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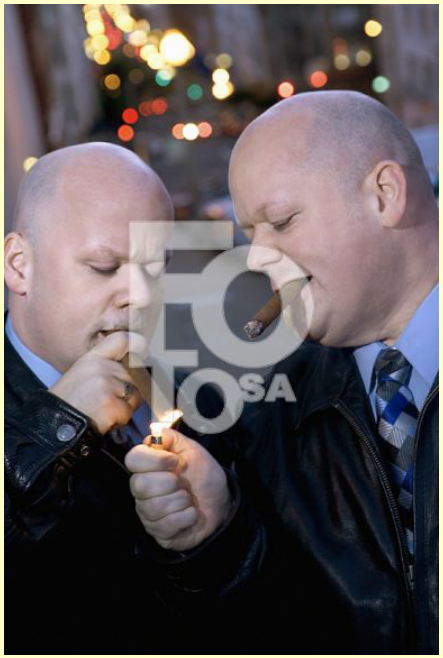
The Effect of Education on Smoking Behavior

Education and smoking behavior

An empirical analysis using twin durations



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Introduction (i)

- Tobacco smoking leading preventable cause of death and disease
  - US: 440,000 deaths per year
  - Australia: 15% of all deaths due to tobacco smoking
- Education policies to reduce smoking?
  - Education and smoking have strong negative association (Cutler and Llera-Muney, 2006)
- Causal impact on health (obese, overweight)
  - Instrumental or natural experiment approach:
    - Institutional differences in education systems, educational reforms
  - Duration (longitudinal) approach: exploiting changes over time.

Introduction (ii)

- IV literature on effect education on smoking incidence
  - Sander (1995):
    - Parents schooling as instrument (questionable)
    - Positive effect on probability to quit smoking
  - De Walque (2007), Grimard and Parent (2007)
    - Natural experiment (Vietnam war)
    - Negative impact on starting, weak evidence for quitting

- Duration models
  - Douglas and Hariharan (1994)
    - Education decreases starting hazard
  - Douglas (1998)
    - Starting: negative relation (-0.14)
    - Quitting: positive relation (+0.12)

    →No flexible baseline, no heterogeneity…

This paper..

..estimates duration models of smoking using a **longitudinal** sample of Australian twins:

- Distinction between starting and quitting
- Twin data can be used for repetitive spells
  - Genuine duration dependence separated from selection effects due to heterogeneity
  - Mass point methodology, twin heterogeneity
- Analysis includes:
  - age and cohort effects
  - proxies for discounting behavior
  - education as time varying variable

Australian Twin Data – The Canberra sample

Table 2.1 Summary statistics of covariates selected twins sample (N=5,378)

	Mean	Standard deviation
Individual characteristics		
Gender (male = 1)	0.34	0.47
Monozygotic twin	0.49	0.50
Age (in 1980)	31.8	10.9
Birth weight (in grams)	2,503	577
Education years (in 1988)	11.8	2.5
9 years	0.27	0.44
11.5 years	0.38	0.49
13 years	0.13	0.33
15-17 years	0.08	0.26
Education years of father	9.9	3.0
Education years of mother	9.5	2.4
Smoking at time of interview ($R = 3$)	0.22	0.42
Has smoked ($R = 2$)	0.21	0.40

Measures of discounting

- Discounting preferences may affect both education and smoking decisions
  - .. And may vary within twins..
- Four measures obtained from factor analysis:
  - Taking decisions quickly
  - Making decisions on instinct, without thinking
  - Having debts and no savings
  - Running out of money

Discounting variables, ctd

(i) Taking decisions quickly

"Do you often make decisions in the spur of the moment?" (YES)
"Have people said that sometimes you act too rashly?" (YES)
"I like to think about things for a long time before I make a decision." (NO)
"I usually think about all the facts before I make a decision." (NO)

(ii) Making decisions on instinct

"I nearly always think about all the facts in detail before I make a decision, even when other people demand a quick decision." (NO)
"I often do things based on how I feel at the moment, without thinking how they were done in the past." (NO)
"I often follow my instincts, hunches, or intuition without thinking through all the details." (YES)

Discounting variables, ctd

(iii) Having debts, no savings

"Would being in debt worry you?" (NO)
"Do you think people spend too much time safeguarding their future with savings and insurances?"(YES)
"I am better at saving money than most people" (NO)

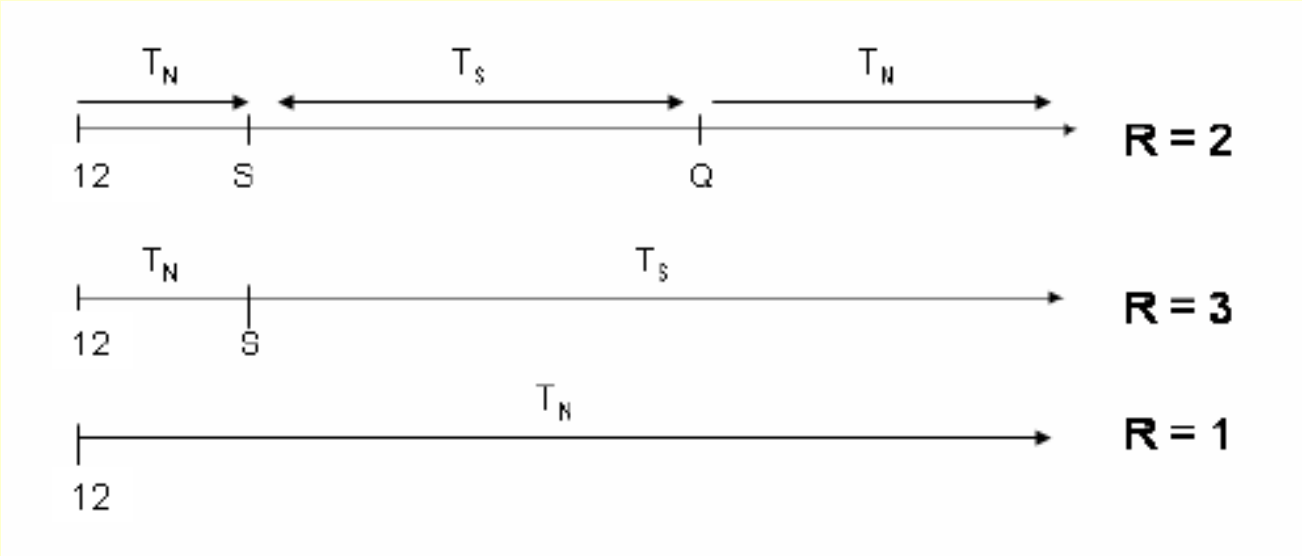
(iv) Running out of money

"I often spend money until I run out of cash or get into debt from using too much credit." (YES)
"Because I so often spend too much money on impulse, it is hard for me to save money, even for special plans like a holiday." (YES)
"I enjoy saving more than spending it on entertainment or thrills." (NO)

(Non-)smoking durations (i)

- Assumption: only one (major) smoking duration → recover spells from starting and quitting moments
  - self reported spells to check robustness

- Three options: have smoked (2), still smoking (3), never smoked (1):



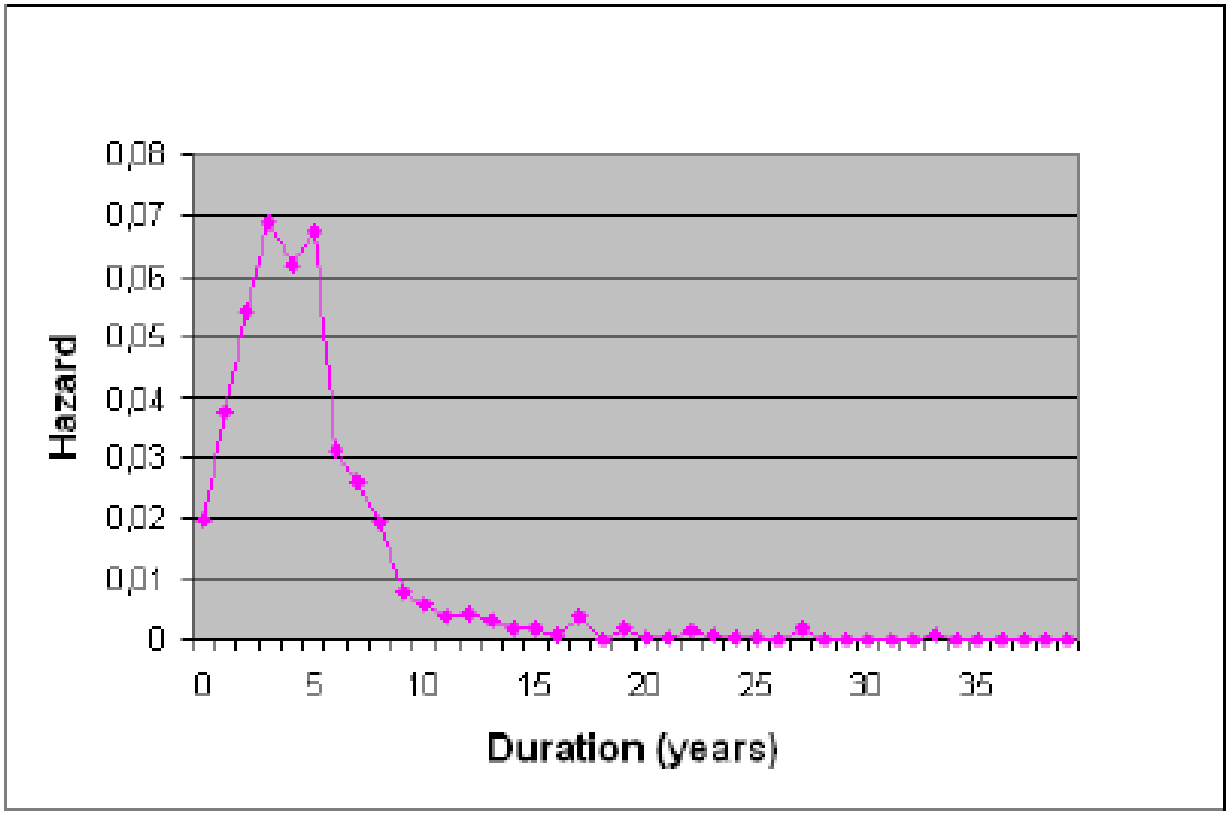
(non-)smoking durations (ii)

Table 2.2 Smoking and non-smoking durations in selected sample (standard deviations in brackets)

	Smoking durations		Non-smoking durations	
	Complete	Censored	Complete	Censored
Number of observations	1,217	1,105	2,246	3,056
Duration	13.4	21.1	5.6	29.1
	(9.7)	(9.5)	(3.6)	(11.1)
Age at start	17.5	17.4	12.0	12.0
	(3.5)	(3.8)	(.)	(.)
Age at end	30.9	38.4	17.6	41.1
	(10.3)	(9.9)	(3.6)	(11.1)
Self reported smoking durations	12.8	18.7		
(1,195 and 1.076 observations)	(9.5)	(9.6)		

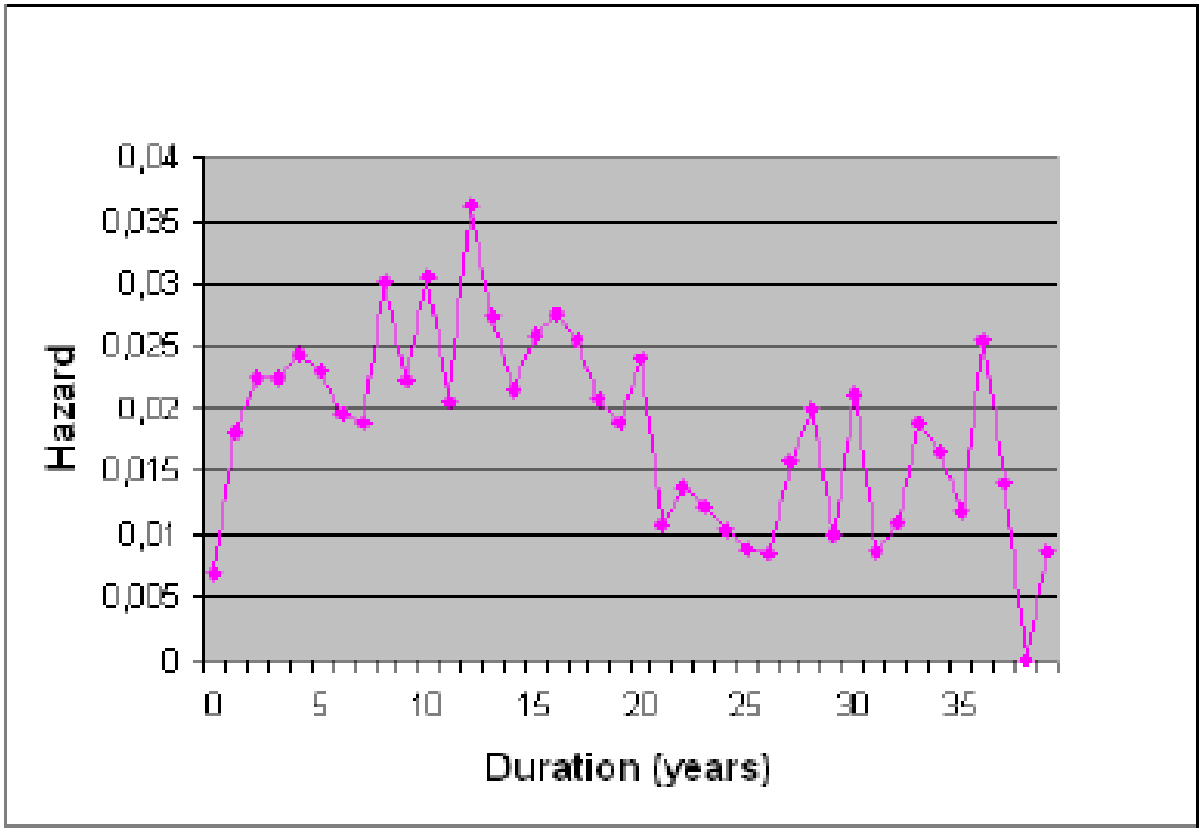
Hazard of starting smoking

Figure 2.2 Observed (non-parametric) hazard rate of starting smoking.



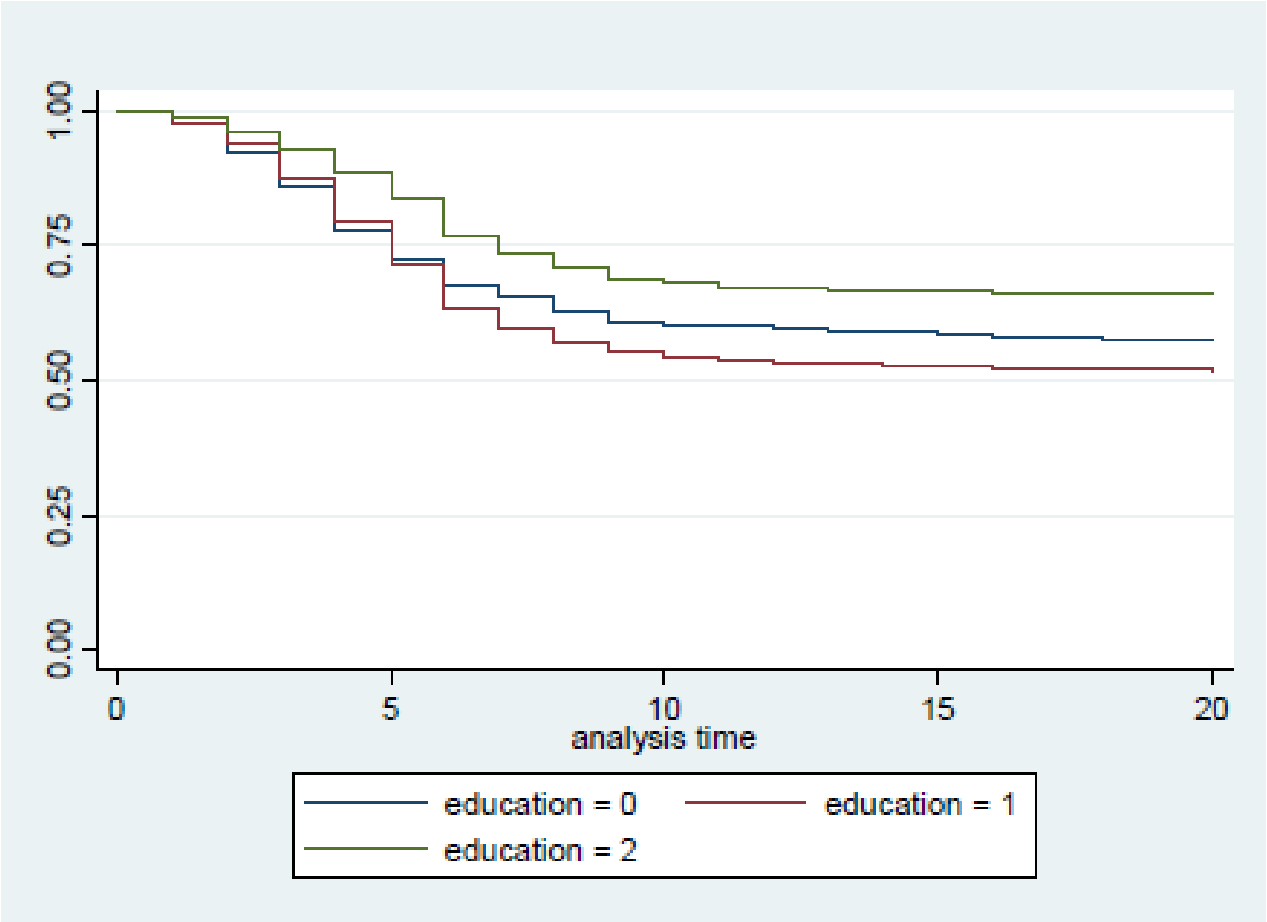
Hazard of quitting smoking

Figure 2.3 Observed (non-parametric) hazard rates of quitting smoking



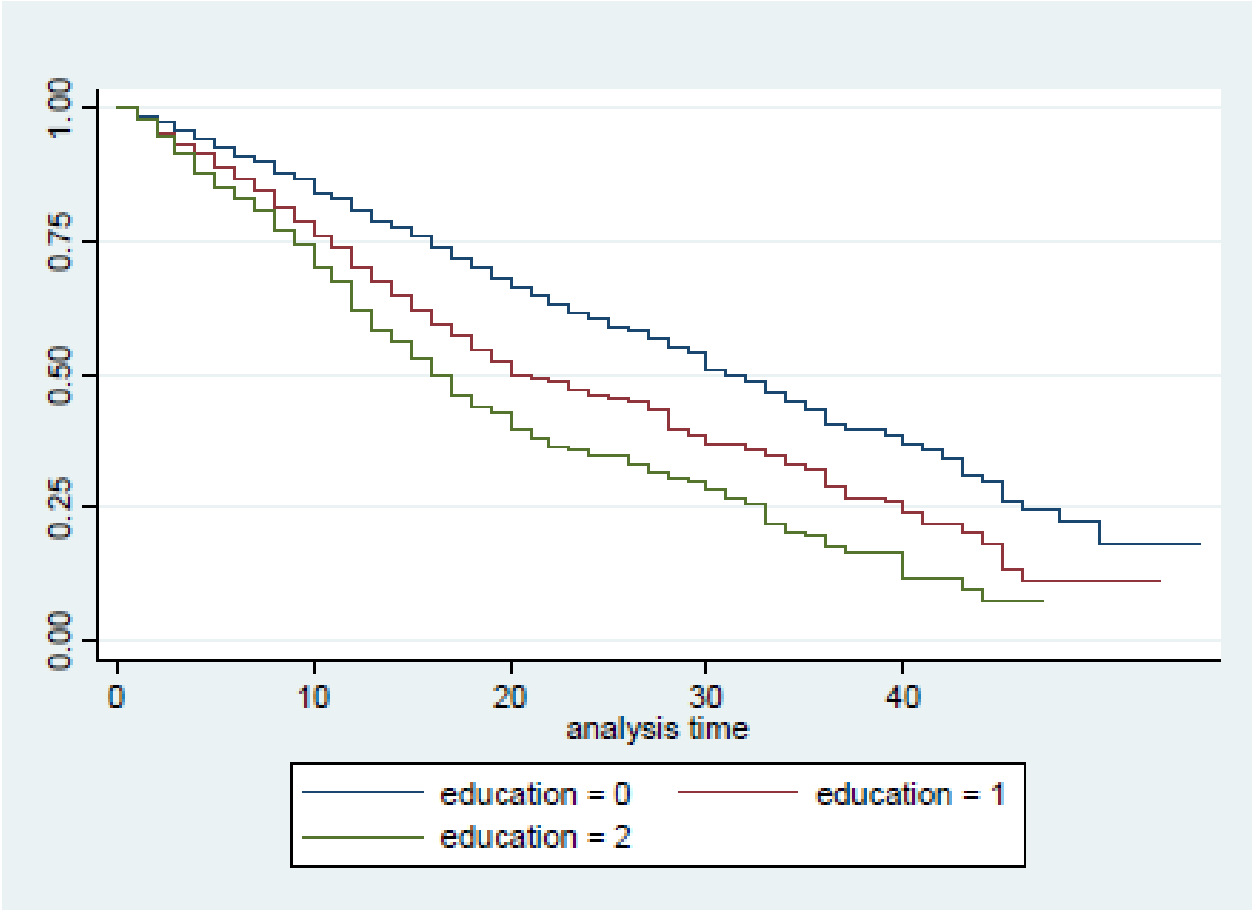
Observed impact of completed education on starting smoking

Figure 2.4 Kaplan-Meier estimates of non-smoking durations for three (clustere



..and quitting smoking..

Figure 2.5 Kaplan-Meier estimates of smoking durations for three (clustered)



Mixed proportional hazards (MPH) specification

$$\theta^{d}_{ijt,\tau} = \lambda_{0d}(t)\ \exp\left\{ X_{ijt}\,\beta^{d} \right\}\ \psi^{d}(\tau)\ v_{j}^{d}$$

- i = individual; j = twin; t = elapsed duration; τ = calendar time; d = **starting** or **quitting**.
- λ is baseline hazard: start with Weibull, allow for more polynomials.
  - No duration dependence in starting hazard
- Ψ is calendar time effect
- v = mass point representing twin effect
  - can be estimated bivariately with (correlated) spells
- ***X*** includes education, cohort dummies, gender, birth weight, age, discounting behavior and education of parents

Key estimation results

Table 4.1 Estimation results MPH model (non-)smoking durations; standard errors in parentheses.

	Hazard of quitting smoking		Hazard of starting smoking	
Baseline Hazard				
Constant	– 10.021**	(0.988)	– 6.814**	(0.335)
ln(duration)	– 1.078**	(0.334)		
Idem, squared	– 0.014	(0.096)		
Individual and twin characteristics				
Education years	0.104**	(0.022)	– 0.016	(0.019)
ln (age-11)	2.197**	(0.914)	7.607**	(0.283)
Idem, squared	0.073	(0.192)	– 2.141**	(0.074)
Decide quickly	– 0.017	(0.073)	0.178**	(0.045)
Decide instinctively	– 0.205*	(0.097)	0.192**	(0.059)
Debts, no savings	– 0.157	(0.172)	0.199*	(0.100)
Out of money	– 0.098*	(0.060)	0.205**	(0.036)
Mass point distribution parameters				
P	0.390**	(0.168)	0.720**	(0.057)
ln(v)	2.082**	(0.154)	– 2.231**	(0.060)
N = 5,378				

Main findings

- Impact education year on quitting hazard: 0.11
  - Coefficient close to Douglas (1998)
  - One year of education = 9 months less smoking per duration (average = 21 years)
- Impact on starting: reverse, but insignificant!
  - Discounting variables are important instead
- Unobserved heterogeneity: 2 mass points
  - No correlation between hazards → separate models
- Quitting hazard increases with age; for starting: hump-shaped age effect
- Negative duration effects on quitting
  - Contrasts to Douglas; now age effects included!!

Robustness (i): unobserved effects

	Quitting hazard	Starting hazard
Benchmark model: unobserved twin effects	0.104**	– 0.016
	(0.022)	(0.019)
(i) Unobserved individual effects	0.137**	– 0.020
	(0.037)	(0.017)
(ii) Sub-sample of monozygotic twins (N=2,732)	0.114**	0.003
	(0.030)	(0.028)
(iii) MPH with twin fixed effects (N=1,470)		– 0.010
		(0.022)

MPH with fixed effects (Ridder and Tunali 1999): estimate probability that the *first individual for each twin pair* starts smoking first (=conditional Logit specification).

→ Only pairs of complete spells and same starting dates

Robustness: measurement errors, heterogeneity in effects

	Quitting hazard	Starting hazard
Benchmark model: unobserved twin effects	0.104**	– 0.016
	(0.022)	(0.019)
(iv) Self reported smoking durations (N=2,271)	0.102**	
	(0.022)	
(v) Completed education as time constant variable	0.063**	– 0.129**
	(0.022)	(0.013)
(vi) Education reported by other twin	0.060**	0.025
	(0.022)	(0.019)
(vii) Impact of gender		
- Education coefficient for men	0.099**	– 0.081**
	(0.030)	(0.025)
- Interaction dummy of education and female twins	0.009	0.115**
	(0.040)	(0.027)

Robustness: Linear Probability model with twin effects

- Implied effect of increased quitting: 8.6 months
- Corresponding decrease of smoking incidence: 0.9%-point.

- LPM model with twin fixed effects: 1.3%-point

To conclude

- Effect of education on smoking is substantially lower than previous studies
  - Importance of education as time varying variable
  - Parent and Grimard (8%-point effect!): local average treatment, special group
  - Group effects, discounting behavior important
- Effect on quitting, not starting!
- Education as means to prevent starting smoking not well targeted.
  - Externalities smaller than expected
  - Peer effects more important

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The Effect of Education on Smoking Behavior

Other current projects

While working here: Welfare to work (WTW)

- Effect performance based contracts for effectiveness of WTW services (cream skimming, placement, parking, gaming)
- Contracting out of WTW by municipalities: modeling use and effectiveness

Other projects and interests:

- School choice behavior of parents and children: quality information, transparency
- Quality information and information disclosure in the hospital industry
- Relative performance and governance of non-profits in social services (WTW, hospitals, child care).
- Crime: police effectiveness, effects on human capital.
- Absenteeism.