Do delayed admissions to nursing homes increase hospital utilization?

Luigi Siciliani

University of York

joint with Marlies Bar, Pieter Bakx, Nigel Rice, Rita Santos, Bram Wouterse

Toulouse, 23 May 2024

*Public Economics and Aging Conference*

Outline

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

Introduction

- **Ageing population** increases demand for long-term care

- In publicly funded systems, limited supply of **nursing homes** combined with insurance generates an **excess demand**
  - leading to long waiting lists for a place in a nursing home

- **Waiting for nursing homes** generates dissatisfaction for individuals and could worsen health and require more **health care**
  - Providers under pressure to increase places and prioritise

- It can therefore generate (negative) **spillover effects** to **health care sector**
  - Higher hospitalisations

Spillovers within and across sectors

Bed blocking

Health care
e.g. primary and secondary care

Long term care
e.g. formal and informal care
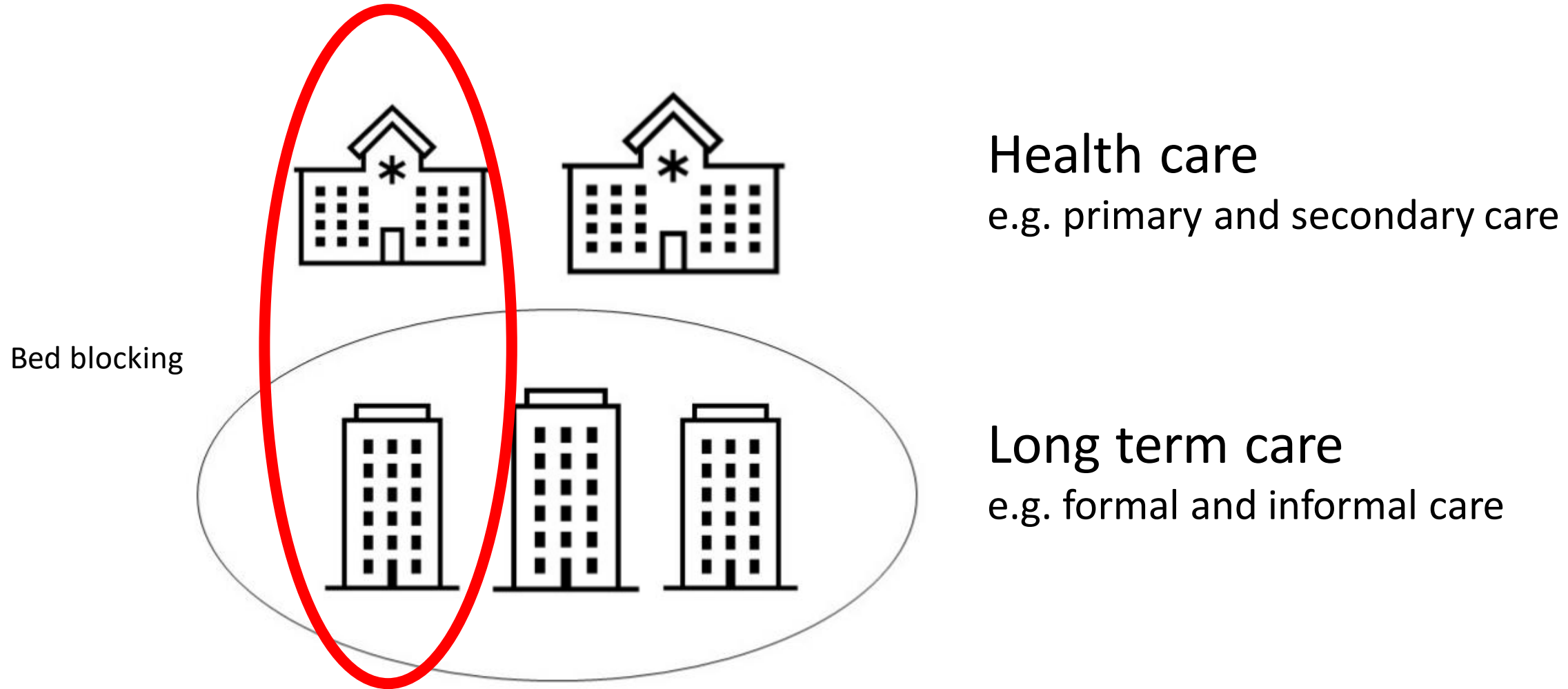
This paper

- **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 healthcare spending and survival; Serrano-Alarcon et al (2022) on 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 in the Netherlands 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)**
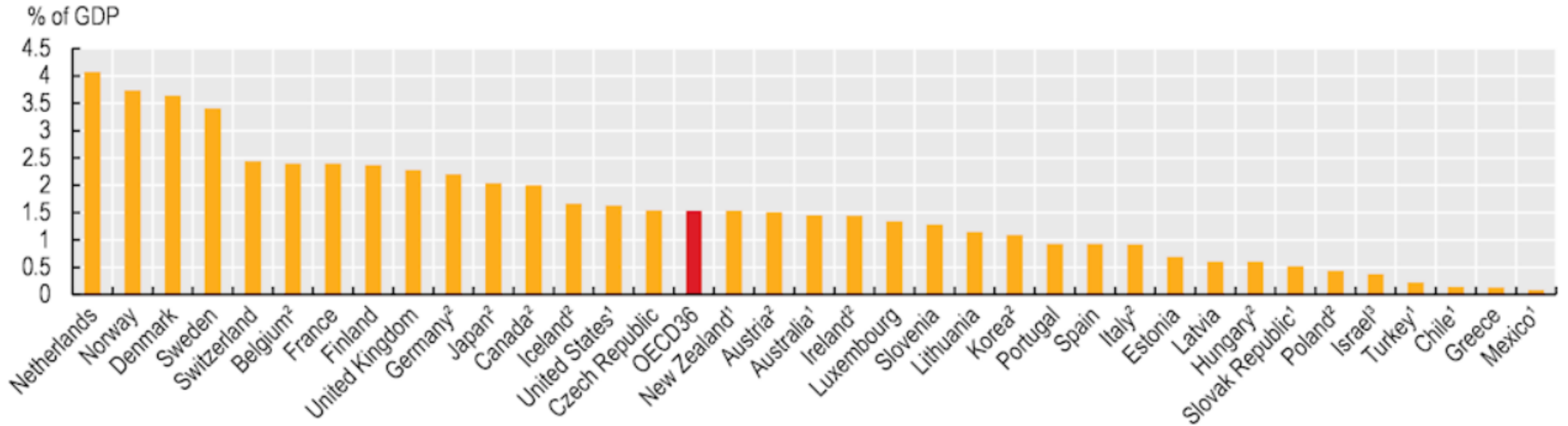
(OECD, 2021)

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 (<u>low</u>) **co-payment**

- Individuals apply for **eligibility** at an independent agency
  - Long Term Care Act

- If granted, individuals have a choice of
  - Receiving care in nursing home or in community
  - Nursing home (within region)
  - **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: personnel 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
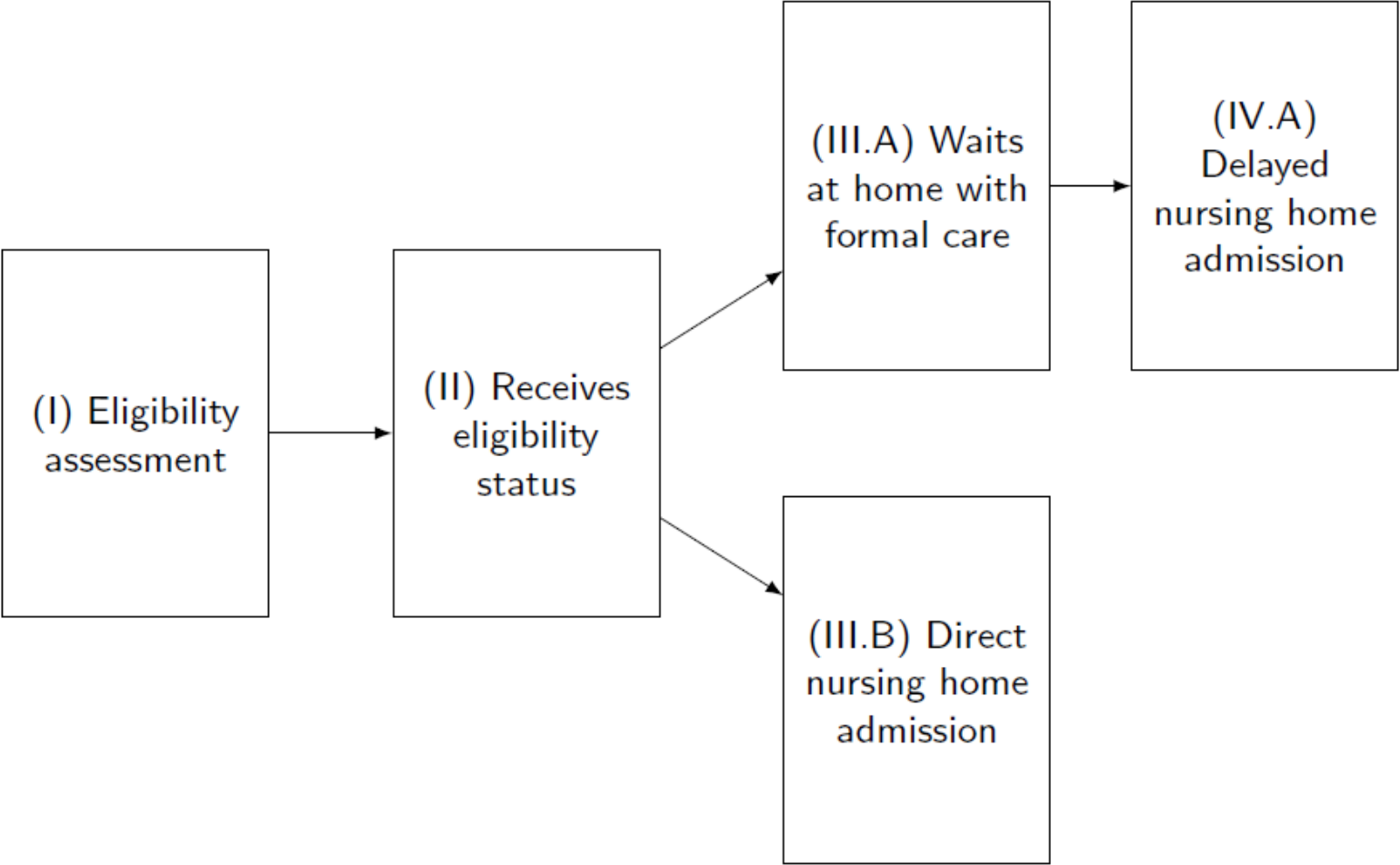
Data

- 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
  - Purchased care with personal budget
  - Received eligibility status in the hospital
  - Moved out of nursing home within a year
  - Delayed by (waiting time) more than a year
  - Died within a year

- 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
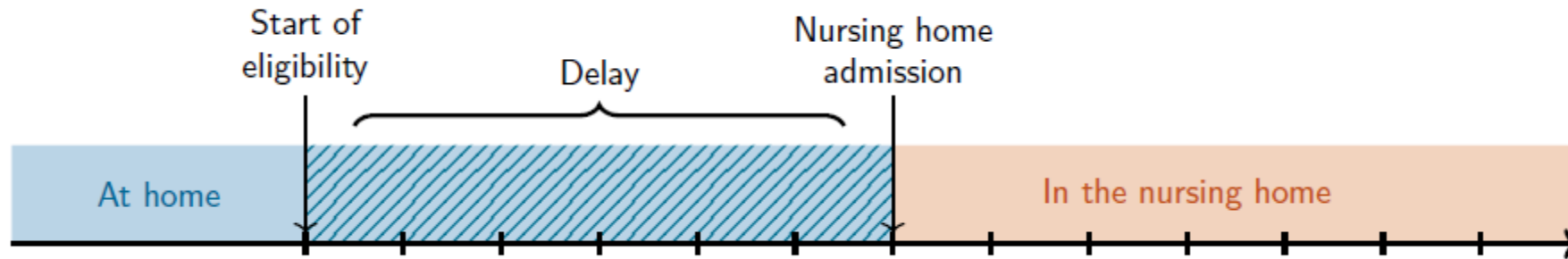
Care at home versus Nursing home

Data

- **Dependent variable**: risk for **urgent hospitalisation** <u>within one year after eligibility</u> 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

	Full sample		Moderate dementia care needs needs		Moderate somatic care		High care needs	
	mean	sd	mean	sd	mean	sd	mean	sd
Outcomes:								
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
Variable of interest:								
Delays (in days)	63.6	89.4	73.0	95.3	64.9	86.0	38.4	71.9
Instrumental variable:								
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	0.3
Healthcare exp. on hospital care (x1000€)	3.8	8.6	2.6	5.7	4.2	8.4	6.4	13.3
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

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

- where *H* is hospitalisation dummy for individual *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)
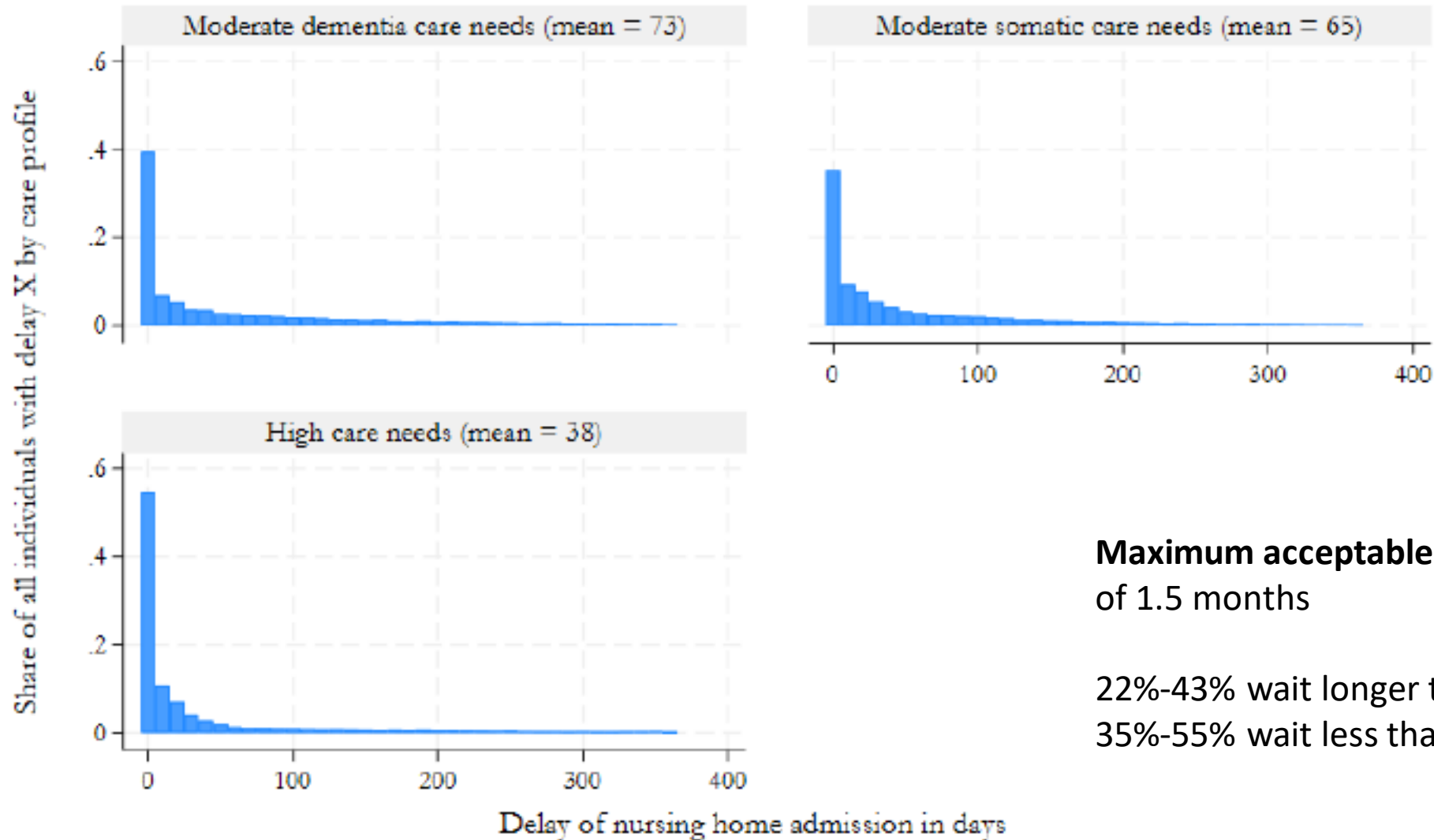
Maximum acceptable waiting time
of 1.5 months

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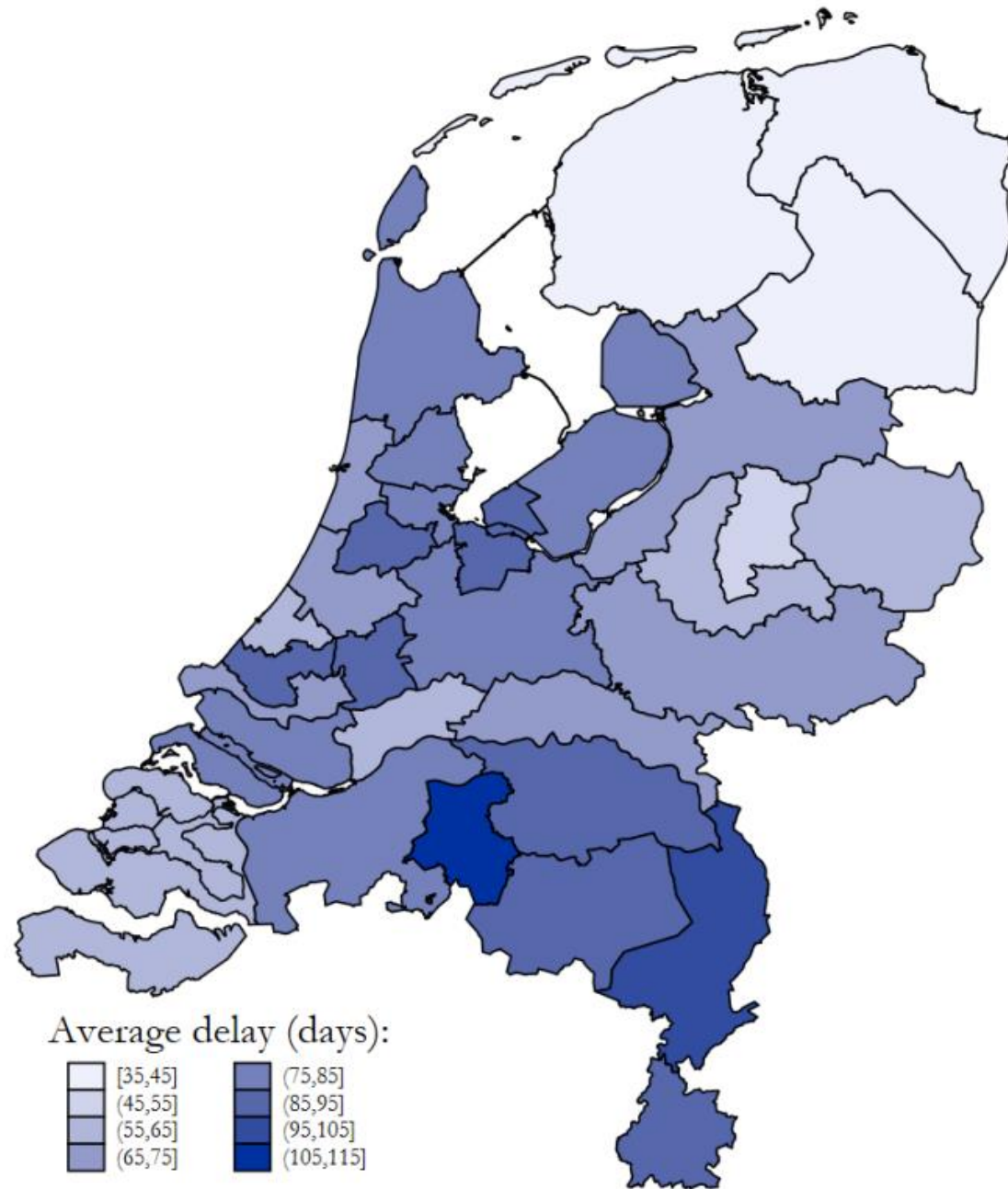35%-55% wait less than 10 days

Methods

- Instrumental variable approach

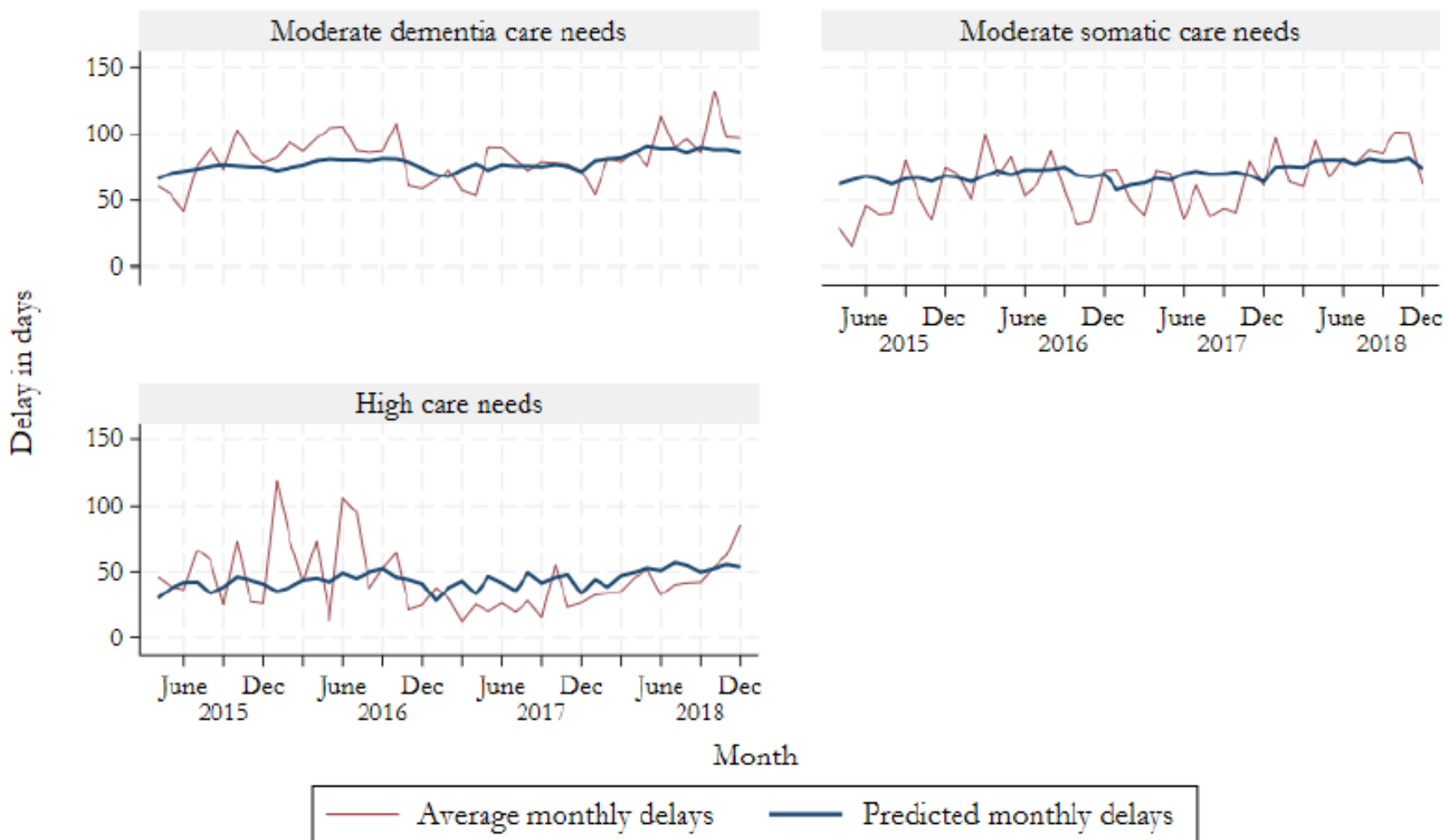$$Congestion_{irc} = \frac{\sum_{j=1}^{J_i} Delay_j}{J_i}$$

- 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

Average delay (days):

[35,45]
(45,55]
(55,65]
(65,75]
(75,85]
(85,95]
(95,105]
(105,115]

Predicted and average monthly delay (Utrecht)

Moderate dementia care needs

Moderate somatic care needs

High care needs

Delay in days

Month

Average monthly delays — Predicted monthly delays

Methods

Two-stage least squares regression with robust standard errors

First stage:

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

Second stage:

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

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)
Panel A: Second stage result (outcome = urgent hospital use)				
$\widehat{Delay}$ (in days)	0.00047***	0.00101*	0.00013	0.00038
	(0.00018)	(0.00056)	(0.00084)	(0.00047)
Panel B: First stage result (endogenous var = delay in nursing home admission)				
Instrument: congestion	0.652***	0.335***	0.312***	0.676***
	(0.0282)	(0.0518)	(0.0599)	(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 sample	By care profile		
		Moderate dementia care needs	Moderate somatic care needs	High care needs
	(1)	(2)	(3)	(4)
Panel I: Living alone				
Panel I.A: Second stage result (outcome = urgent hospital use)				
Delay (in days)	0.00068***	0.00213**	-0.00012	0.0108*
	(0.00022)	(0.00093)	(0.00085)	(0.00057)
Panel I.B: First stage result (endogenous var = delay in nursing home admission)				
Instrument: congestion	0.654***	0.299***	0.362***	0.704***
	(0.03480)	(0.06703)	(0.06985)	(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
Panel II: Living with a partner, child(ren) or other				
Panel II.A: Second stage result (outcome = urgent hospital use)				
Delay (in days)	0.00010	-0.00013	0.00199	-0.00080
	(0.00030)	(0.00075)	(0.00312)	(0.00084)
Panel II.B: First stage result (endogenous var = delay in nursing home admission)				
Instrument: congestion	0.639***	0.369***	0.175	0.638***
	(0.04818)	(0.08141)	(0.11738)	(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

Other outcomes

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 (urgent) if urgent hospitalisation
	(1)	(2)	(3)	(4)	(5)
$\widehat{Delay}$ (in days)	0.00049**	0.00010	0.00018*	0.00819***	0.02896***
	(0.00019)	(0.00012)	(0.00009)	(0.00245)	(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

OLS and reduced form

| | Full sample | 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***	0.00037***	0.00021***	0.00056***
	(0.00002)	(0.00002)	(0.00003)	(0.00005)
Panel B: Reduced form includig all covariates (OLS):				
Congestion	0.00031**	0.00034*	0.00004	0.00026
	(0.00012)	(0.00019)	(0.00026)	(0.00032)
Panel C: Reduced form excluding health covariates (OLS)				
Congestion	0.00031**	0.00033*	-0.00007	0.00024
	(0.00012)	(0.00019)	(0.00027)	(0.00032)
Observations	72,762	38,125	19,556	15,081
Mean dept. var	0.1588	0.1291	0.1993	0.1813

Exclusion restriction

- Variation in congestion not correlated with

  - Observed characteristics (F-statistic of joint significance = 1.5)

  - Rejected applications on eligibility
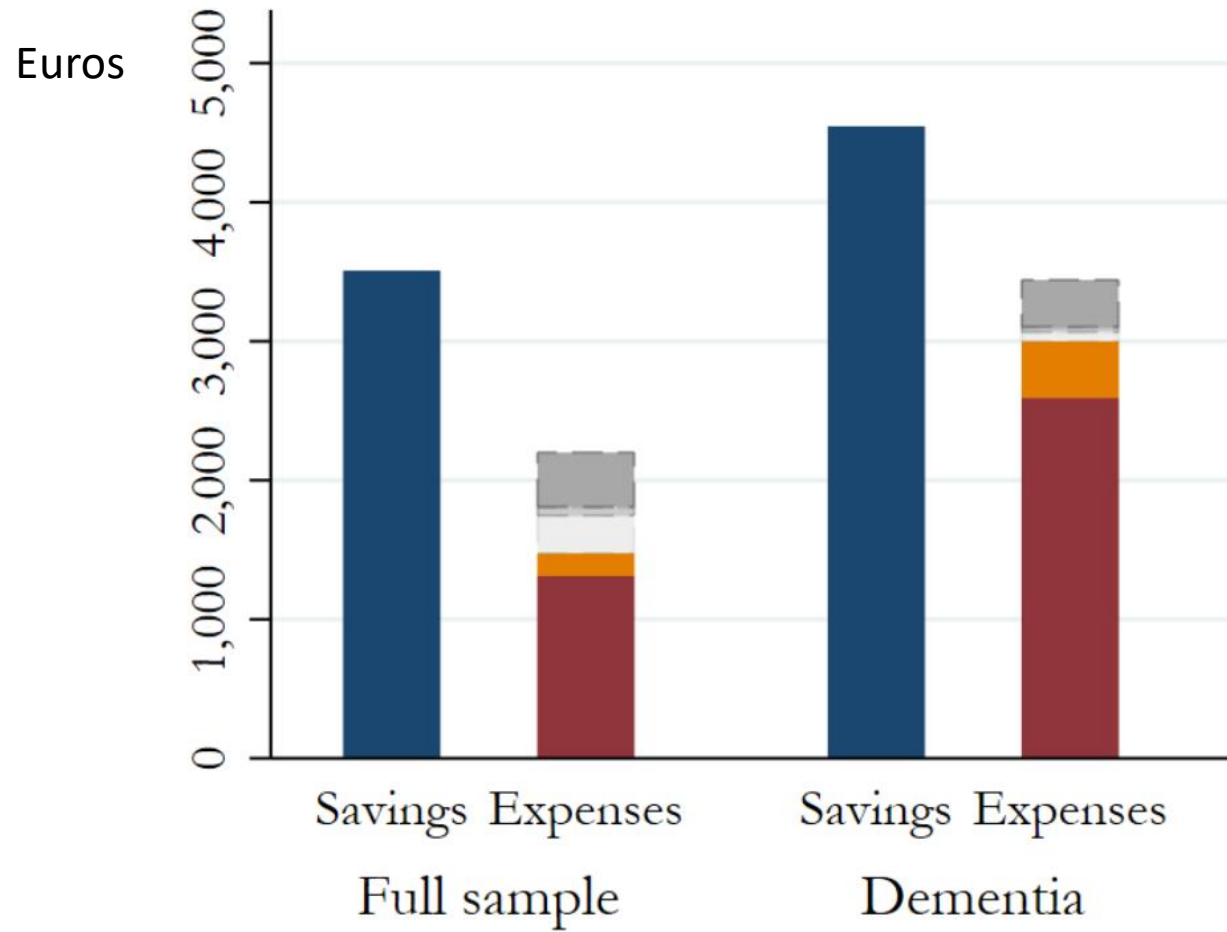
What about expenditure?

- 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*

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)

Policy implications

- **Improved prioritization** to reduce the health loss from delays

- **Better support** individuals while waiting **at home**, especially for individuals with dementia and living alone

- Account for spillovers when allocating of resources (more **funding for nursing homes**)

Acknowledgments

Thank you!