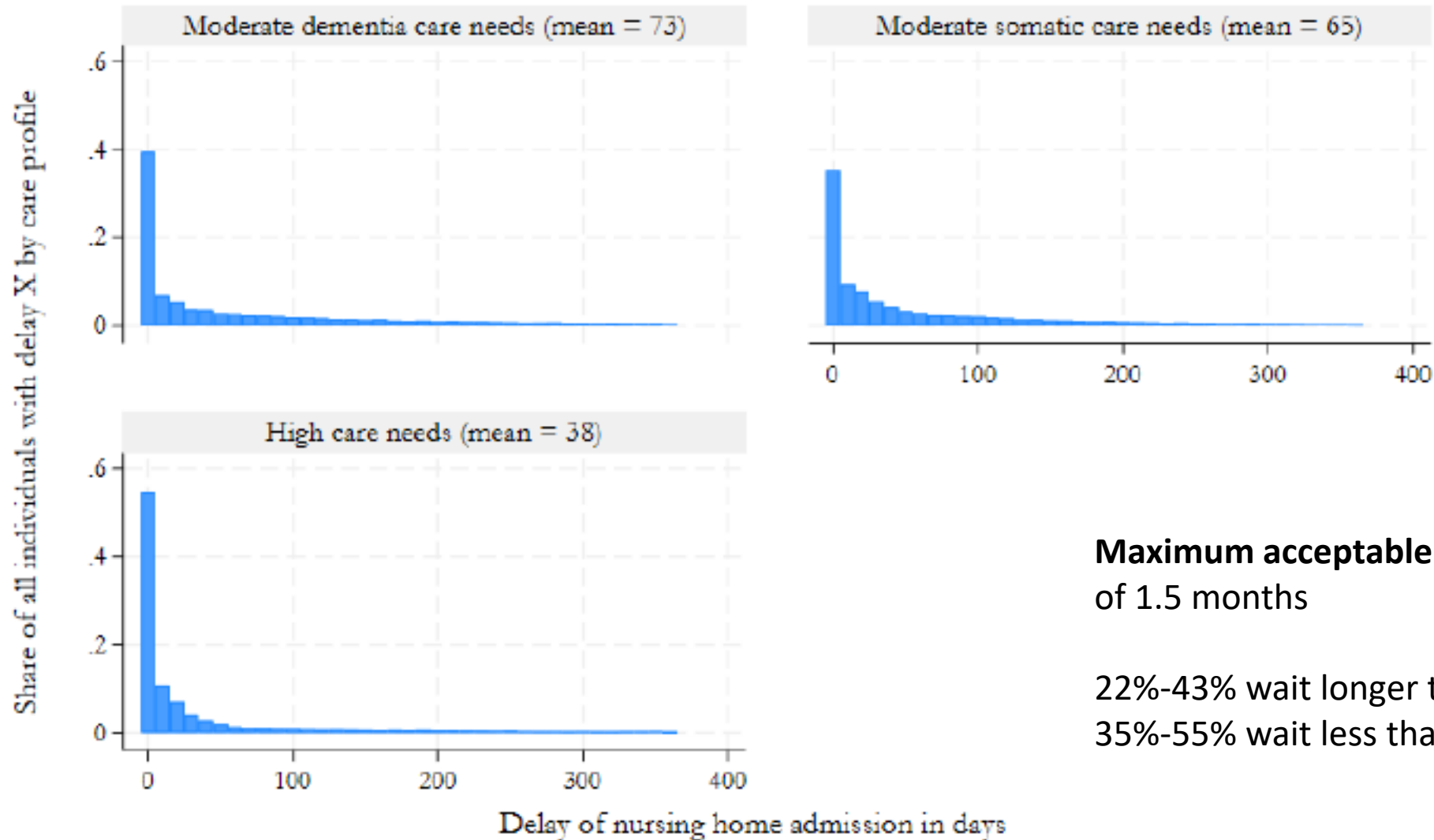
# Methods

- Baseline regression

$$H_{irp} = \alpha + \beta D_{irp} + X_i \gamma + \nu_r + \rho_p + \varepsilon_{irp}$$

- where  $H$  is hospitalisation dummy for patient  $i$  in region  $r$  and profile  $p$
- $D$  is delay (waiting time for accessing a nursing home)
- $X$  is individual characteristics
- Threats to identification
  - Unobserved health factors (omitted variable)
    - Individuals with higher need would like shorter wait, providers may prioritise sicker individuals
  - Patient preferences, for given health (omitted variable)
  - Health shock reduces waiting times – become more urgent (reverse causality)

# Variation in delay (individual level)



**Maximum acceptable waiting time**  
of 1.5 months

22%-43% wait longer than max  
35%-55% wait less than 10 days

# Methods

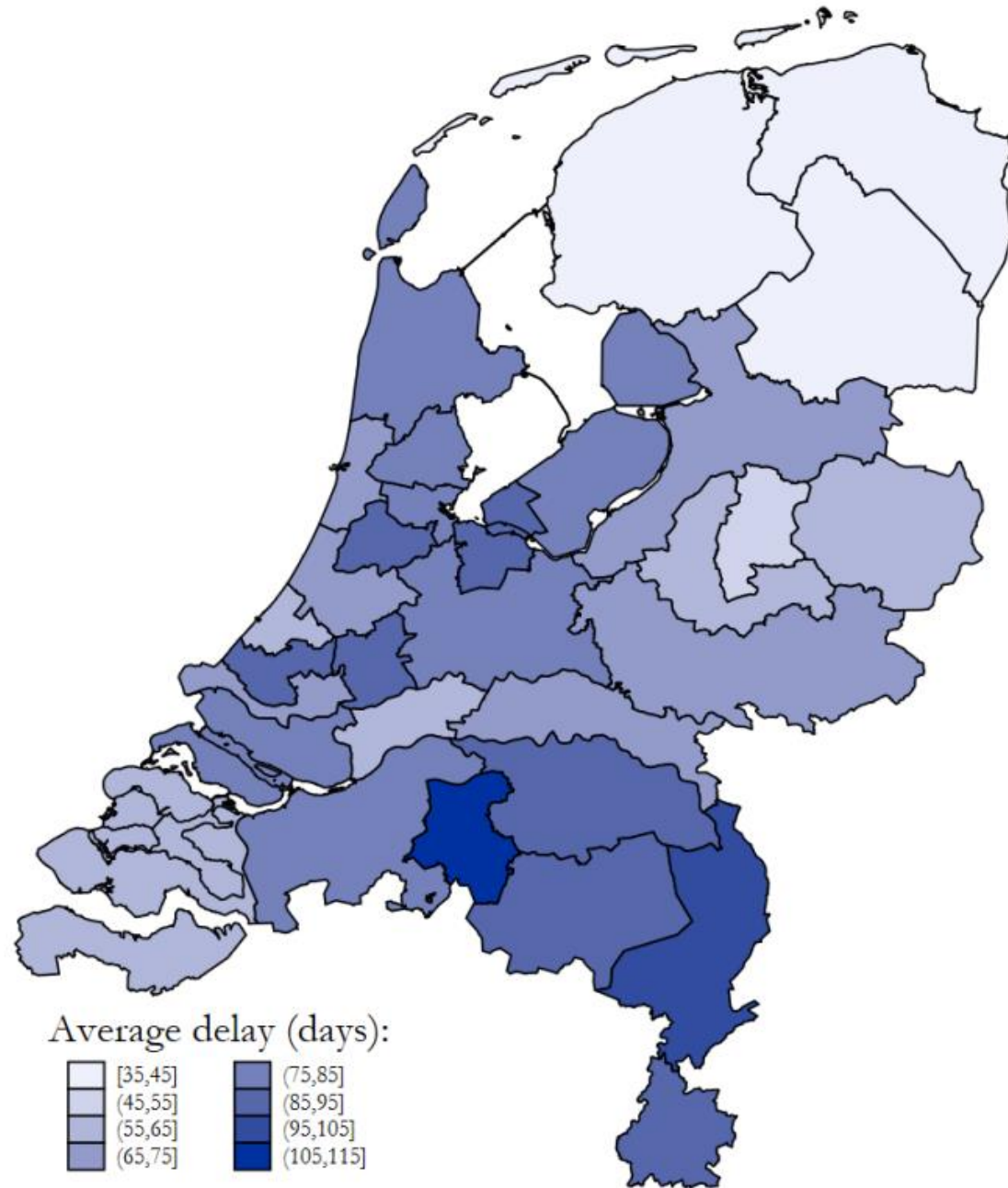
- Instrumental variable approach

$$Congestion_{irc} = \frac{\sum_{j=1}^{J_i} Delay_j}{J_i}$$

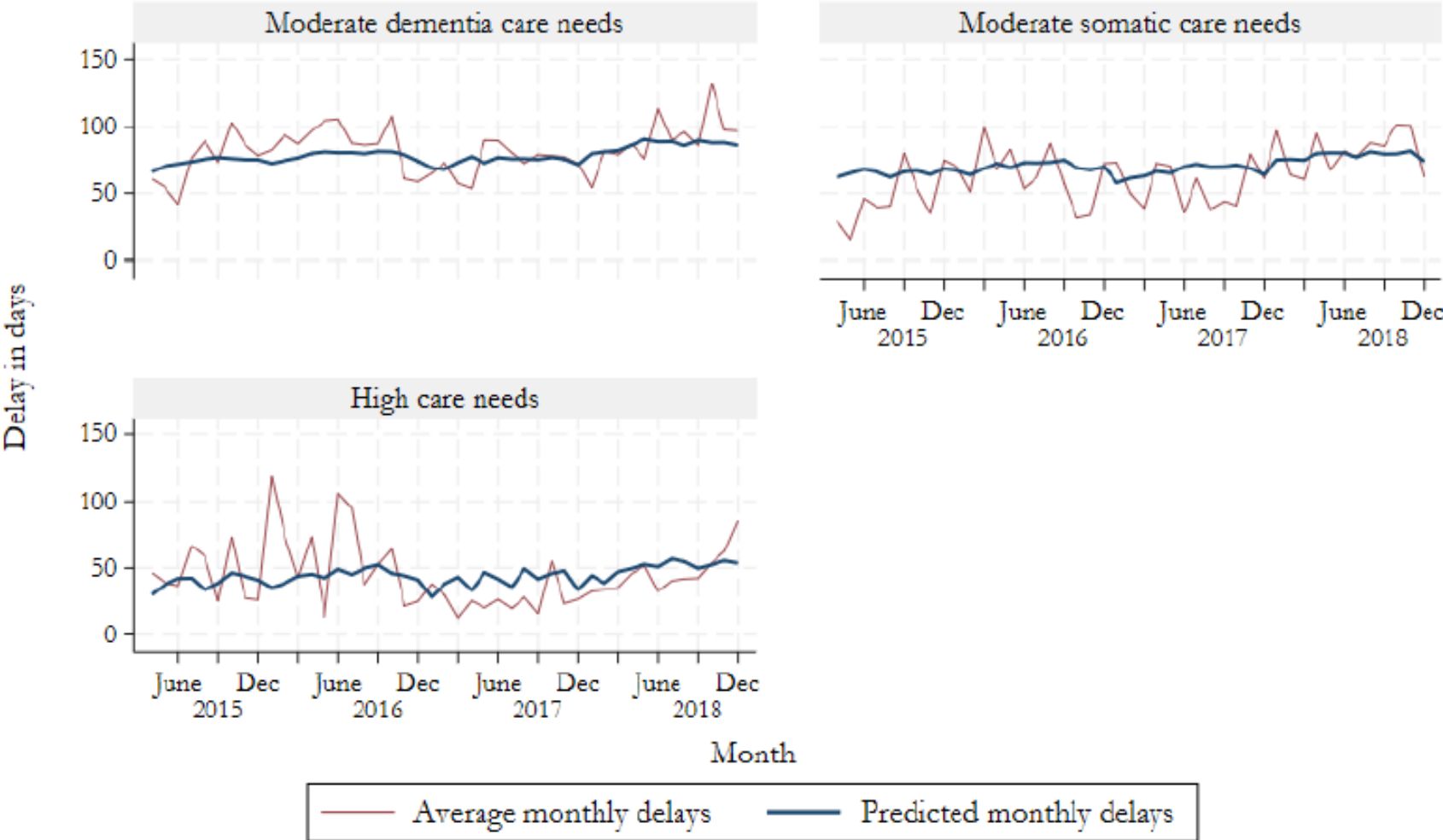
- We instrument individual delay with the average delay in the same region and profile in a time window (-45 days, + 45 days) from individual eligibility
- Exploits variation within-region and within-subgroup variation in delays and over time

# Average delays in nursing home admissions

Dementia care needs



# Difference between predicted and average monthly delay (instrument)



# Methods

Two-stage least squares regression with robust standard errors

First stage:

$$D_{irp} = \lambda + \delta C_{irp} + X_i \theta + \mu_r + \rho_p + \epsilon_{irp}, \quad (3)$$

Second stage:

$$H_{irp} = \alpha + \beta \hat{D}_{irp} + X_i \gamma + \nu_r + \varrho_p + \varepsilon_{irp}. \quad (4)$$



# Results: +10 days increase hospitalisation risk by 0.47 pp

Table 2: The effect of delayed nursing home admissions on urgent hospital use

	Full sample	By care profile		
		Moderate dementia care needs	Moderate somatic care needs	High care needs
	(1)	(2)	(3)	(4)
<i>Panel A: Second stage result (outcome = urgent hospital use)</i>				
$\widehat{Delay}$ (in days)	0.00047*** (0.00018)	0.00101* (0.00056)	0.00013 (0.00084)	0.00038 (0.00047)
<i>Panel B: First stage result (endogenous var = delay in nursing home admission)</i>				
Instrument: congestion	0.652*** (0.0282)	0.335*** (0.0518)	0.312*** (0.0599)	0.676*** (0.0656)
F-statistic	534.0	41.8	27.1	106.2
Care profile fixed effects	Yes	No	No	No
Observations	72,762	38,125	19,556	15,081
Mean dept. var	0.1588	0.1291	0.1993	0.1813

# Heterogeneity

Living alone  
versus  
living with a  
partner

Living alone:  
+ 10 days  
→

+0.68 pp in

***Urgent  
hospitalisation***

	Full sam- ple	By care profile		
		Moderate dementia care needs	Moderate somatic care needs	High care needs
	(1)	(2)	(3)	(4)
<b>Panel I: Living alone</b>				
<i>Panel I.A: Second stage result (outcome = urgent hospital use)</i>				
<i>Delay (in days)</i>	0.00068*** (0.00022)	0.00213** (0.00093)	-0.00012 (0.00085)	0.00108* (0.00057)
<i>Panel I.B: First stage result (endogenous var = delay in nursing home admission)</i>				
Instrument: congestion	0.654*** (0.03480)	0.299*** (0.06703)	0.362*** (0.06985)	0.704*** (0.08210)
F-statistic	353.5	19.8	26.9	73.5
Care profile fixed effects	Yes	No	No	No
Observations	45,430	21,768	14,424	9,238
Mean dept. var	0.1637	0.1344	0.1991	0.1775
<b>Panel II: Living with a partner, child(ren) or other</b>				
<i>Panel II.A: Second stage result (outcome = urgent hospital use)</i>				
<i>Delay (in days)</i>	0.00010 (0.00030)	-0.00013 (0.00075)	0.00199 (0.00312)	-0.00080 (0.00084)
<i>Panel II.B: First stage result (endogenous var = delay in nursing home admission)</i>				
Instrument: congestion	0.639*** (0.04818)	0.369*** (0.08141)	0.175 (0.11738)	0.638*** (0.10990)
F-statistic	175.8	20.6	2.2	33.7
Care profile fixed effects	Yes	No	No	No
Observations	27,330	16,356	5,132	5,842
Mean dept. var	0.1506	0.1220	0.1995	0.1874

# Falls

+ 10 days of waiting



+0.18 pp in risk of a fall

+0.08 days in hospital

+0.29 days conditional on being hospitalised

	Hospital related outcomes				
	All hospitalisations	Non-urgent hospitalisations	Hospitalisation due to fall (urgent)	# days in hospital (urgent)	# days in hospital if urgent hospitalisation
	(1)	(2)	(3)	(4)	(5)
$\widehat{Delay}$ (in days)	0.00049** (0.00019)	0.00010 (0.00012)	0.00018* (0.00009)	0.00819*** (0.00245)	0.02896*** (0.01109)
Observations	72,762	72,762	72,762	72,762	11,553
Mean dept. var	0.2030	0.0583	0.0433	1.3300	8.3768

**Exposure to risk or health deterioration?**

Direct versus indirect effect

First six months versus second six months from eligibility

		Outcome:	
		Urgent hospitalisation within 0-6 months (both at home and in a nursing home)	Urgent hospitalisation within 6-12 months (in a nursing home only)
		(1)	(2)
Second stage (outcome = urgent hospitalisation):			
$\widehat{Delay}$ (in days)		0.00081** (0.00038)	0.00032 (0.00032)
Covariates		Yes	Yes
Year fixed effects		Yes	Yes
Region fixed effects		Yes	Yes
Observations		63,330	63,330
Mean dept var		0.0990	0.0641

# OLS and reduced form

	Full sam- ple	By care profile		
		Moderate dementia care needs	Moderate somatic care needs	High care needs
	(1)	(2)	(3)	(4)
Panel A: Ordinary least squares (including covariates):				
Delay (in days)	0.00036*** (0.00002)	0.00037*** (0.00002)	0.00021*** (0.00003)	0.00056*** (0.00005)
Panel B: Reduced form including all covariates (OLS):				
Congestion	0.00031** (0.00012)	0.00034* (0.00019)	0.00004 (0.00026)	0.00026 (0.00032)
Panel C: Reduced form excluding health covariates (OLS)				
Congestion	0.00031** (0.00012)	0.00033* (0.00019)	-0.00007 (0.00027)	0.00024 (0.00032)
Observations	72,762	38,125	19,556	15,081
Mean dept. var	0.1588	0.1291	0.1993	0.1813

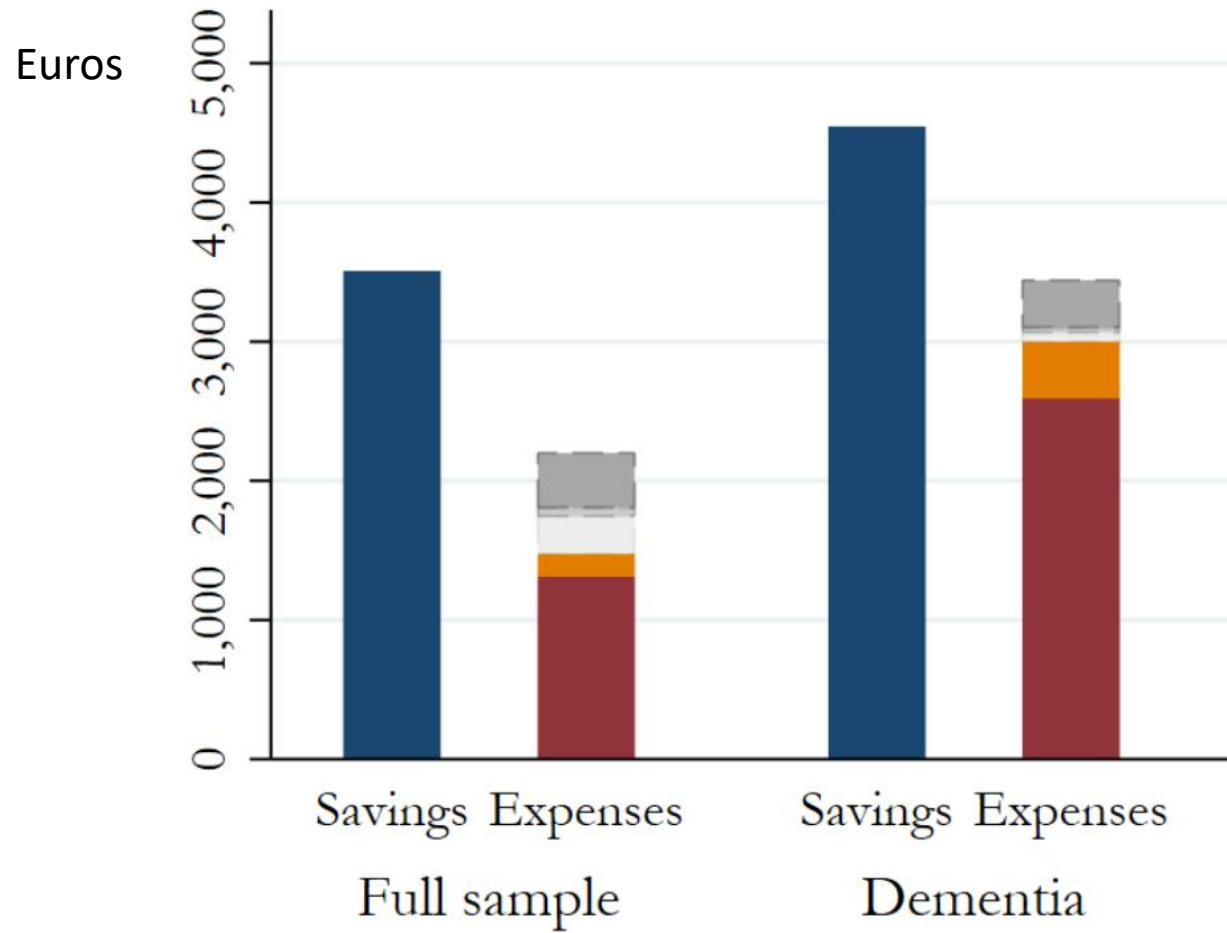
# What about expenditure?

- Consider 1 additional month of delay
- Savings: nursing home expenditure for 1 month
- Costs
  - Home care
  - Additional hospital care

**Nursing home expenditure**

**Home care expenditure**

**Hospital expenditure**



Savings/expenses due to an additional month of delay



Nursing home care



Home care



Hospital care



Hospital care - imprecise



Medication\*



General practitioner care\*



Community nursing\*

# Exclusion restriction

- Variation in congestion not correlated with
  - Observed characteristics (F-statistic of joint significance = 1.5)
  - Rejected applications



# Conclusions

- Negative spillovers across sectors
  - Delays in the nursing home sector increase demand for hospital care
- Delaying a nursing home admission by one additional month increases the probability to be hospitalised by 1.4 ppt (approx. 10%)  
Driven by:
  - Individuals with dementia care needs
  - Hospitalisations after a fall
  - The first period after eligibility (while at home)

# Conclusions

- Implications
  - Improved prioritization to reduce the health loss from delays
  - Better support individuals while waiting at home, especially for individuals with dementia (and limited informal care)
  - Account for spillovers when allocating of resources

# Acknowledgments

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Thank you!