Short- and medium term effects of informal care provision on health

Hendrik Schmitz Matthias Westphal

Universität Duisburg–Essen & CINCH

28.11.2013

Health, Education and Retirement over the Prolonged Life Cycle – Vienna

UNIVERSITÄT DUISBURG ESSEN

CINCH
competent in competition + health

Motivation I

- Low birth rates and prolonged life cycle: population ageing

$\Rightarrow$ strong implications for the labor market and social security systems.

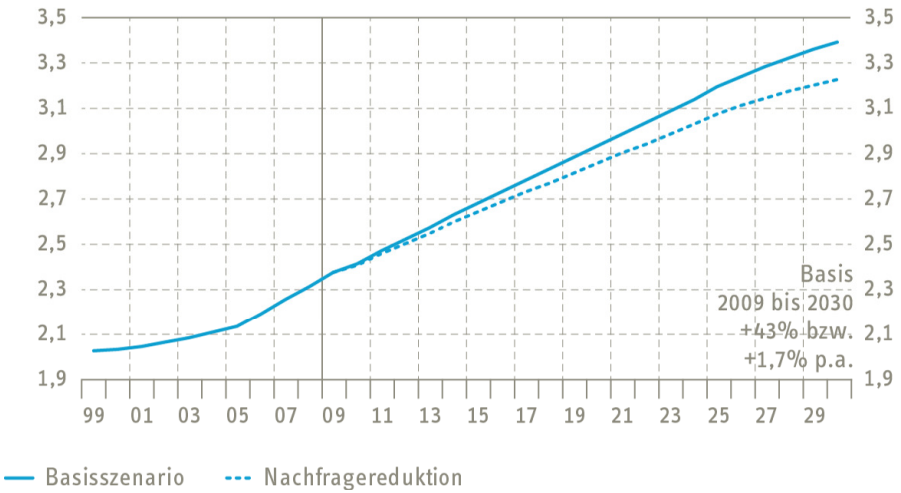
  - Long-term care is one important part

- Publicly funded costs of long-term care in the EU27 increase from 1.2% of GDP to 2.5% in 2060

Motivation II

in Germany:

- 2011: 2,32m receive long-term care (LTC) services in total



Source: Augurzky et al.(2011)

- 1,54m (65%) are cared by relatives (1,05m exclusively)

Research question

Is there any negative health effect for informal caregivers?

Literature

Economic Studies

- Coe und Van Houtven (2009), Do et al. (2013): care and diseases
- Van Houtven et al. (2005); Schmitz und Stroka (2013): care intensity and drug prescription
- Van den Berg and Ferrer-i-Carbonell (2007); Bobinac et al. (2010); Leigh (2010): care and well-being

Medical studies: many, but:

- Small, non-representative samples
- Descriptive analysis, cross-section
- Focus on dementia patients

Own contribution:

- Medium-term effects

Data

Socio-economic Panel (SOEP)

- Representative household survey with currently 22,000 individuals from Germany
- Covers topics on health, labor, education, income, etc.
- Waves 2002-2010

Outcome variable: health

- Version of the SF12v2-questionnaire
- Summary scale for mental (MCS) and physical health (PCS)
- Range between 0 and 100, mean = 50, std. dev. = 10

Care in the SOEP: "What is a typical day like for you? How many hours do you spend on care and support for persons in need of care?"

Empirical Strategy:

Matching algorithm (Propensity score, Gauß-Kernel)

- $T = \begin{cases} 1, & \text{if provided at least 2hrs care in } t = 0 \\ 0, & \text{else} \end{cases}$

We would like to know $ITE_i = Y_{i1} - Y_{i0}$

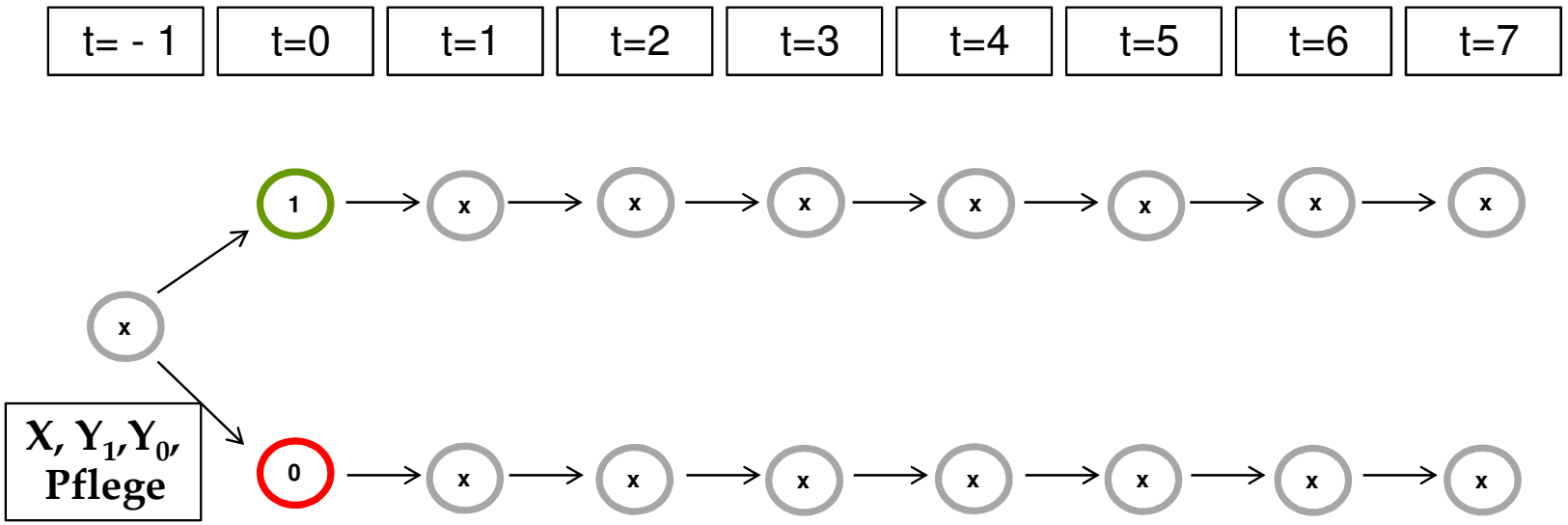
- Y_{i1}: Outcome of i with care,
- Y_{i0}: Outcome of i without care

Instead, we focus on the $ATT = E(Y_1 - Y_0|T = 1)$.

Main assumption: CIA

$$Y_0, Y_1 \perp\!\!\!\perp T|X \tag{1}$$

Time dimension and selection issues

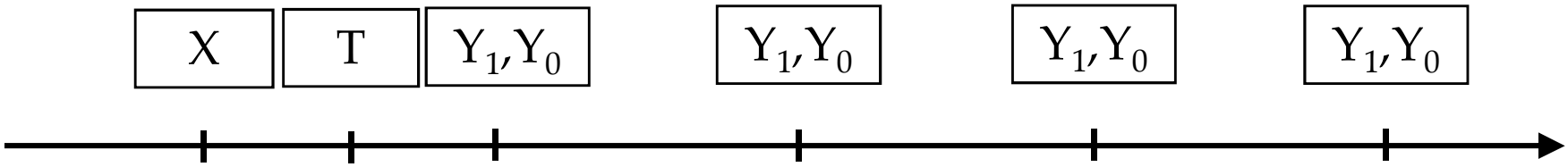


Selection of healthy individuals into care
$\Rightarrow$ Matching on outcome variables $t-1$ (pre-treatment)

Selection out of care
$\Rightarrow$ No problem

Further unobserved heterogeneity
$\Rightarrow$ Stratified estimation

Time dimension



	t=-1	t=0	t=1	t=3	t=5	t=7
Wave 1	2002	2003	2004	2006	2008	2010
Wave 2	2004	2005	2006	2008	2010	
Wave 3	2006	2007	2008	2010		
Wave 4	2008	2009	2010			

Sample Size

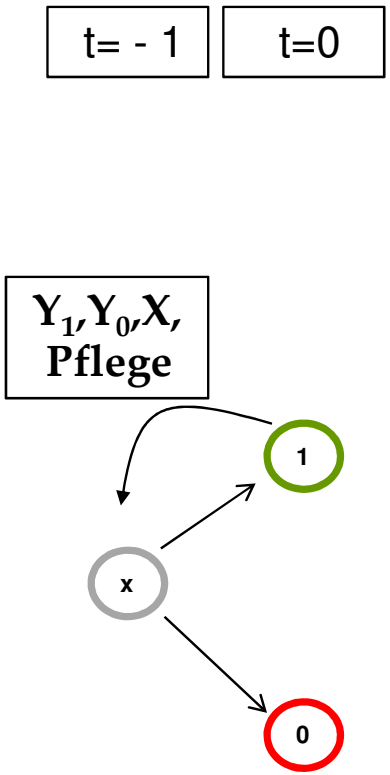
Only women are considered

		t=0	t=1	t=3	t=5	t=7
Hours of care = 0		29,080	26,667	18,956	11,455	5,194
Hours of care = 1	862 (= 41%)		800	564	357	160
Hours of care = 2	507 (= 24%)		479	317	197	85
Hours of care = 3	203 (= 10%)		193	140	81	36
Hours of care = 4	167 (= 8%)		152	100	53	24
Hours of care $>$ 4	358 (= 17%)		331	211	111	53
All observations		31,177	28,622	20,288	12,254	5,552

Source: SOEP, own calculations. Number in parentheses is the share among all individuals with positive hours of care. Hours of care are measured in $t = 0$ only.

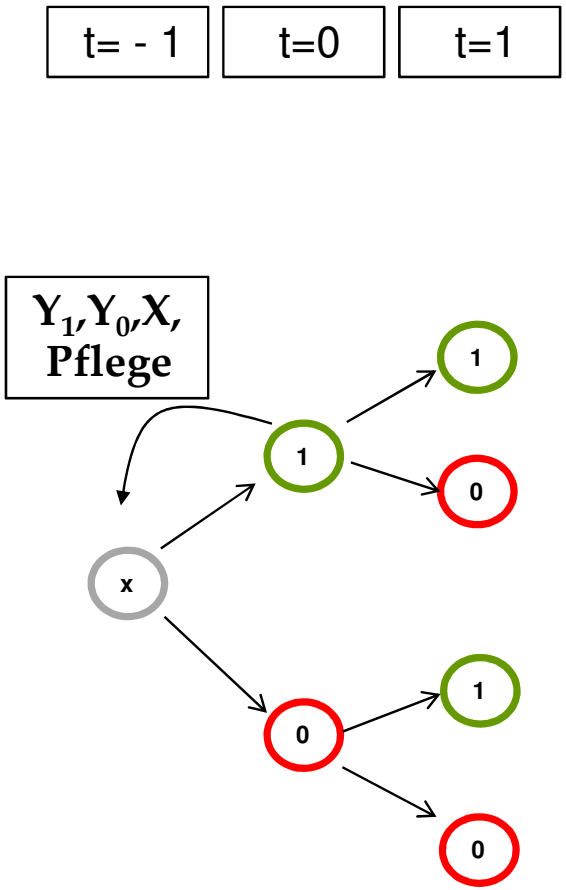
Why a static model?

In principle, a dynamic approach by Lechner and Miquel (2010) or Lechner (2009b) conceivable



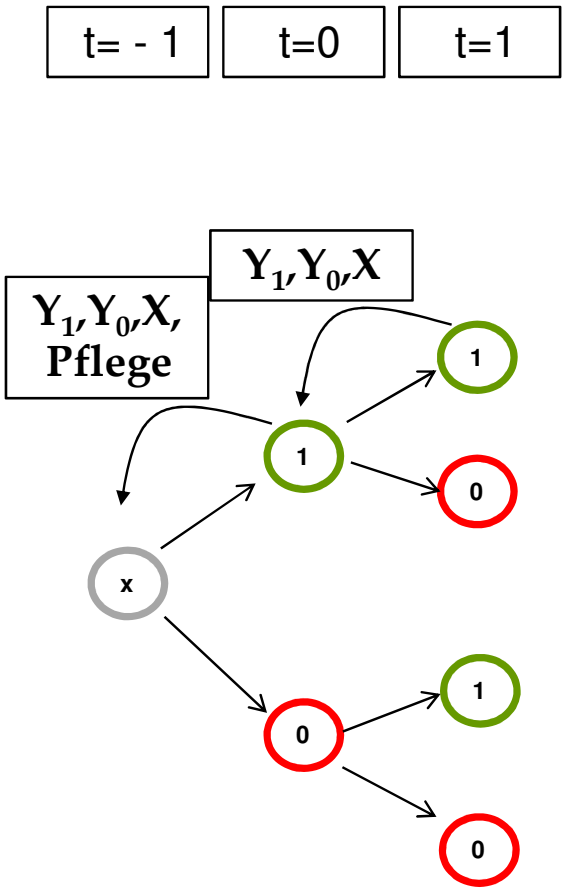
Why a static model?

In principle, a dynamic approach by Lechner and Miquel (2010) or Lechner (2009b) conceivable



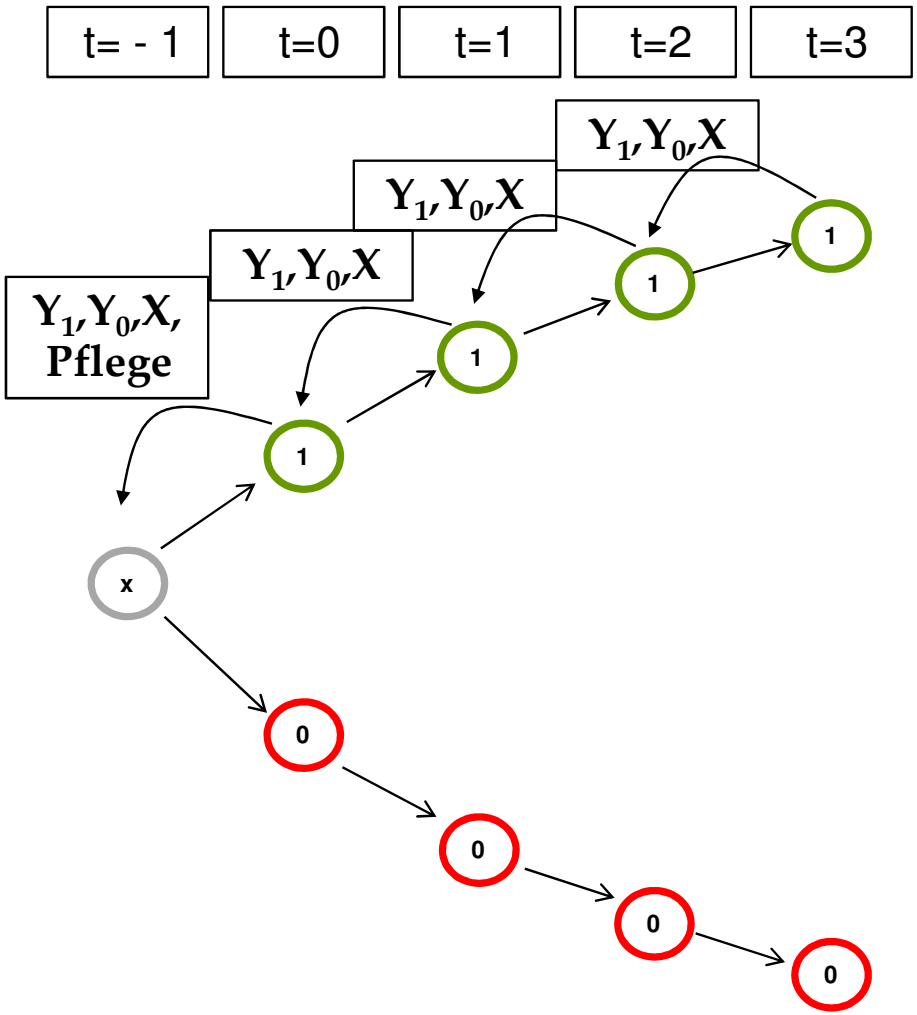
Why a static model?

In principle, a dynamic approach by Lechner and Miquel (2010) or Lechner (2009b) conceivable

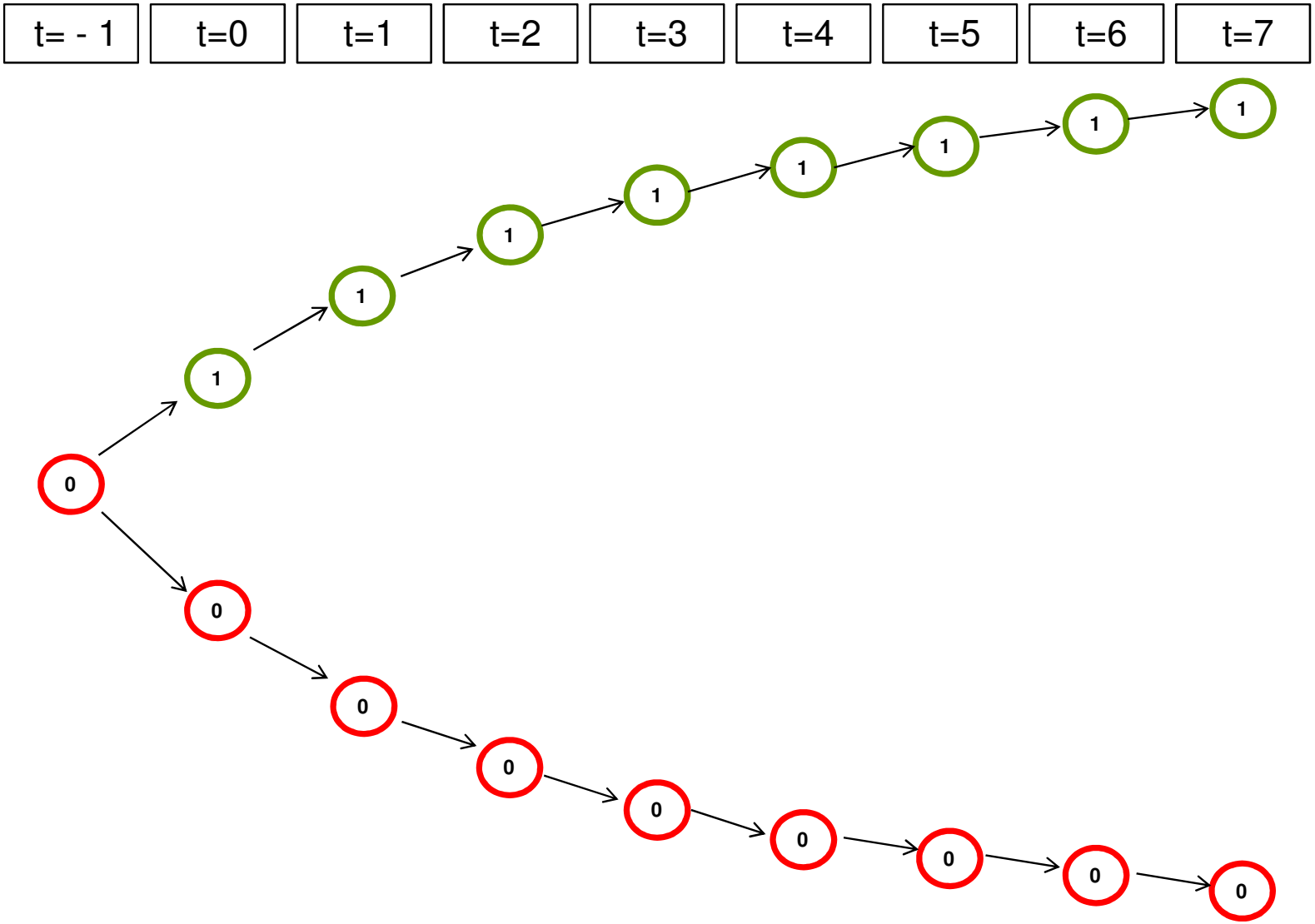


Why a static model?

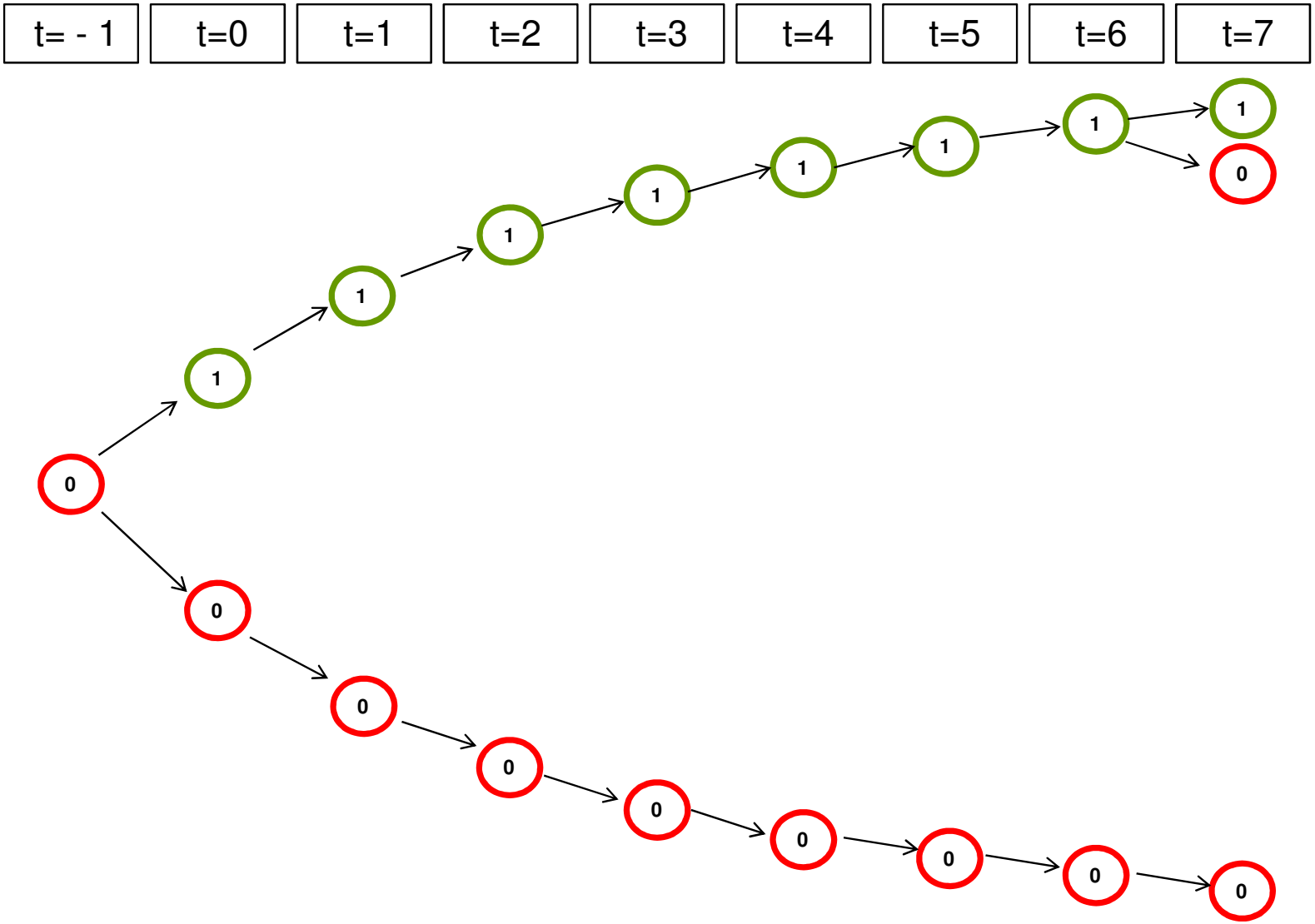
In principle, a dynamic approach by Lechner and Miquel (2010) or Lechner (2009b) conceivable



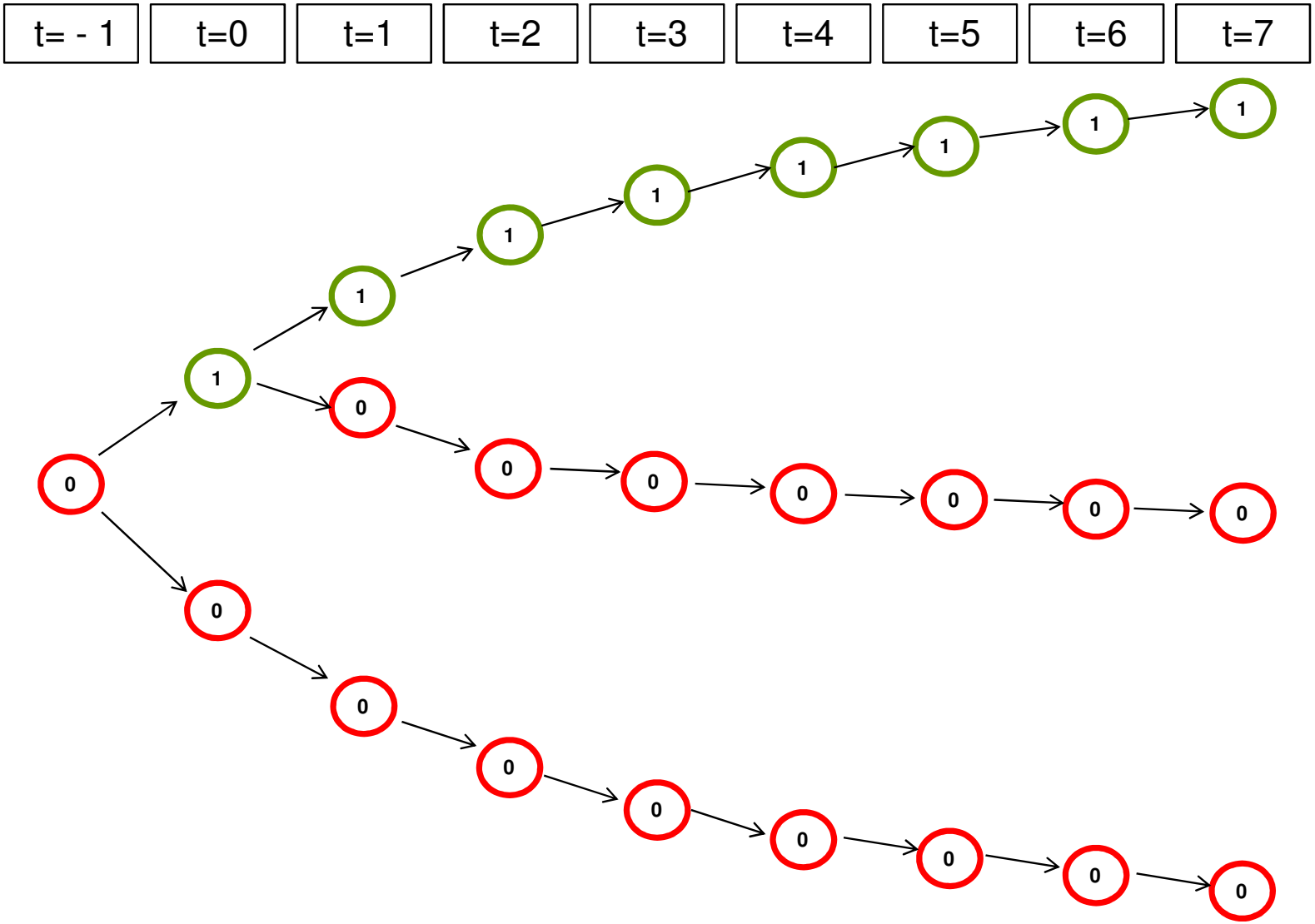
Why a static model?



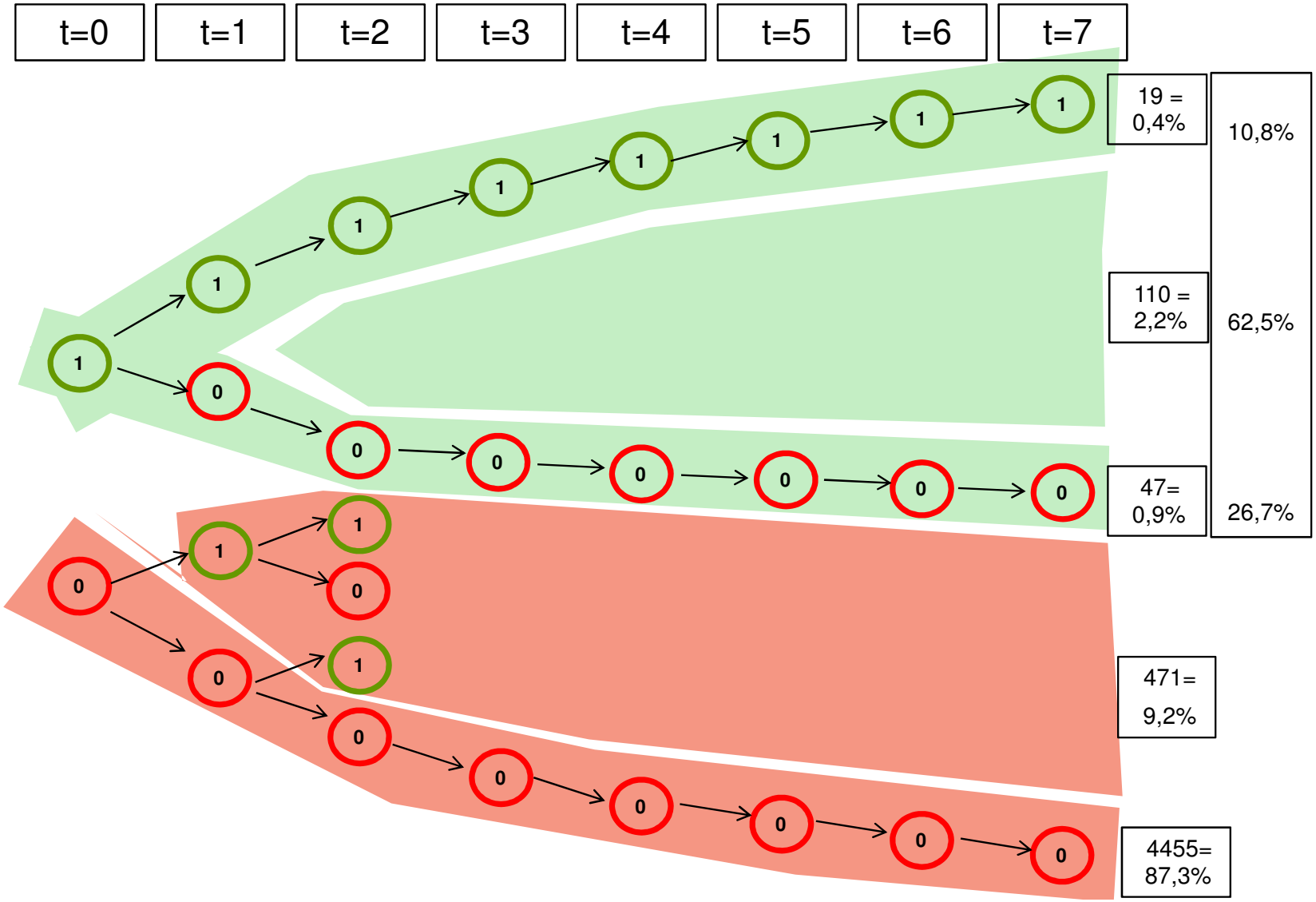
Why a static model?



Why a static model?



Why a static model?



Why a static model?

To sum up

- comparing each of the $2^8 = 256$ different paths is not managable
- observations in each path are very small
- Even then, we could not model the yearly transitions appropriately

Thus, we are able to answer:

- What is the average effect of care in one year on health in later years?
- not possible: What is the average effect of different years of care?

Matching variables

Why do people care?

1. Because they have to
2. ... and they want to
3. ... and they are able to.

Variables for 1

- Mother alive, father alive, age of parents
- Number of sisters, number of brothers

Variables for 2

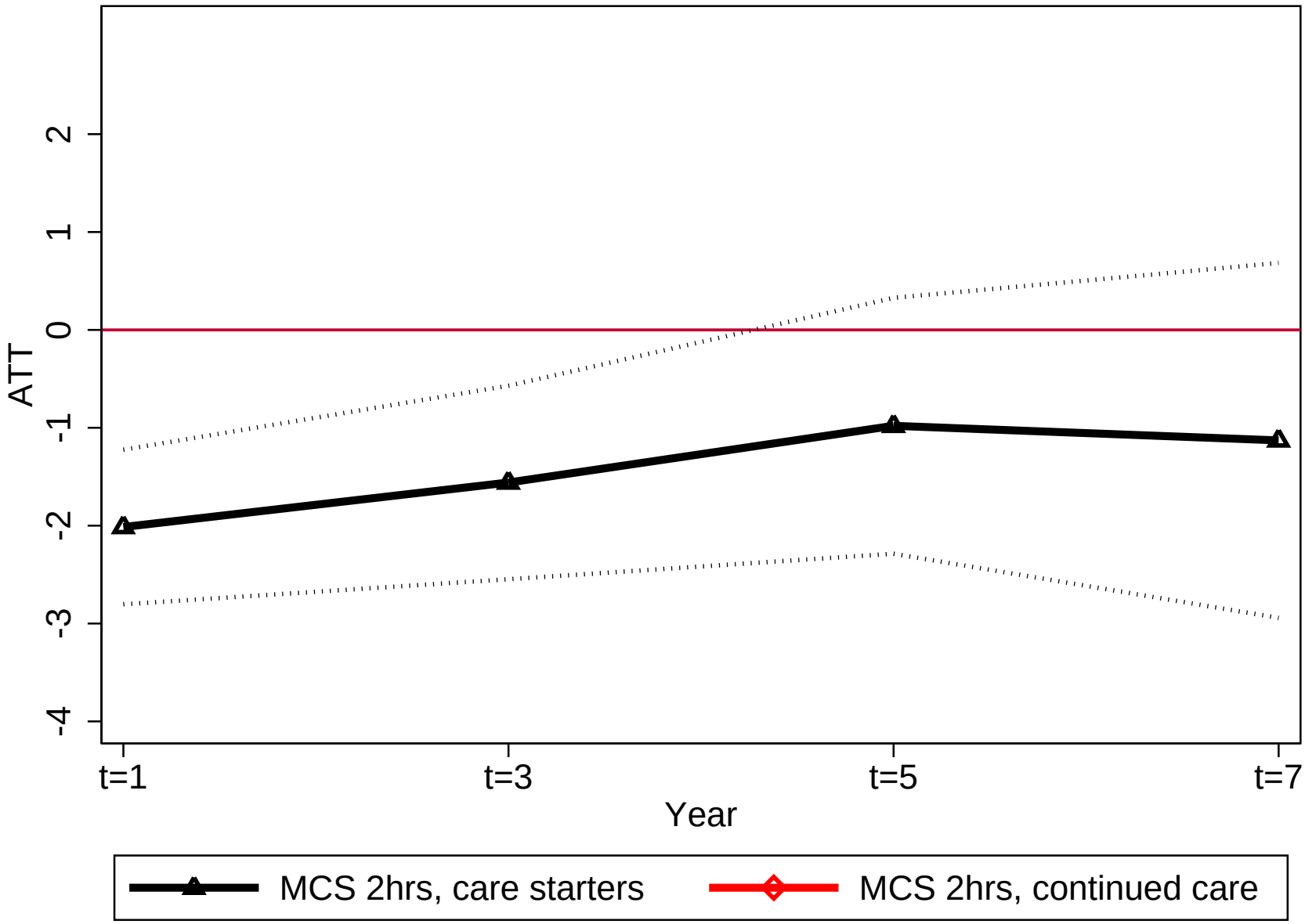
- Socio-economics characteristics (age, family status, education, labor force participation)
- Personality traits (BIG 5, reciprocity, acceptance of private participation in health care)

Variables for 3

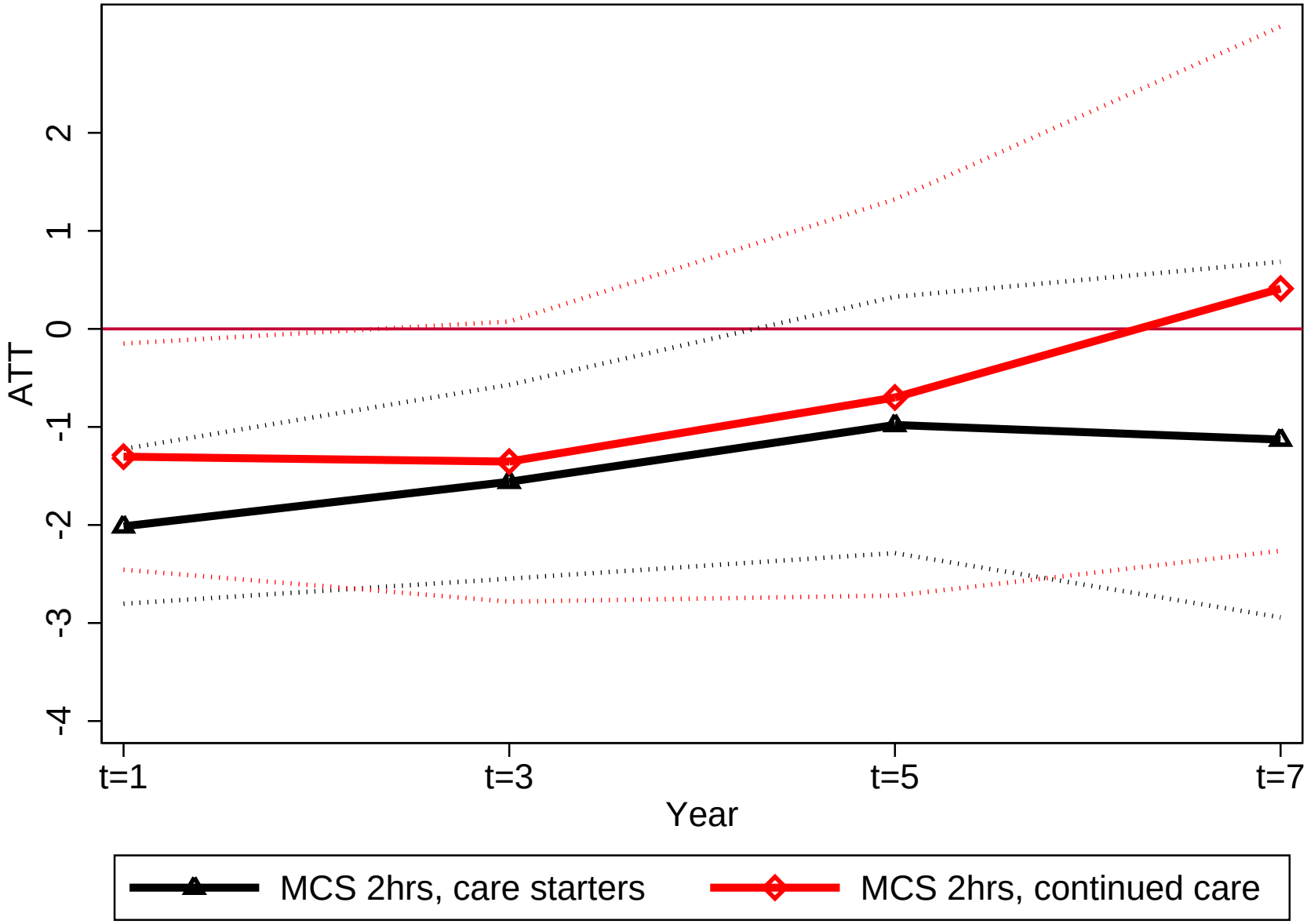
- MCS, PCS, health satisfaction

Kontrollvariablen

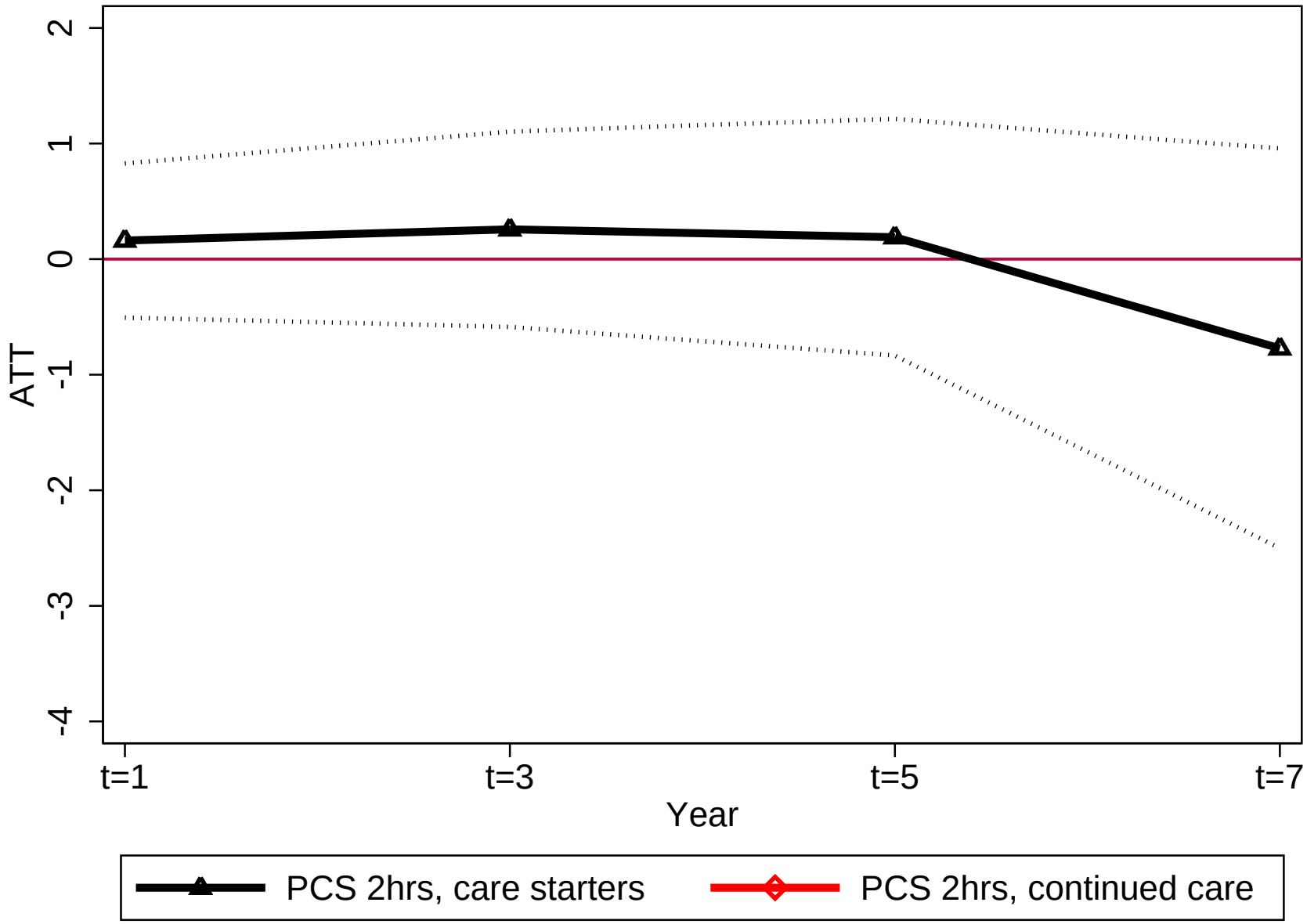
Results: MCS


ATT
2
1
0
-1
-2
-3
-4
t=1
t=3
t=5
t=7
Year
MCS 2hrs, care starters
MCS 2hrs, continued care

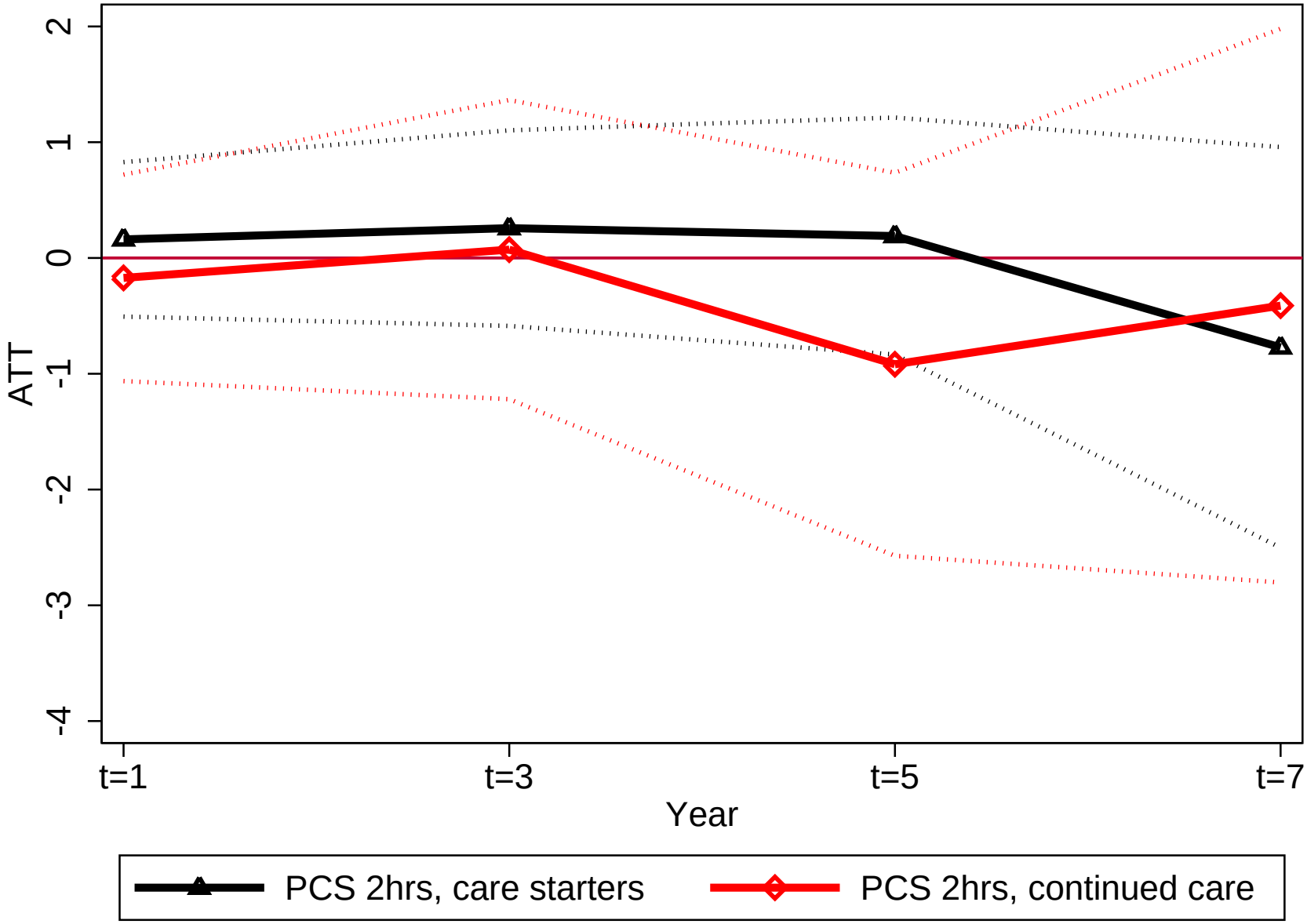
Results: MCS


ATT
2
1
0
-1
-2
-3
-4
t=1
t=3
t=5
t=7
Year
MCS 2hrs, care starters
MCS 2hrs, continued care

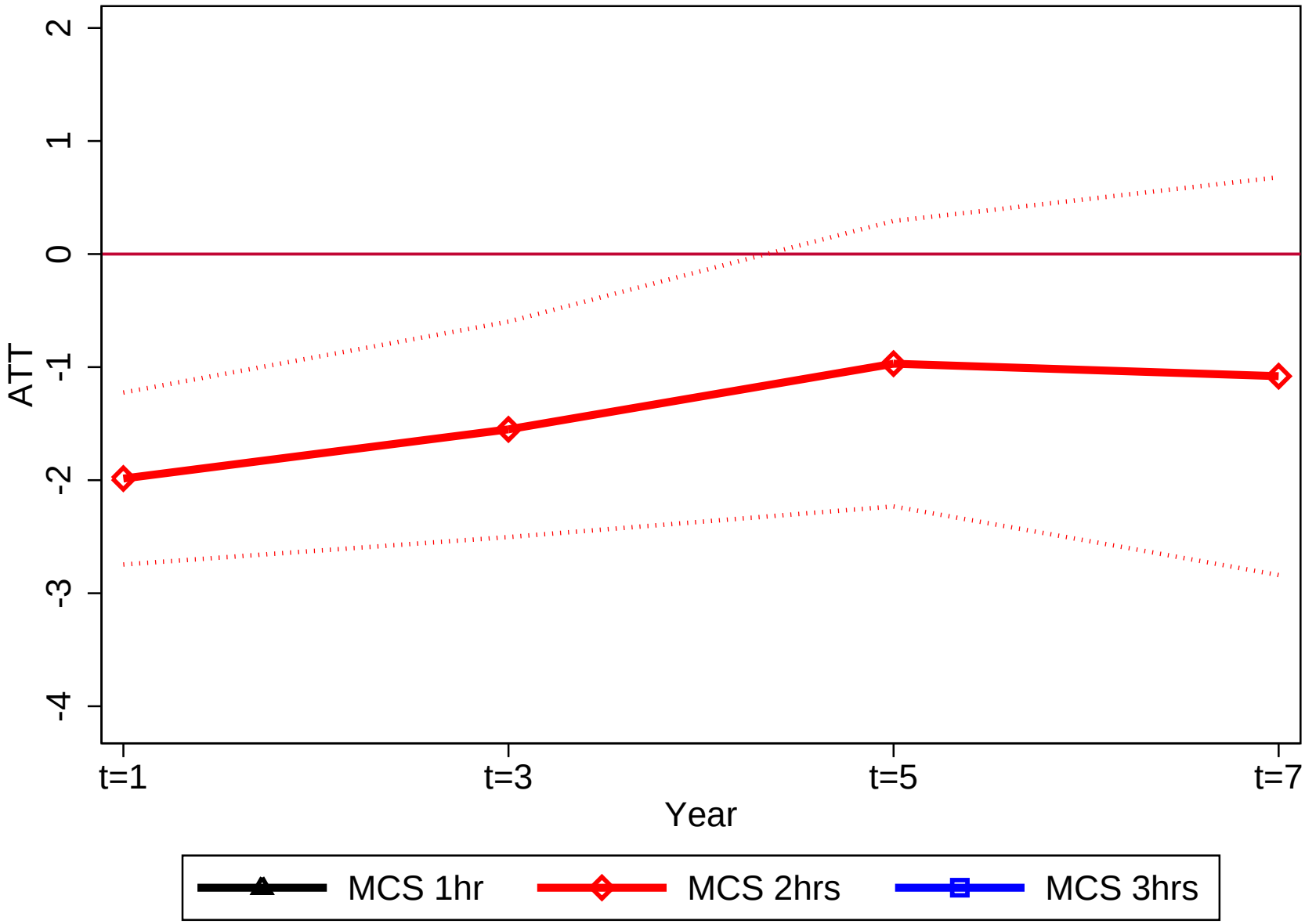
Results: PCS


ATT
2
1
0
-1
-2
-3
-4
t=1
t=3
t=5
t=7
Year
PCS 2hrs, care starters
PCS 2hrs, continued care

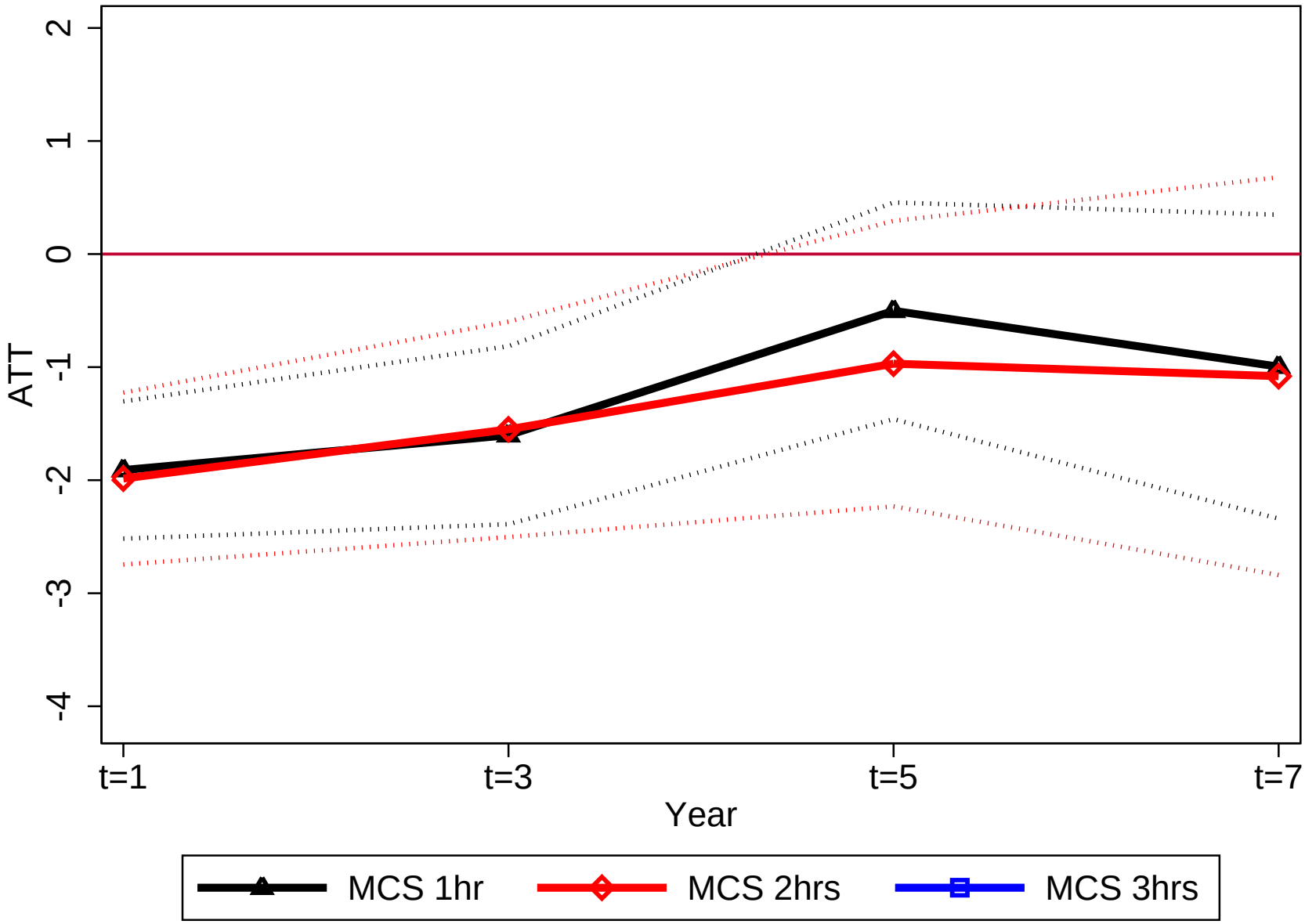
Results: PCS


ATT
2
1
0
-1
-2
-3
-4
t=1
t=3
t=5
t=7
Year
PCS 2hrs, care starters
PCS 2hrs, continued care

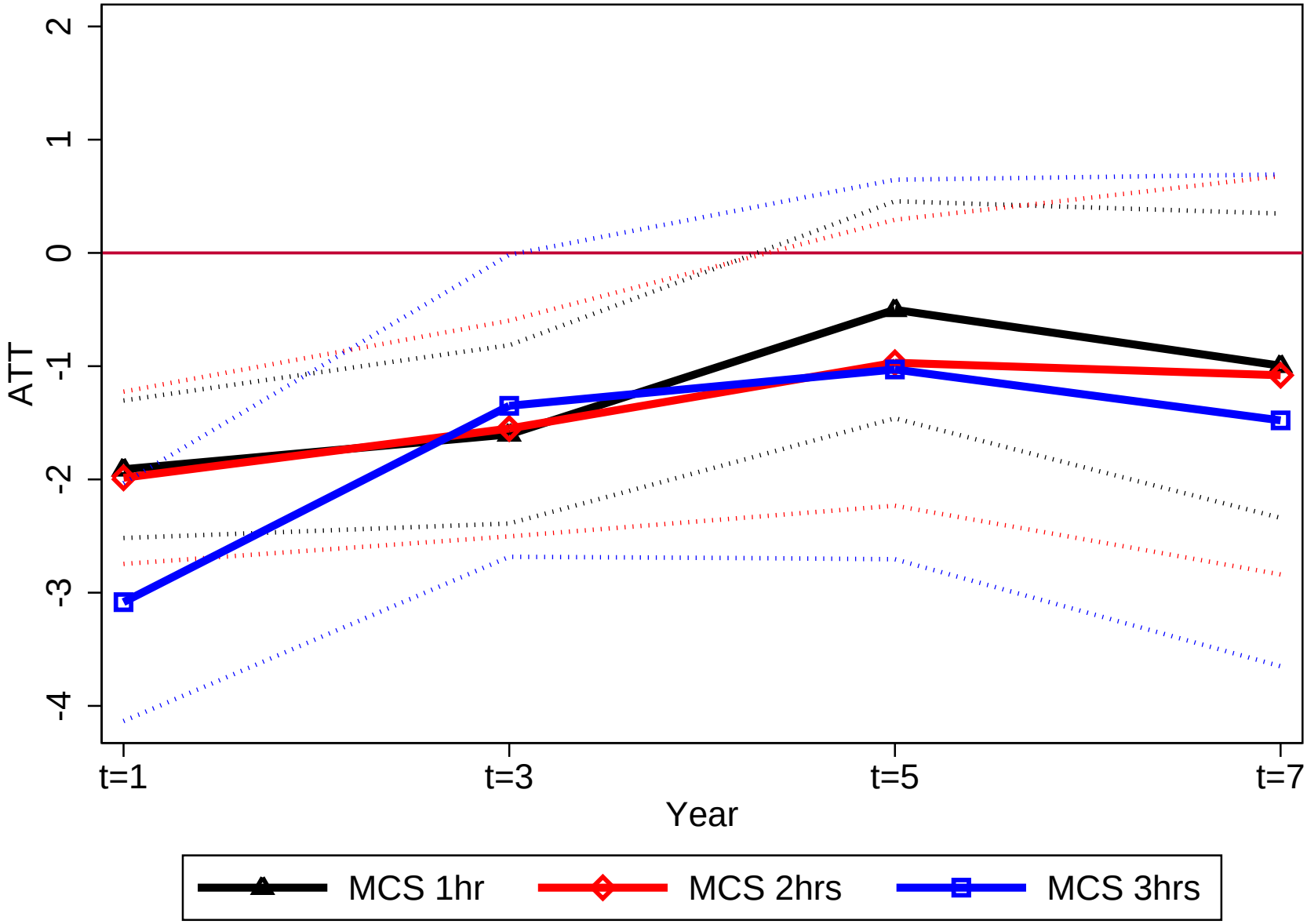
Results: MCS for different care intensities



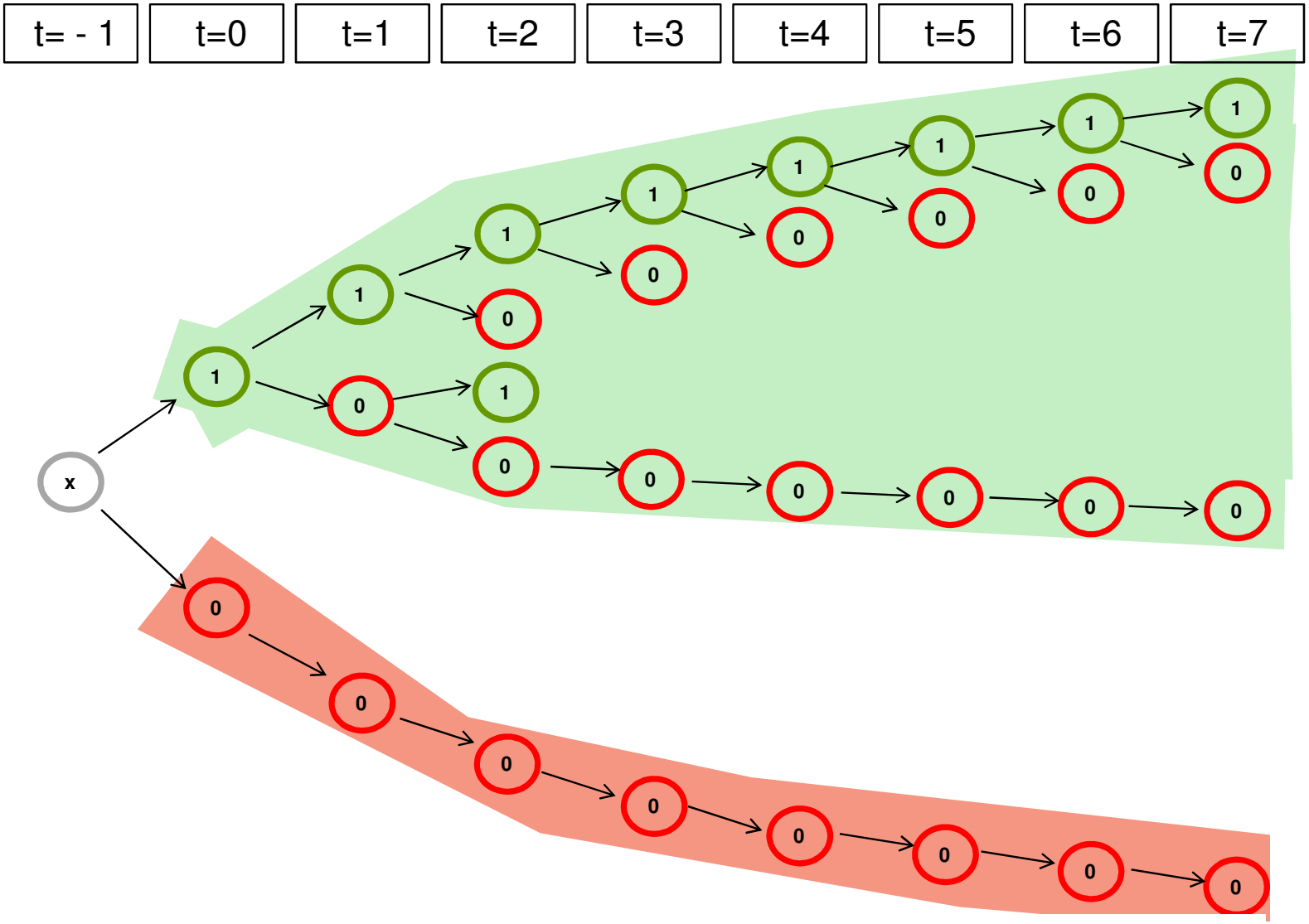
Results: MCS for different care intensities



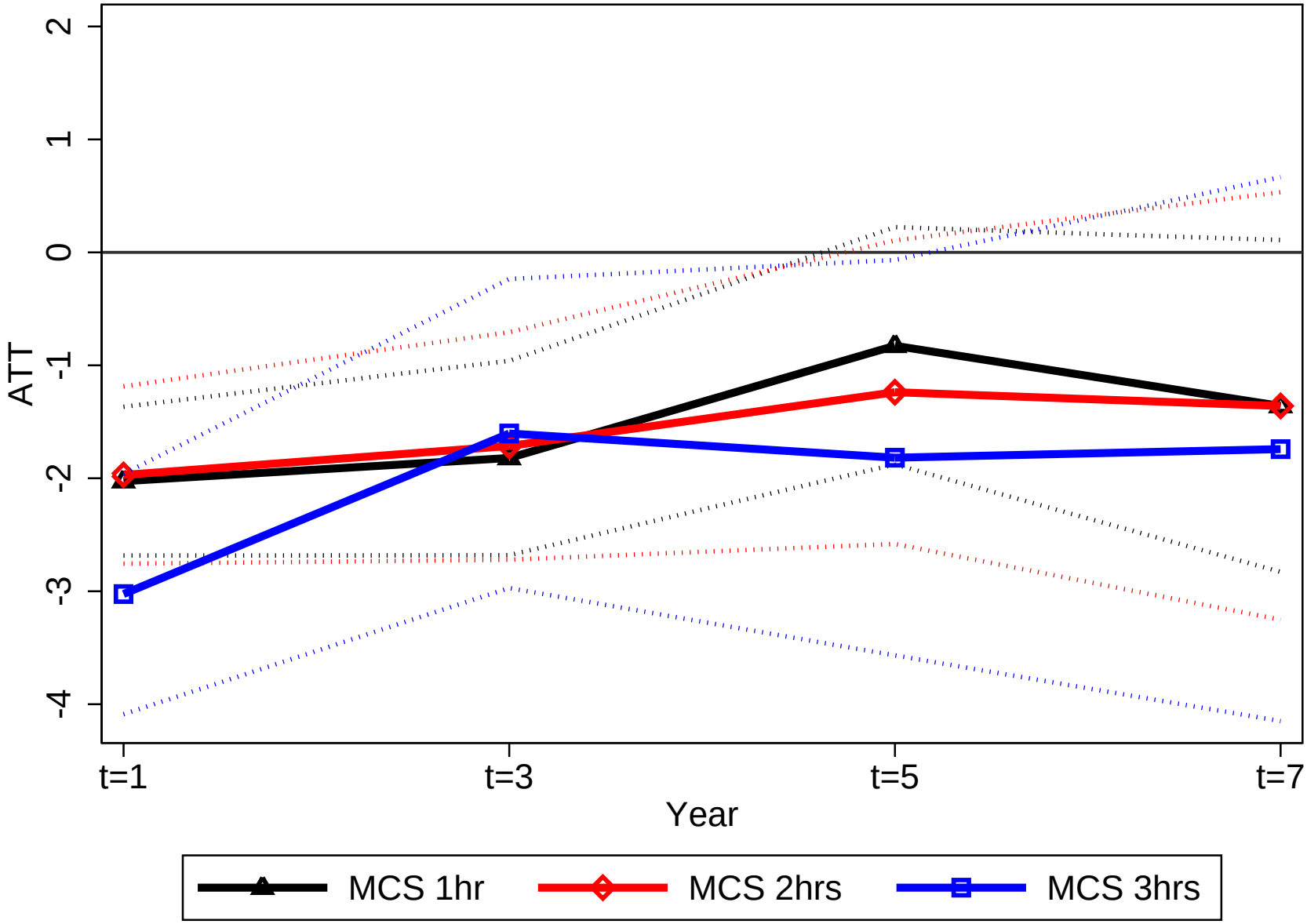
Results: MCS for different care intensities



Alternatively



Results: MCS, control group of never carers



Intermediate Results

Main results so far:

- Considerable short-term effects of informal care on mental health of female caregivers
- Effects increase with more care intensity
- Irrespective of the intensity: effects attenuate over time (and are insignificant)

Why is that?

- Majority has stopped caring after 3 years
- Short-term effects are driven by active care (and maybe by the bereavement effect)
- There is no “scarring effect”

Sensitivity Analysis

Sensitivity analysis (Ichino et al., 2008). Is a potential failure of the CIA crucial?

Assessment: slightly relax the unconfoundedness assumption. We assume that

$$Y_0, Y_1 \not\perp\!\!\!\perp T|X$$

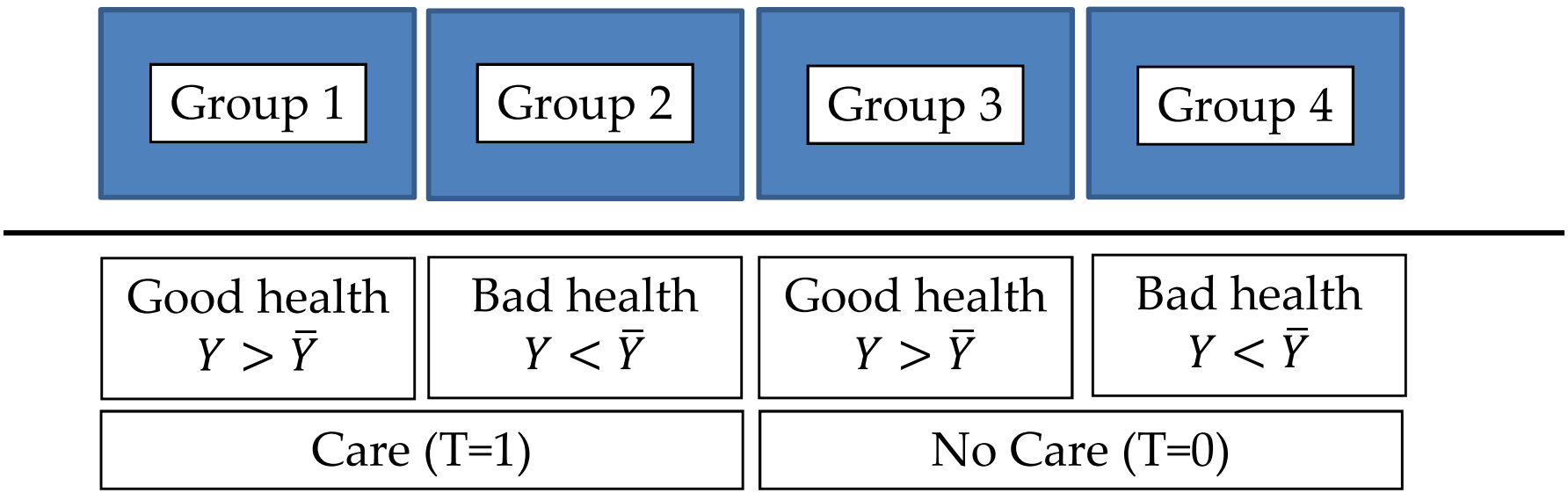
but the failure is due to an unobserved binary variable U. Could we condition on it, we had

$$Y_0, Y_1 \perp\!\!\!\perp T|(X, U) \tag{1'}$$

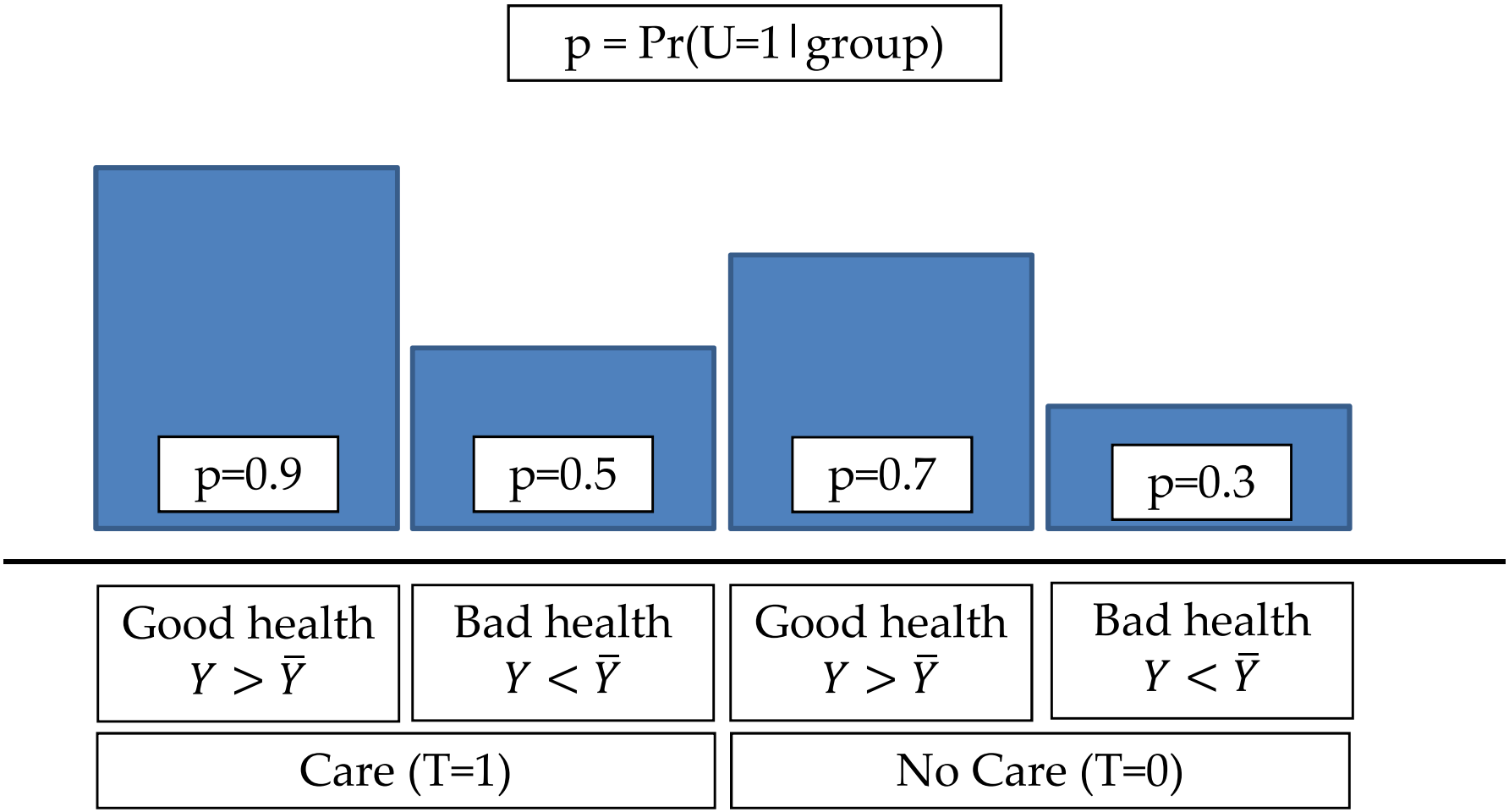
Example: U is genetic endowment ($U = 1$ good, $U = 0$ bad).

Idea: make some assumptions on U (in particular how it drives the selection and the outcome), simulate and match on it.

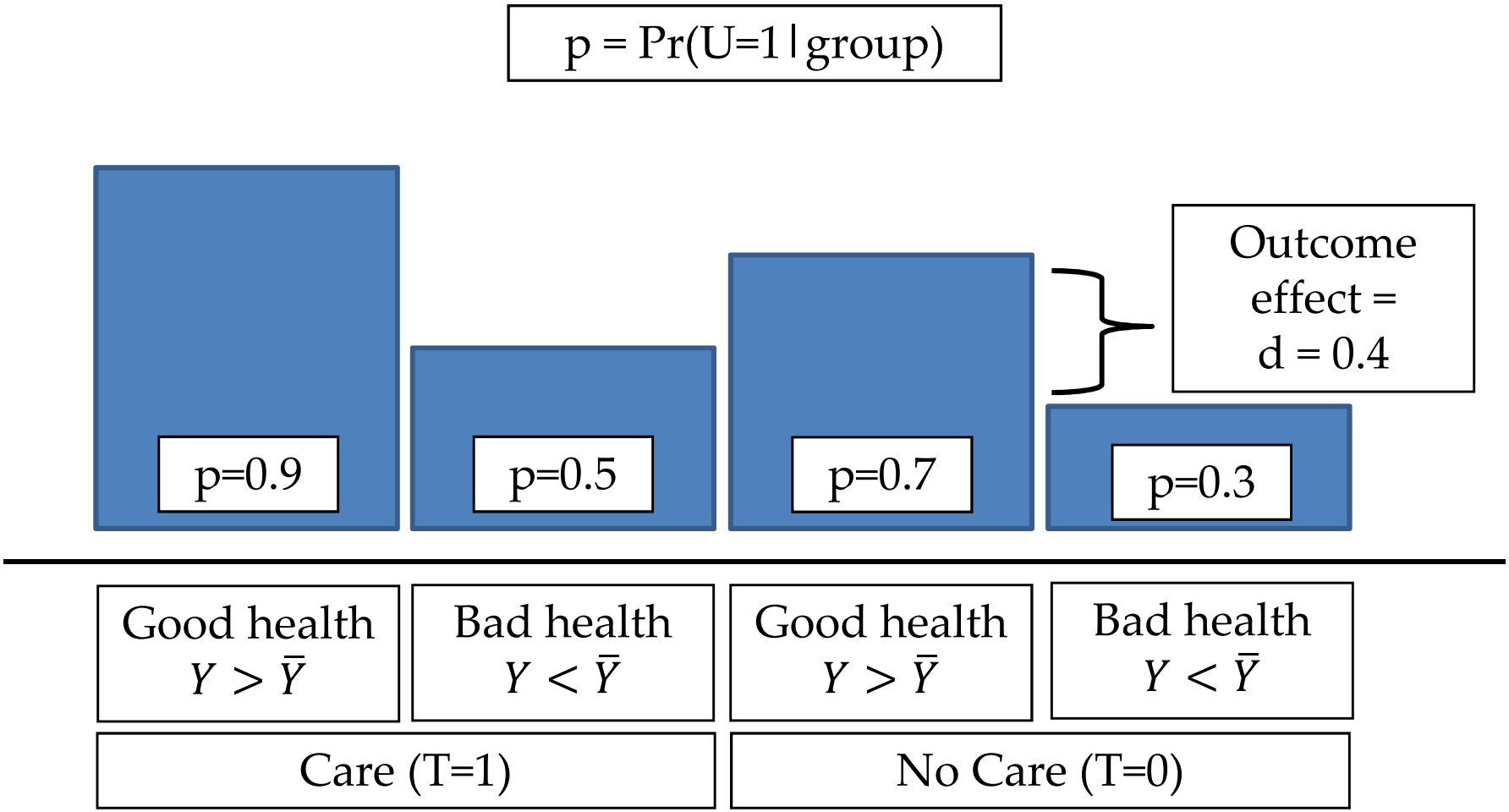
Sensitivity Analysis



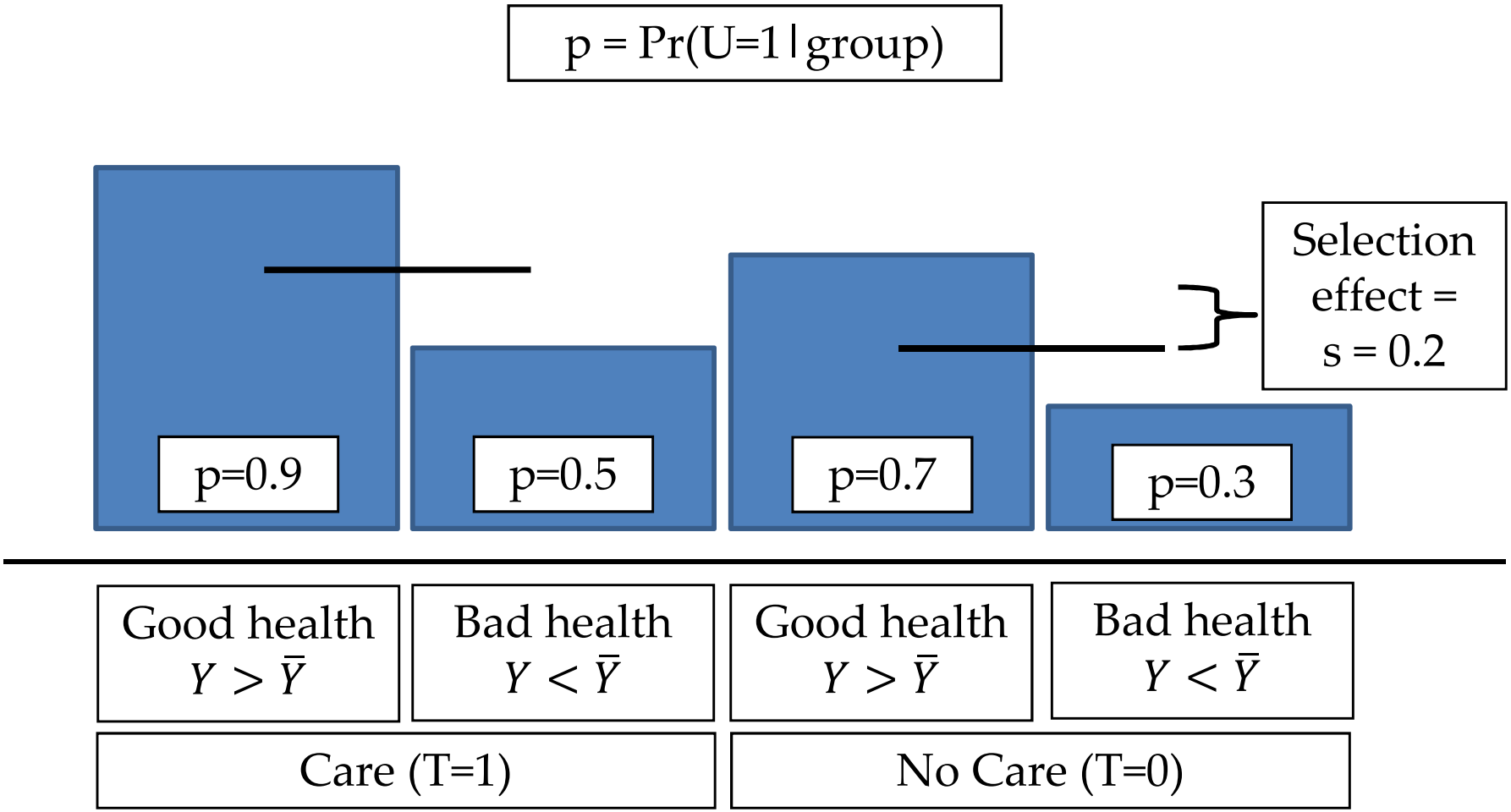
Sensitivity Analysis



Sensitivity Analysis



Sensitivity Analysis



Justification of choice of d and s

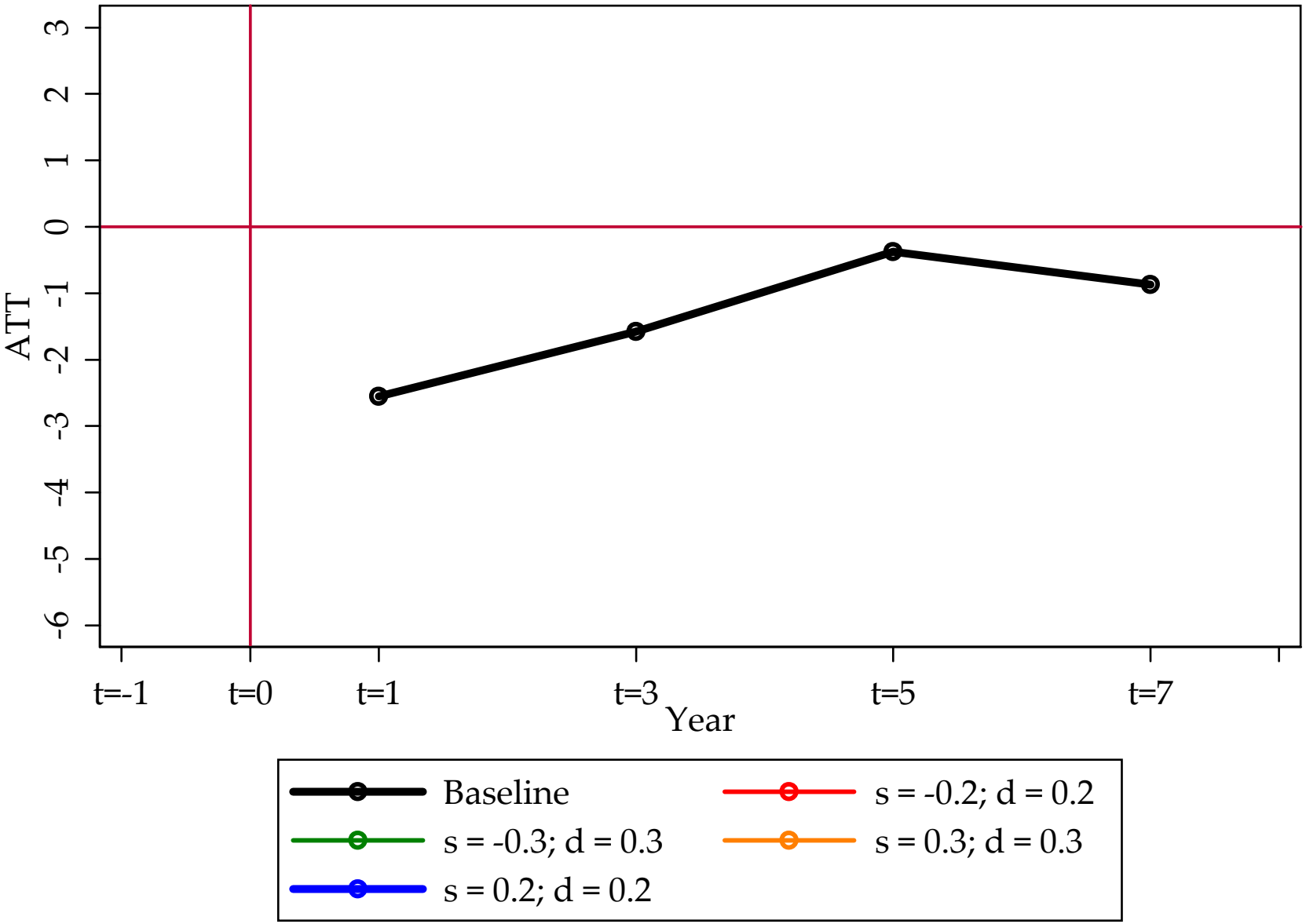
Assumption: unobserved U has a stronger effect than each single observable (but not too strong). Choices:

1. Outcome effect = 0.2 (0.3) and Selection effect = 0.2 (0.3)
2. Outcome effect = 0.2 (0.3) and Selection effect = -0.2 (-0.3)

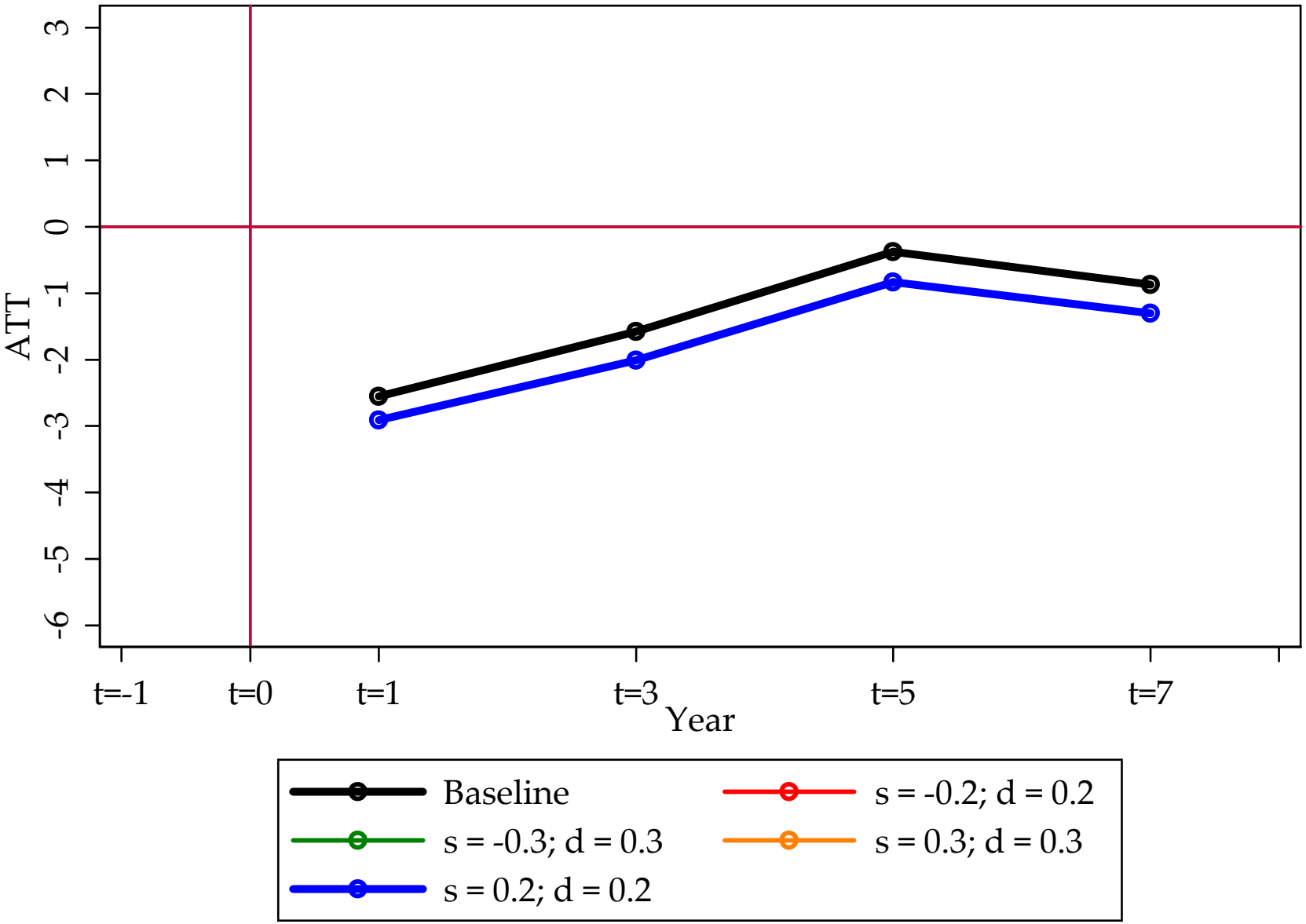
Table : Distribution of p_{ij} across control variables in the sample

	d	**s**	**Effect**
Mother alive	-0.05	-0.05	(+)
Number of sisters	0.01	-0.03	(-)
Age	0.21	0.19	(+)
Married	0.19	0.16	(+)
Divorced	-0.03	-0.02	(+)
Full time	-0.04	-0.07	(+)
MCS	-0.03	-0.09	(+)
PCS	-0.12	-0.12	(+)

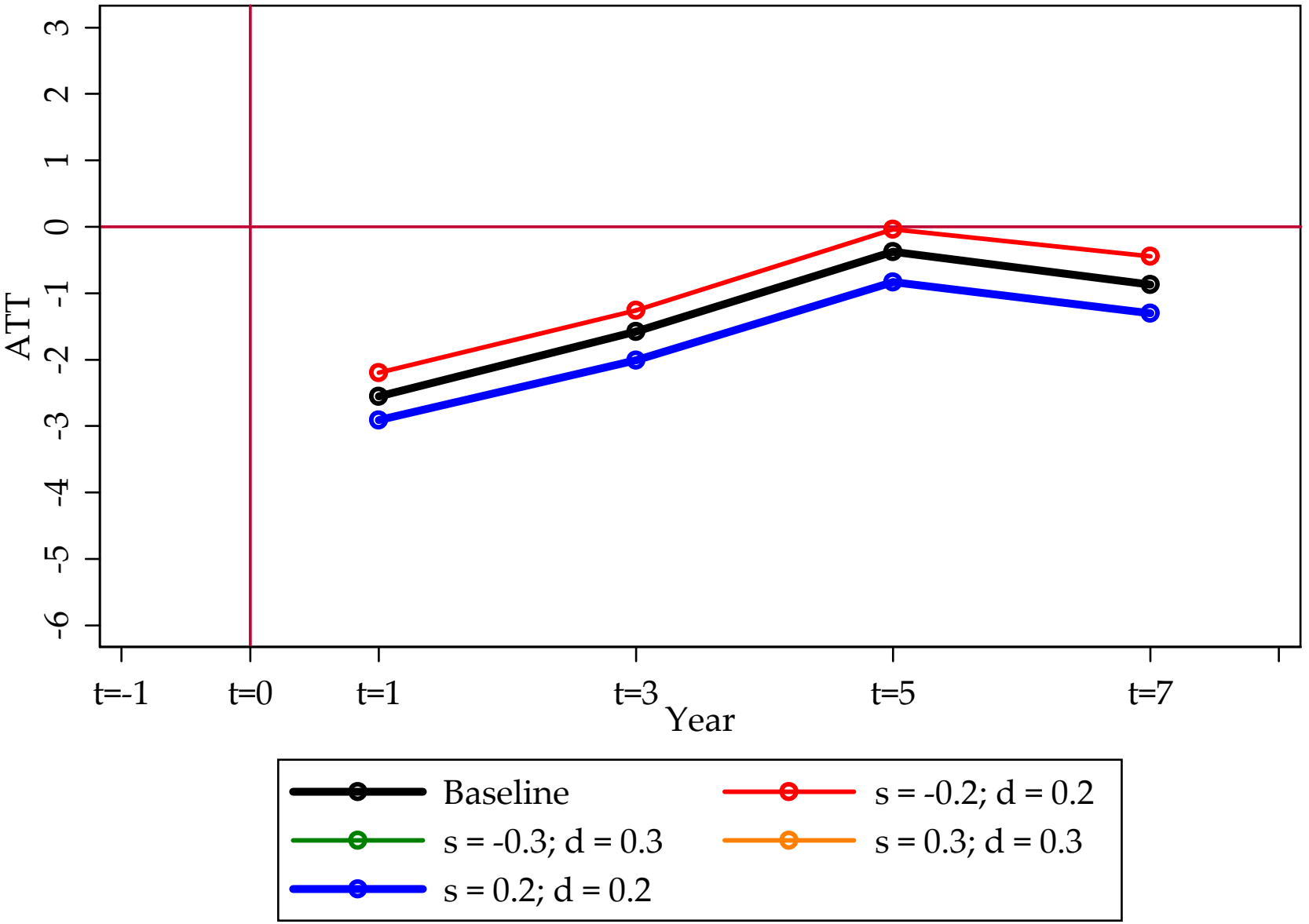
Sensitivity Analysis: Results



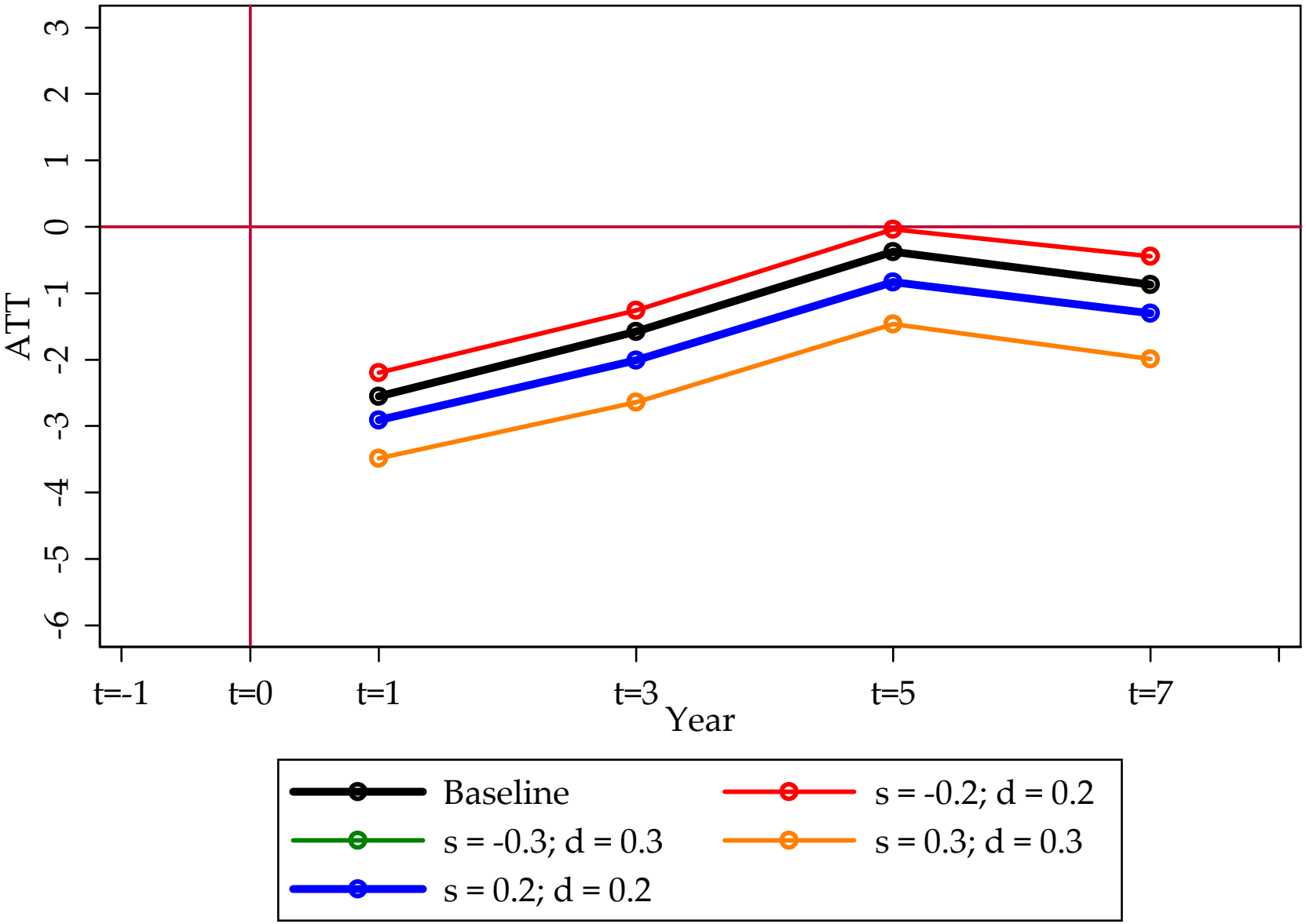
Sensitivity Analysis: Results



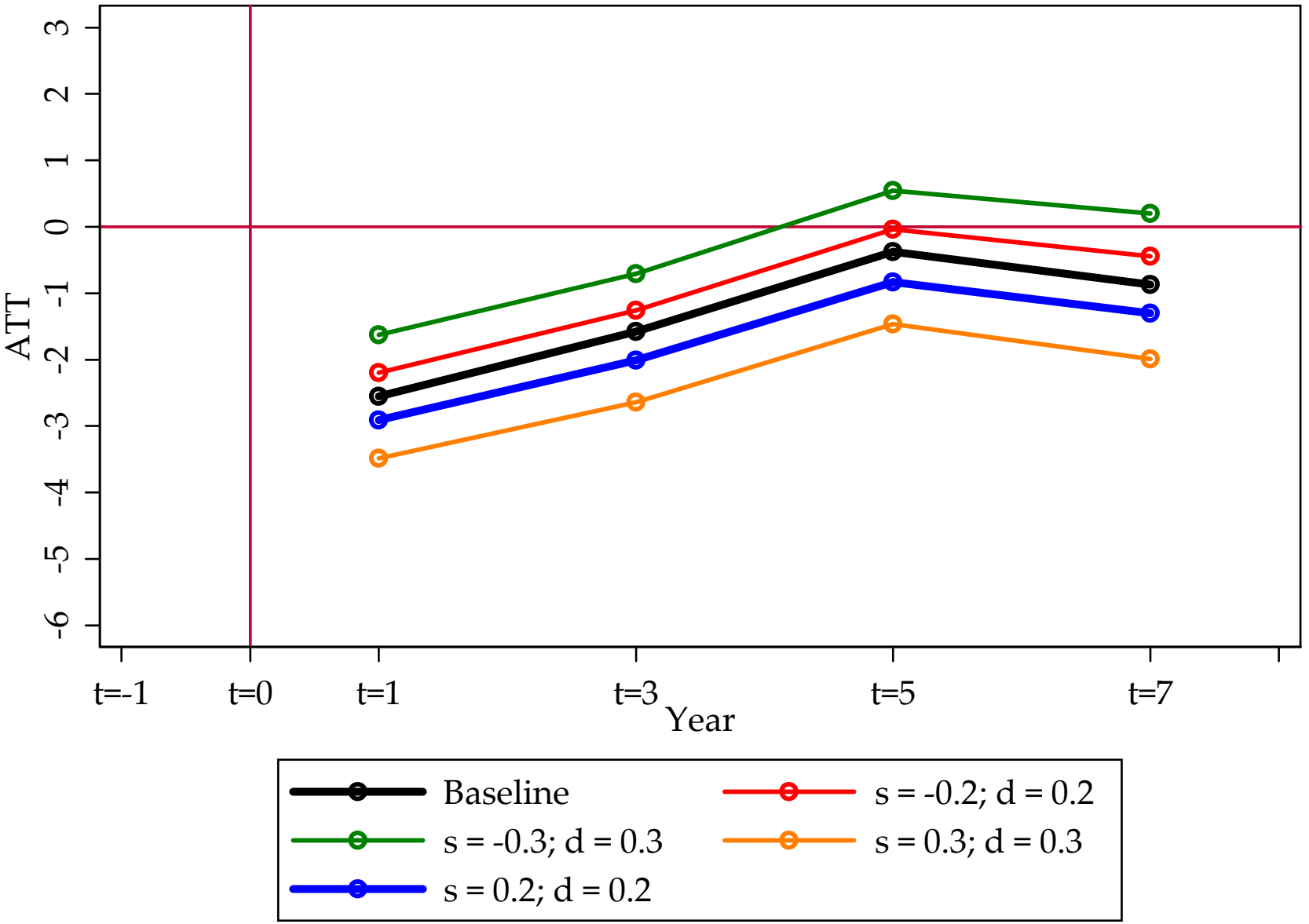
Sensitivity Analysis: Results



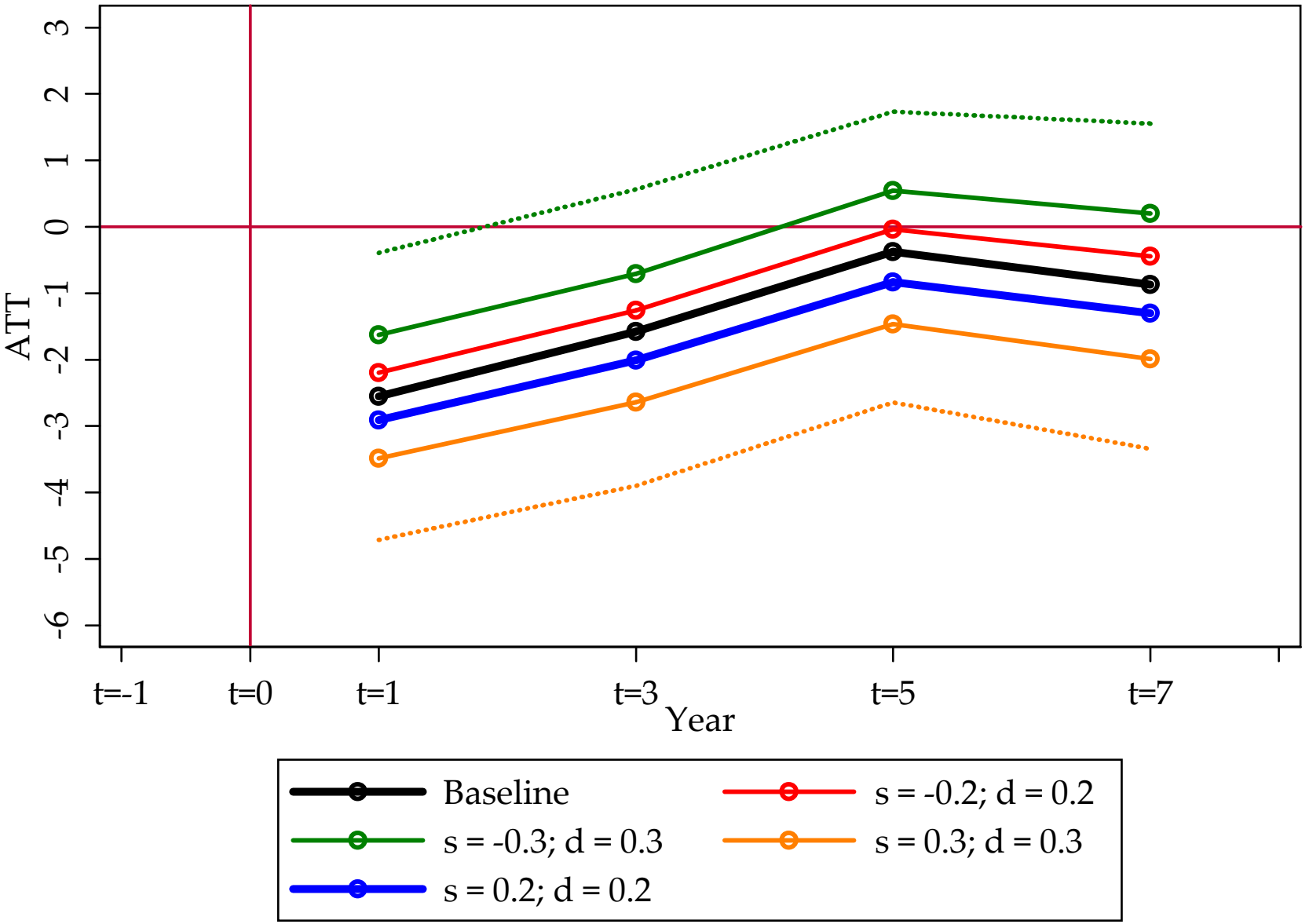
Sensitivity Analysis: Results



Sensitivity Analysis: Results



Sensitivity Analysis: Results



Summary

Summary:

- Short-term effects of informal care on mental health (females)
- After about 5 years they are back at to the base level
- Short-term effects increase in care intensity, medium-term effects do not
- No significant effects for physical health
- Results hold for certain deviations from the CIA assumption

Main limitations: Estimated effect is compound of many different effects

- Intensity and duration
- Relation to care recipient
- Combination of care with other burdens (care & full-time work)

Thank you for your attention

Backup slides

Care durations in the balanced panel

Years of consecutive care as of t=0		1	2	3	4	5	6	7	8	Total
Uncensored	Obs.	309	51	24	9	7	7	5	-	412
	Share	75%	12%	6%	2%	2%	2%	1%	-	100%
Censored	Obs.	265	244	84	108	37	42	12	23	815
	Share	33%	30%	10%	13%	5%	5%	1%	3%	100%
Total	Obs.	574	295	108	117	44	49	17	23	1227
	Share	47%	24%	9%	10%	4%	4%	1%	2%	100%

Source: SOEP, own calculations. Uncensored individuals did not provide care in $t = -1$ and stopped caregiving some time before $t = 7$. Therefore, the maximum observable care duration is 7 years.

Interpreting the results

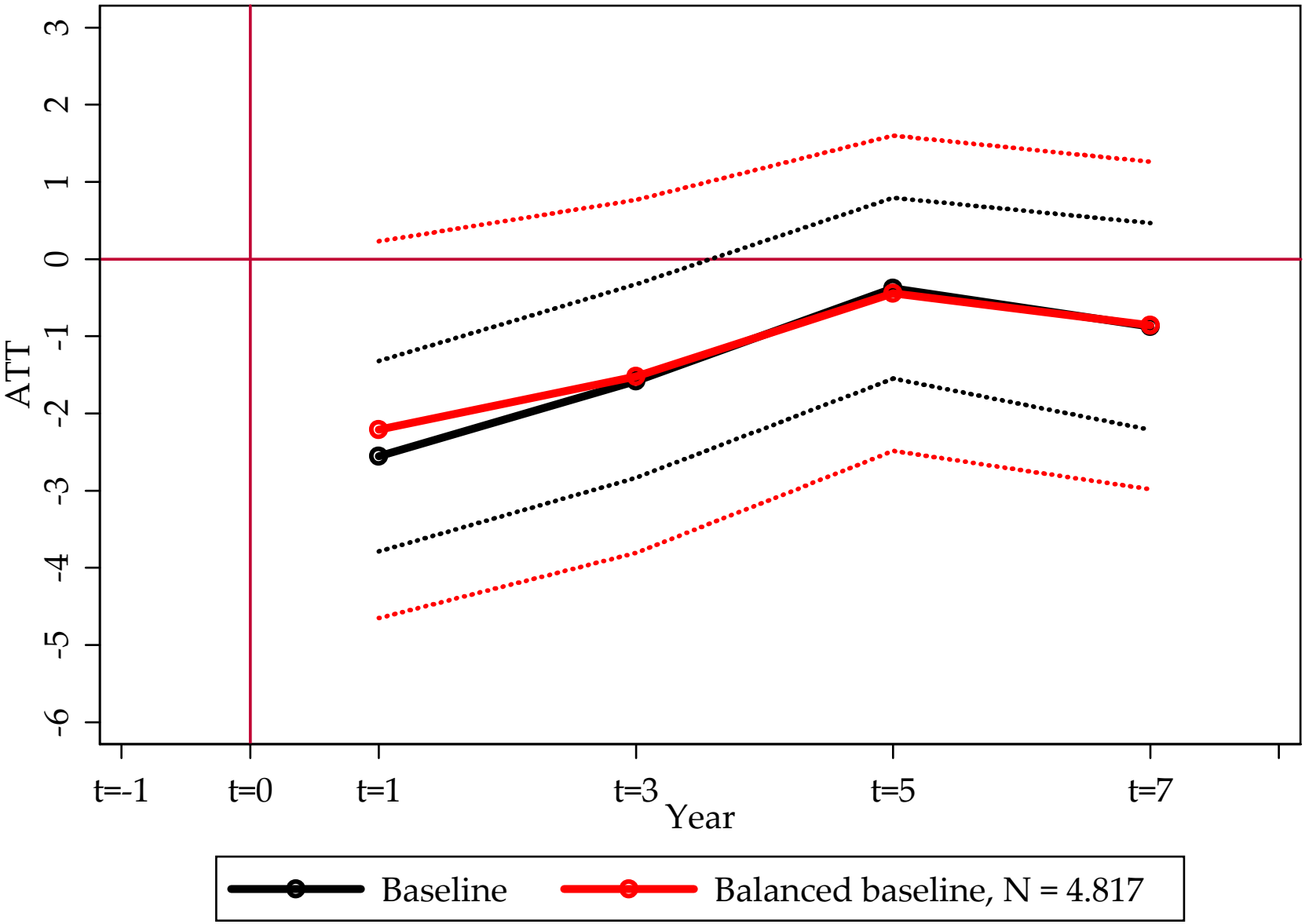
Effects in $t = 1$ (baseline specification)

- 2 hours: -2.00
- 3 hours: -3.02

Some results from the literature using the MCS measure

- Schmitz (2011): Unemployment (plant closure): +0.5 to -1.5 (insign.)
- Marcus (2013): Unemployment of couples (plant closure): -2.7 (sign.)
- Lechner (2009): Sport participation, 16 years after: +0.9 (insign.)

Results: MCS, balanced and unbalanced



	Treated		Controls		Matched controls		Standardized bias		
	mean	sd	mean	sd	mean	sd	unmatched sample	matched sample (0.06)	(0.03)
Stage i): care obligations									
Age mother	44.94	34.76	37.92	30.65	44.81	33.3	21.43	4.37	0.40
Mother alive	0.44	0.5	0.49	0.5	0.44	0.5	-9.13	-1.58	-0.35
Father alive	0.22	0.41	0.34	0.47	0.23	0.42	-28.5	-6.16	-2.28
Number of sisters	0.89	1.29	1.03	1.33	0.89	1.25	-10.51	-2.13	-0.48
Stage ii): willlingness to provide care									
NEURO	4.52	0.68	4.37	.72	4.52	0.71	21.84	6.44	0.96
CONSC	6.04	0.75	5.97	0.79	6.04	0.77	10.01	3.34	0.94
AGREE	5.61	0.84	5.58	0.84	5.6	0.84	3.41	1.30	0.54
OPENN	4.37	1.15	4.51	1.12	4.38	1.13	-12.43	-4.48	-1.55
EXTRA	5.01	0.92	5.04	0.95	5.01	.95	-2.66	-0.69	0.10
Positive reciprocity	5.67	0.95	5.55	0.99	5.67	0.96	11.77	3.01	-0.18
Negative reciprocity	2.71	1.20	2.87	1.24	2.73	1.21	-12.93	3.01	-1.65
Acceptance of private funding	3.31	0.81	3.29	0.80	3.31	0.81	2.68	0.66	-0.10
Age	56.20	12.94	46.54	16.35	55.19	13.74	45.19	6.88	3.91
Age squared	3326.24	1426.78	2721.65	1691.83	3234.7	1495.73	38.63	13.94	5.85
Married	0.80	0.40	0.63	0.48	0.78	0.41	38.82	13.01	4.33
Divorced	0.07	0.25	0.09	0.28	0.07	0.25	-7.38	-2.81	-1.02
Single	0.07	0.25	0.17	0.38	0.08	0.27	-32.61	-11.03	-4.29
Children in hh	0.18	0.38	0.30	0.46	0.19	0.40	-29.00	-10.43	-3.65
Educ general	0.17	0.37	0.17	0.38	0.17	0.38	-1.76	-1.02	-0.68
Educ middle	0.55	0.50	0.49	0.50	0.54	0.50	11.73	3.52	0.56
Foreign	0.04	0.20	0.06	0.24	0.04	0.2	-10.29	-3.71	-1.42
West	0.69	0.46	0.75	0.43	0.69	0.46	-13.92	-4.78	-1.26
Full time	0.13	0.34	0.26	0.44	0.14	0.35	-34.34	-11.36	-3.70
Stage iii): ability to provide care									
MCS	47.32	10.51	49.46	10.13	47.41	10.9	-20.72	-6.54	-0.90
PCS	46.42	10.03	49.02	10.14	46.68	10.48	-25.8	-8.53	-2.52
Satisfaction health	6.19	2.21	6.58	2.17	6.21	2.23	-17.91	-5.72	-1.36
Satisfaction life	6.58	1.86	6.97	1.76	6.6	1.93	-21.34	-6.69	-1.08
N		1,227		30,270		30,270			

Empirical Strategy

$$A\hat{T}T = \frac{1}{n_1} \sum_{i \in I_1} \left[Y_{1i} - \sum_{j \in I_0} \omega(i,j) \cdot Y_{0j} \right]$$

$$\omega(i,j) = \frac{K(\frac{p_i - p_j}{h})}{\sum_{\{j \in D=0\}} K(\frac{p_i - p_j}{h})}, \qquad K(u) = exp(-u^2/2)$$

A refinement

Exploit the double robustness property (Bang & Robins, 2005)

double Robustness Property:

$$\hat{\beta}_{ATT} = (\mathbf{X}'\mathbf{W}\mathbf{X})^{-1}\mathbf{X}'\Delta y$$

- $\hat{ATT}$: weighted average
- control again for the confounding factors

$\Rightarrow$ doubly consistent estimator

- robust standard errors: similar, but slightly more conservative

Stratifiziertes Matching

$$\widehat{ATT} = \frac{1}{n} \sum_{i \in 1,2} n_i \cdot ATT_i \qquad \widehat{se} = \sqrt{\frac{1}{n^2} \sum_{i \in 1,2} n_i^2 \cdot se_i^2}$$

SF-12 Questionnaire

Health and Illness

99. How would you describe your current health?

Very good ..... ☐
Good ..... ☐
Satisfactory ..... ☐
Poor ..... ☐
Bad ..... ☐

**100. When you ascend stairs, i.e. go up several floors on foot:
Does your state of health affect you greatly, slightly or not at all?**

Greatly ..... ☐
Slightly ..... ☐
Not at all ..... ☐

**101. And what about having to cope with other tiring everyday tasks,
i.e. when one has to lift something heavy or when one requires agility:
Does your state of health affect you greatly, slightly or not at all?**

Greatly ..... ☐
Slightly ..... ☐
Not at all ..... ☐

SF-12 Questionnaire

102. Please think about the last four weeks. How often did it occur within this period of time, ...

	Always	Often	Some-times	Almost	Never
• that you felt rushed or pressed for time?	☐	☐	☐	☐	☐
• that you felt run-down and melancholy?	☐	☐	☐	☐	☐
• that you felt relaxed and well-balanced?	☐	☐	☐	☐	☐
• that you used up a lot of energy?	☐	☐	☐	☐	☐
• that you had strong physical pains?	☐	☐	☐	☐	☐
• that due to physical health problems					
– you achieved less than you wanted to at work or in everyday tasks?	☐	☐	☐	☐	☐
– you were limited in some form at work or in everyday tasks?	☐	☐	☐	☐	☐
• that due to mental health or emotional problems					
– you achieved less than you wanted to at work or in everyday tasks?	☐	☐	☐	☐	☐
– you carried out your work or everyday tasks less theroughly than usual?	☐	☐	☐	☐	☐
• that due to physical or mental health problems you were limited socially, i.e. in contact with friends, acquantances or relatives?	☐	☐	☐	☐	☐