

Information, Development, and Life-course Smoking Pattern in Mainland China and Taiwan over 50 Years

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Our goal: Test whether

- Decisions to smoke vary with information on costs of smoking
 - Initiation
 - cessation
- Using longitudinal data from
 - Taiwan National Health Interview Survey (TNHIS)
 - China Health and Nutrition Survey (CHNS)

Motivation

- Estimated annual premature deaths attributable to tobacco consumption
 - >5 million worldwide (WHO 2012)

In China

- About 300 million smokers (China Ministry of Health 2006)
- 1 million premature deaths each year and rising (Liu et al. 1998; Peto et al. 2009)
- Annual cigarette consumption rising
 - Overall
 - 500 billion (1978) to 2,000 billion (2006) (Peto et al. 2009)
 - Per capita (men)
 - 4 cigs/day (1972) – 10 cigs/day (1992) – 15 cigs/day (late 1990s)
(Yang et al 2008; Peto et al 2009)
- Intensity
 - Smokers<20 per day/smokers>20 cigs per day doubled from 1998 to 2003
 - >50% 2003 smokers consume >20 cigs/day (Qian et al. 2010)
- Rising % of Smokers who don't want to quit/don't think about quitting
 - 74% (2005) to 84% (2010) (China Ministry of Health 2010)
- Cigarettes part of cultural norms - gifting (Rich et al. 2012)
- But... all is not lost...in most recent cohorts (male) prevalence declining

Plan

- Describe data
 - Surveys in Taiwan and China
 - Construct smoking life-history of each person
- Variation we try to exploit
 - Geographic, temporal, individual
- Model decisions to start and quit
 - Price
 - Information on health risk of smoking
 - Allow response to vary by birth cohort and education
- Results
- Limitations

Data (I) Individual smoking

- Taiwan National Health Interview Survey (TNHIS) 2001, 2005
 - Nationally representative cross-section
 - About 20,000 individuals age 12 years and older
- China Health and Nutrition Survey (CHNS) 1991-2006
 - Not nationally representative (9 provinces of 34 provincial level units)
 - Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning, Shandong
 - Panel survey began in 1989
 - about 4400 households with a total of 16,000 individuals.
- Demographic data on
 - individual age, sex, education, marital status, household income (in survey year), and ...

Data (I) (continued)

- Lifetime smoking behavior
 - Whether ever smoked (lifetime)
 - Age started (regularly)
 - Whether currently smoke
 - Age quit/months since quit
 - Average consumption (current or when smoked)

Data (I) (continued)

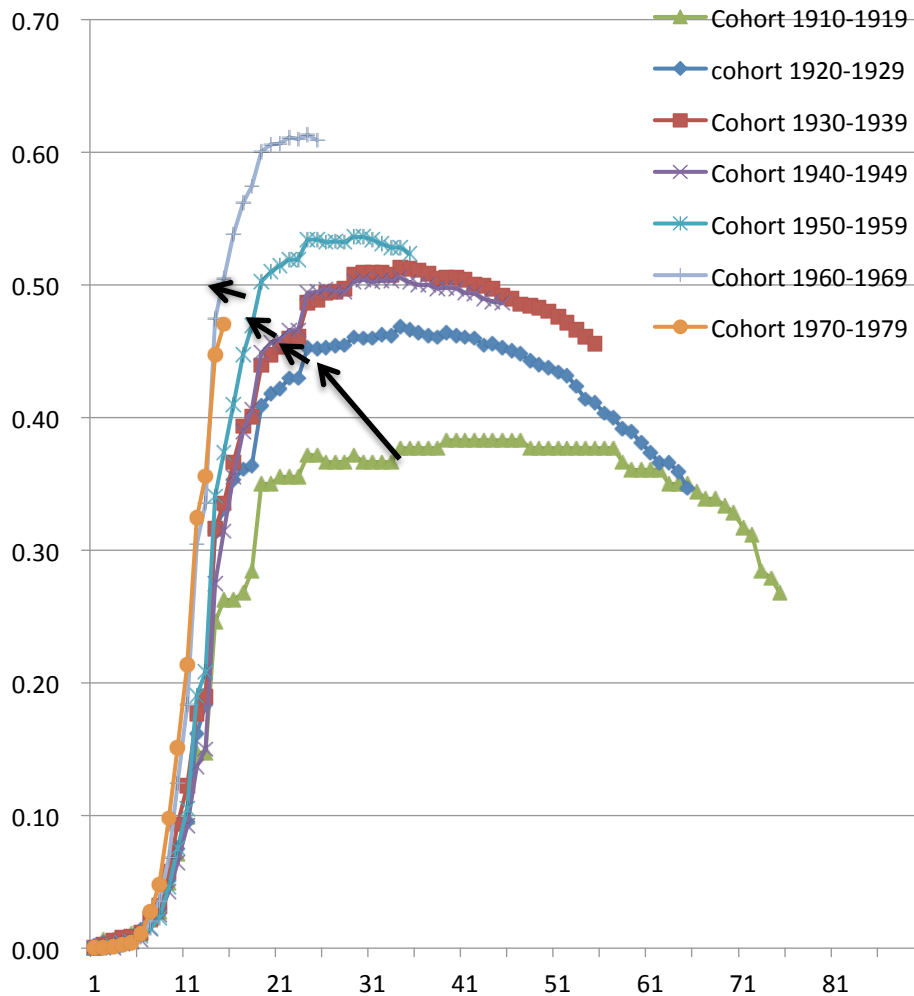
- Constructing life-course smoking history
 - Ignore temporary quits
 - Assume smoked between age started/age quit
 - Assumption introduces bias – but..
 - » Minimal (Kenkel et al 2003; Christopoulou et al. 2011)
 - » Occurs at endpoints (start/quit)
 - » Mostly around quit years (Bar & Lillard 2012)
 - Create smoking status indicator
 - = “1” in year smoked, “0” otherwise

Data (I) (continued)

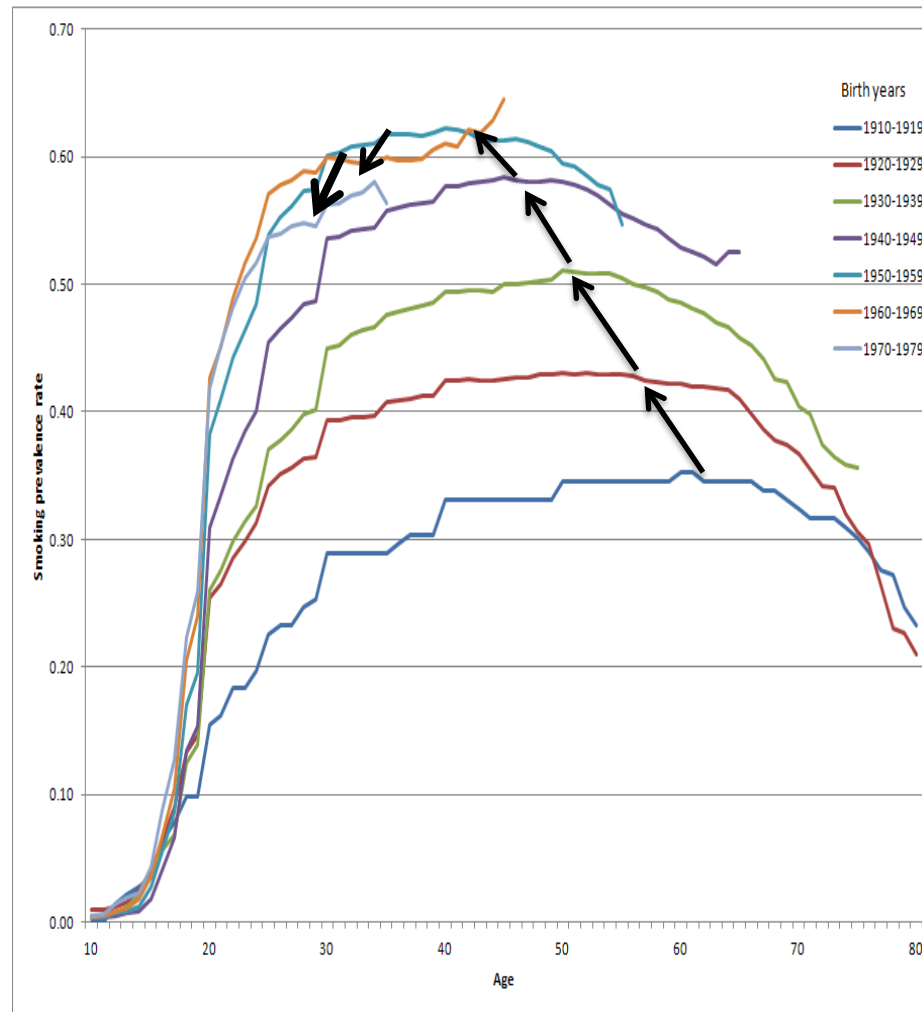
- Advantages
 - Exploits largest possible sample (all survey respondents)
 - Measure smoking behavior of current *and* ex-smokers
 - Smoking behavior of multiple birth cohorts
 - Maximizes time period over which behavior observed
 - Full use of temporal variation in policies/price/conditions
- Disadvantages
 - Survivor bias (solution offered in Christopoulou et al. 2011)
 - Heaping (solution in Bar & Lillard 2012)
 - Small cell counts in oldest of old cohorts

Life-course Smoking Patterns among Men

Taiwan



China

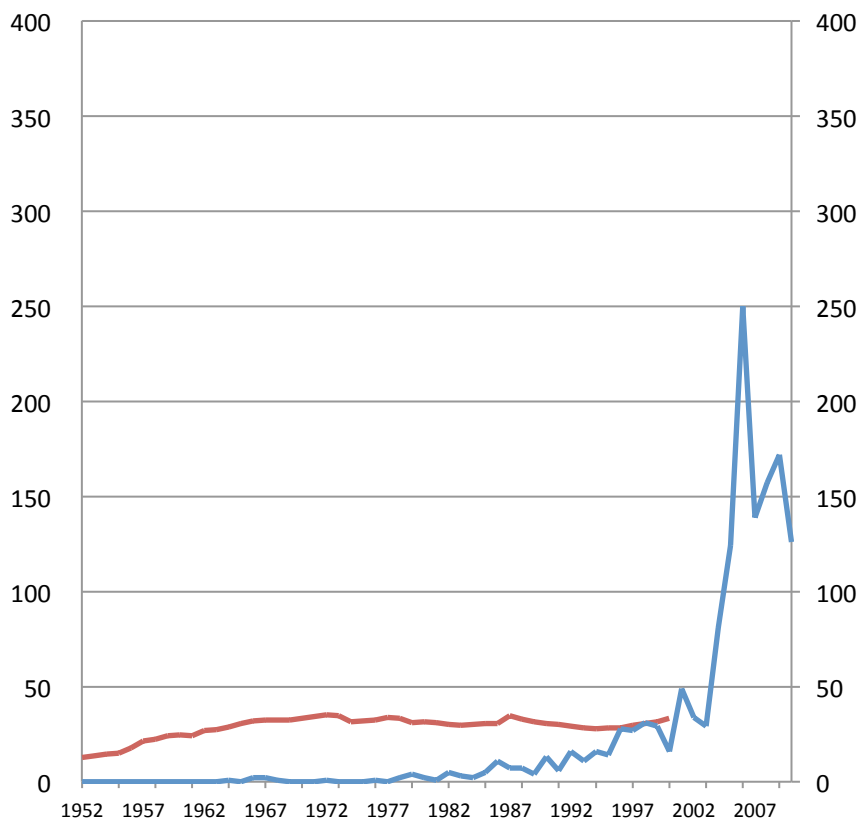


Data (II) Price and Information

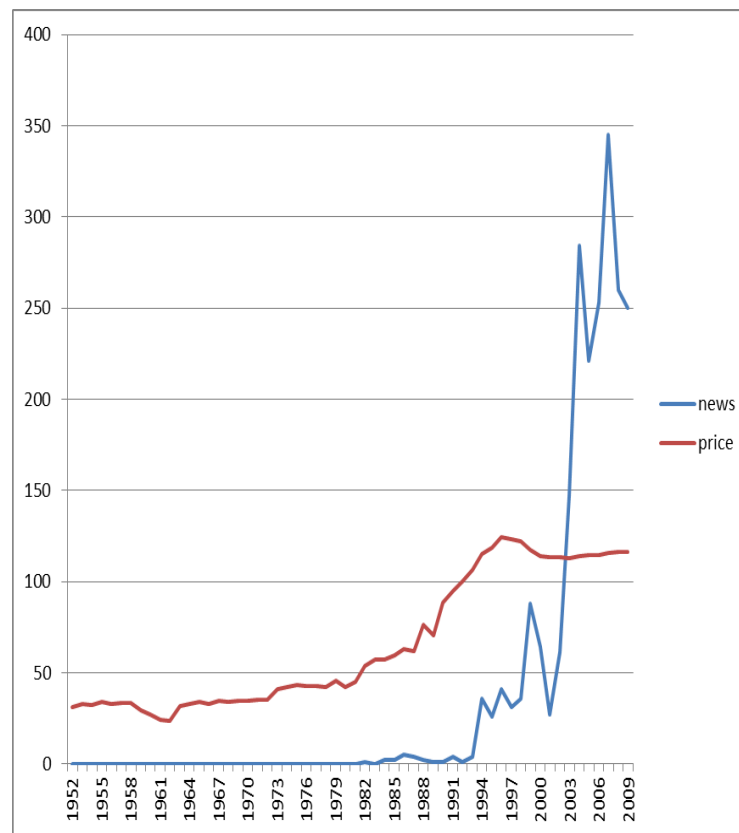
- Need to measure price over *long* historical period
 - Want 1935-present
 - Have ~1950-2005 (Taiwan), 1952-present (China)
- Tobacco statistical yearbooks
 - Taiwan Tobacco and Wine Statistical Yearbook (Taiwan Tobacco and Liquor Corporation)
 - China Statistical Yearbook
- Health risk information
- Taiwan News Wisdom Database - historical newspaper articles 1941-present
 - China Daily News, United Daily News, the Economic Daily News, Ming-Seng Daily, United Daily Evening News, Star Daily, Business Daily, Central Daily, Freedom Daily, Apple Daily, Chinese Daily, and Merit Times.
 - Key words: smoking & lung cancer, smoking & heart disease, smoking & emphysema
- Database of Chinese National Press Index <http://www.cnbkxy.com> 1949-present
 - more than 200 newspapers, and 6000 social science journals
 - Key words 'xiyan'(smoking).
- Articles screened to select only those related to health effects of cigarette smoking
 - E.g. deleted articles about fire hazard associated with smoking

Smoking Health Risk Information & Cigarette Price 1952-2010

Taiwan



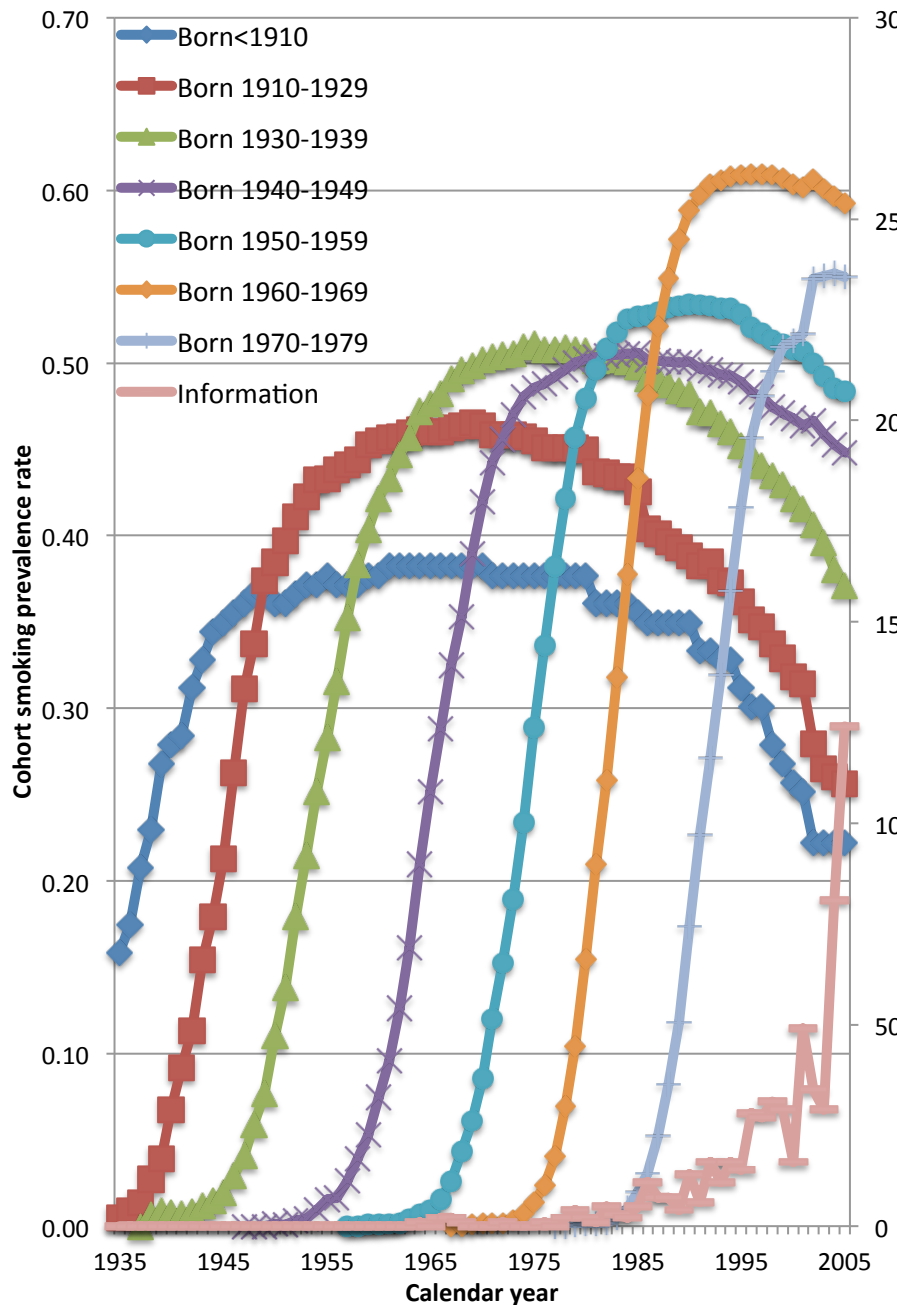
China



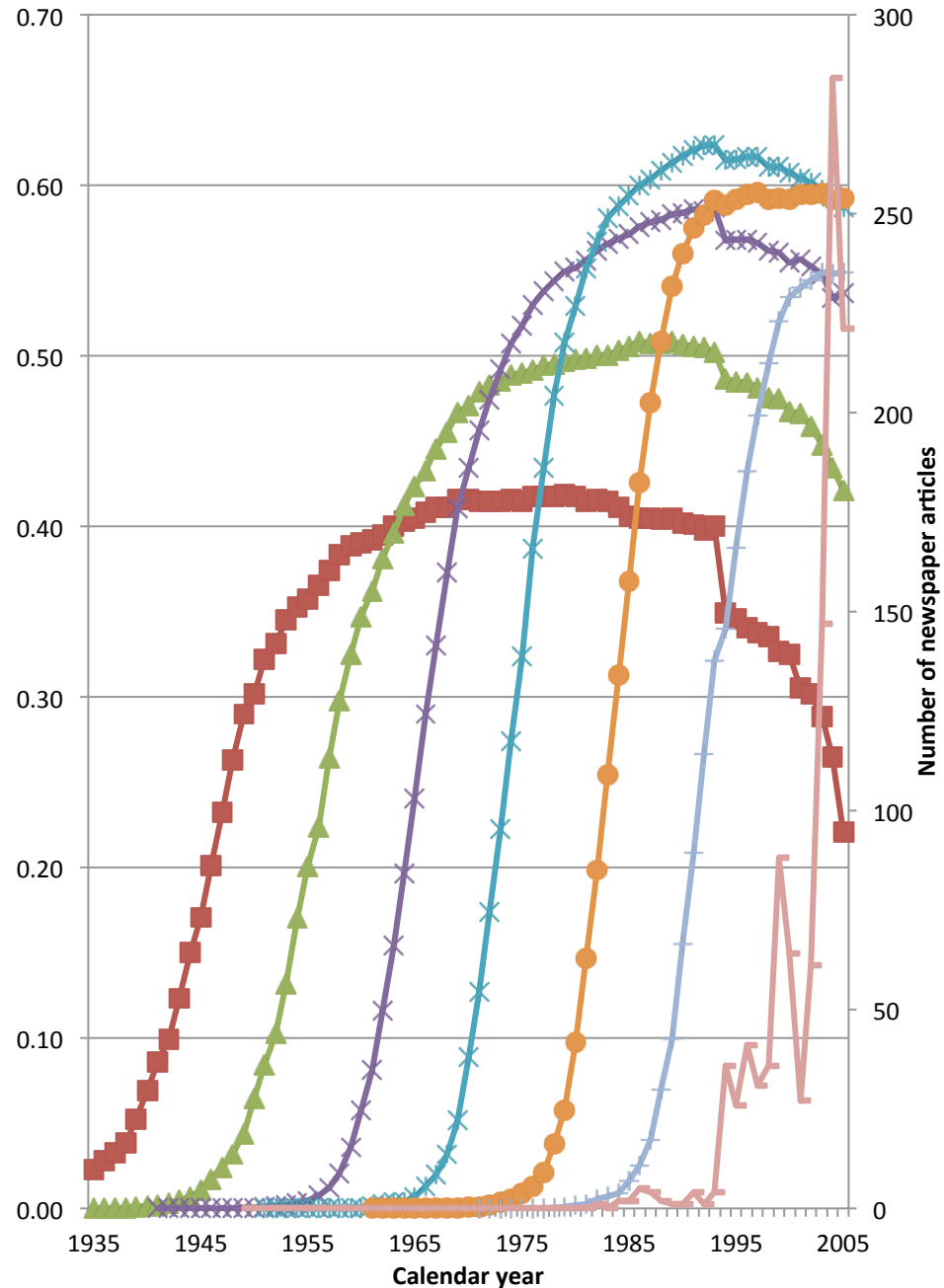
Sources of Variation

- Temporal
 - Price
 - Count of newspaper articles on risks of smoking
- Cross-sectional (do not yet exploit) – differences between Taiwan and China
 - Price
 - Count of newspaper articles on risks of smoking
- Individual
 - Whether “treated” by information
 - Cohorts who “came of smoking age” before/after
 - Education interacted with information

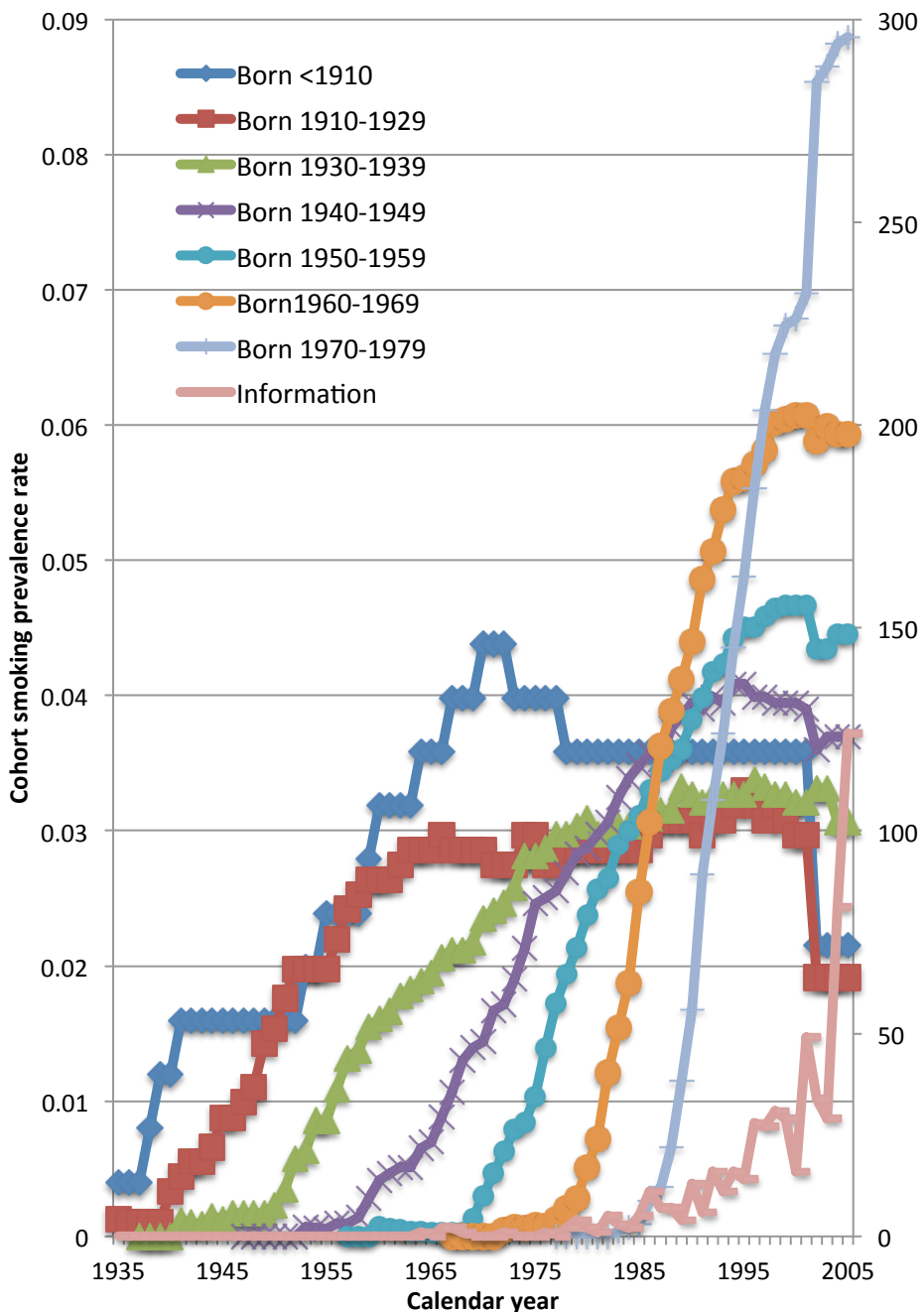
Taiwan - men



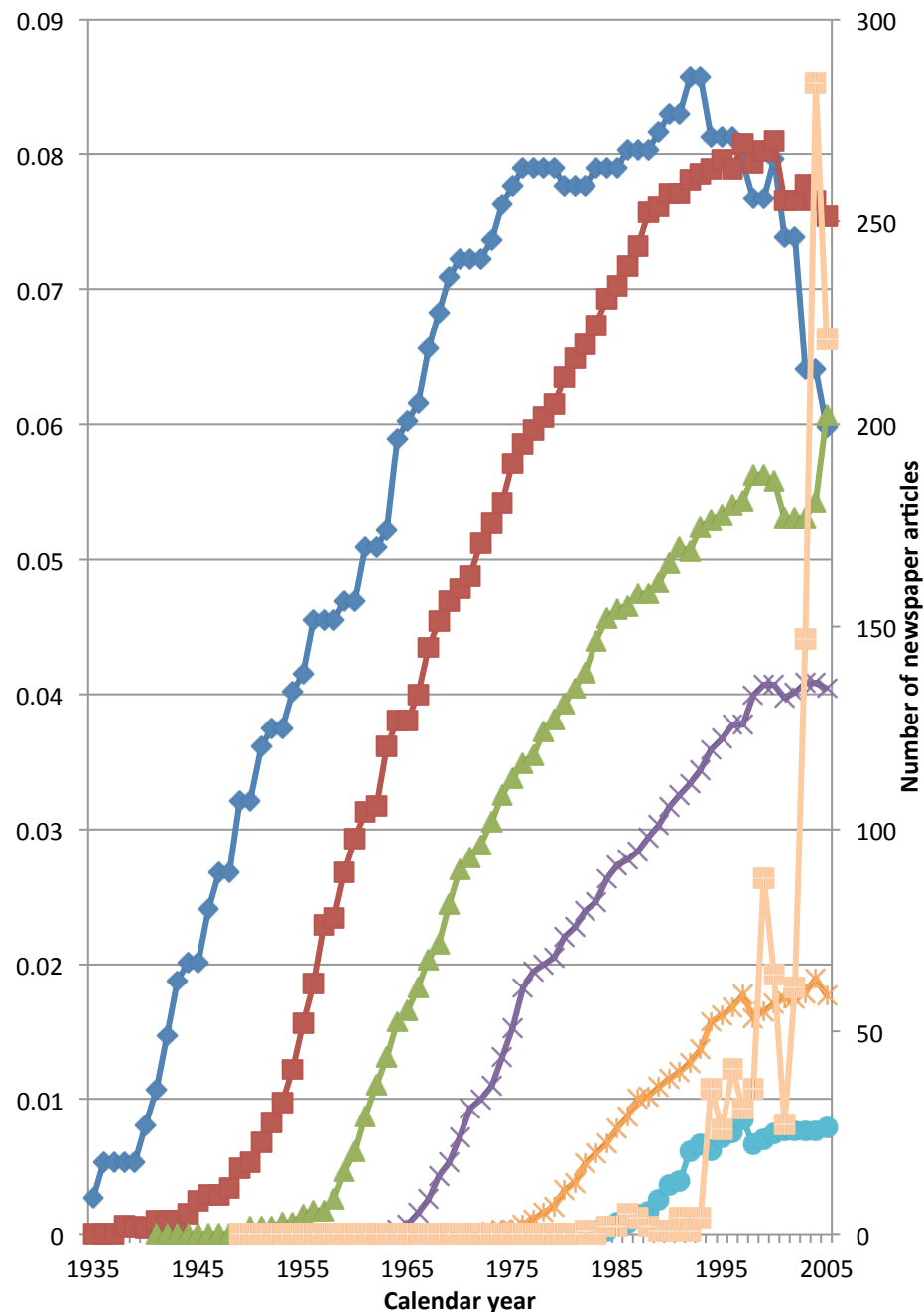
China - men



Taiwan - women



China - women



Means (CHNS only)

Variable	Mean	Std. Dev.
Initiation	0.04	0.20
Price	57.27	29.09
Born 1920-1929	0.00	0.00
Born 1930-1939	0.00	0.00
Born 1940-1949	0.00	0.00
Born 1950-1959	0.07	0.34
Born 1960-1969	0.50	1.13
Born 1970-1979	0.57	1.47
Info flow -1920s	0.00	0.00
Info flow 1930s	0.00	0.00
Info flow 194s	0.00	0.00
Info flow 1950	0.06	0.27
Info flow 1960s	0.29	0.73
Info flow 1970s	0.40	1.10
GDP per capita	1184.59	2076.42
N	279677	

Specifications

$$Start_{ict} = \beta_{10} + \beta_{11} P_{it} + \beta_{12} Info_{ict} + \beta_{13} Info_{ict} * Ed_{it} + \beta_{14} X_{ict} + \tau_{ic} + \varepsilon_{ict}$$

Sample restricted to people age 13-27 who have not previously smoked

$$Quit_{ict} = \beta_{10} + \beta_{11} P_{it} + \beta_{12} Info_{ict} + \beta_{13} Info_{ict} * Ed_{it} + \beta_{14} X_{ict} + \tau_{ic} + \varepsilon_{ict}$$

Sample restricted to people age 13 and older who smoke

$$Smoke_{ict} = \beta_{10} + \beta_{11} P_{it} + \beta_{12} Info_{ict} + \beta_{13} Info_{ict} * Ed_{it} + \beta_{14} X_{ict} + \tau_{ic} + \varepsilon_{ict}$$

Sample restricted to people age 13 and older

Information is a vector that (sometimes) includes one of two measures (or both):

“Stock” (sum of articles from age 13 up to previous year)

Flow (number of articles published in current year)

Method – Linear probability models

Estimate models by OLS (linear probability models)
Separately by sex

Controls

Age, age squared

Ethnicity (Taiwan – mainlander, Hakka, other)

Education

Household income (in survey year)

Birth cohort

Region/place of residence

GDP per capita (China only)

Quadratic time trends

Results – Smoking initiation

	Men			Women		
	Taiwan		China		Taiwan	
Variables	1		1		1	
Price	0.0020		-0.0213***		-0.0084***	
	(0.0077)		(0.0056)		(0.0024)	
Info stock	-0.0115***		-0.0473***		0.0001	
	(0.0010)		(0.0085)		(0.0004)	
Info flow	-0.0158**				0.0007	
	(0.0073)				(0.0031)	
N	336155		279677		334338	
R2	0.043		0.0603		0.006	
Root MSE	0.159		0.19377		0.050	

***, ** denote linear probability model coefficients with p-values < .01 and .05 respectively. Controls include age, age-squared, education, household income, dummy for place of residence (rural, town, city), (Taiwan) ethnic background, and a quadratic time trend

Results – Smoking cessation

	Men			Women		
	Taiwan		China		Taiwan	
Variables	1		1		1	
Price	-0.2272		0.0004***		0.0331**	
	(0.3382)		(0.0000)		(0.0153)	
Info stock	0.0018***		-0.0199***		0.0057***	
	(0.0005)		(0.0008)		(0.0021)	
Info flow	-0.0523		0.0080***		-0.0079	
	(0.0326)		(0.0004)		(0.0144)	
N	207227		269693		15003	
R2	0.015		0.101		0.014	
Root MSE	0.049		0.043		0.061	

***, ** denote linear probability model coefficients with p-values < .01 and .05 respectively. Controls include age, age-squared, education, household income, dummy for place of residence (rural, town, city), (Taiwan) ethnic background, and a quadratic time trend

Allow for differential effect of information, by birth cohort and education level

Estimate models by OLS (linear probability models)
Separately by sex

Controls

Age, age squared

Ethnicity (Taiwan – mainlander, Hakka, other)

Education

Household income (in survey year)

Birth cohort

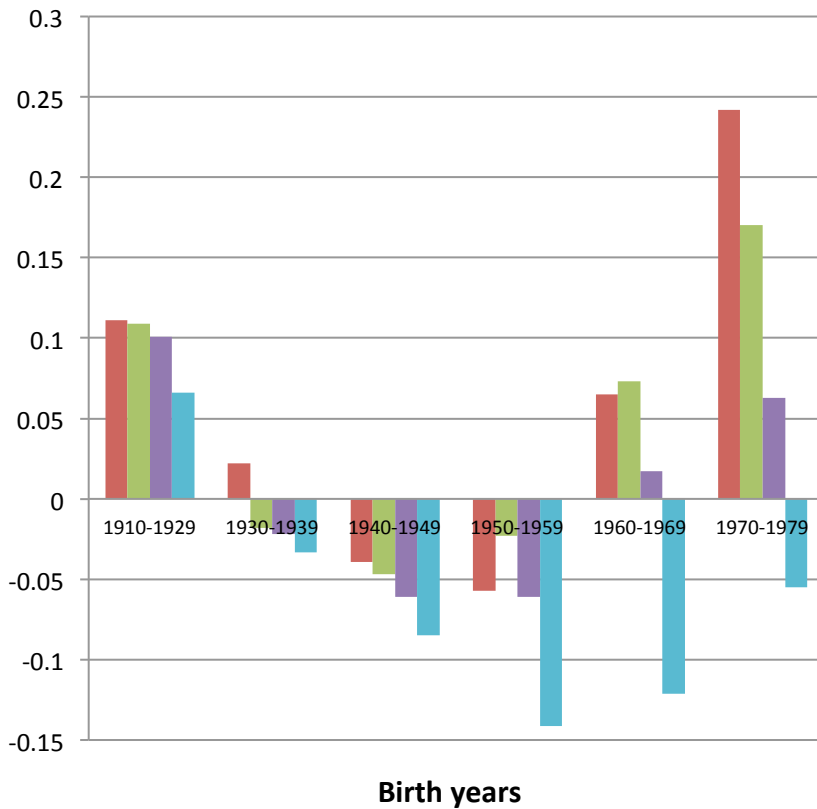
Region/place of residence

GDP per capita (China only)

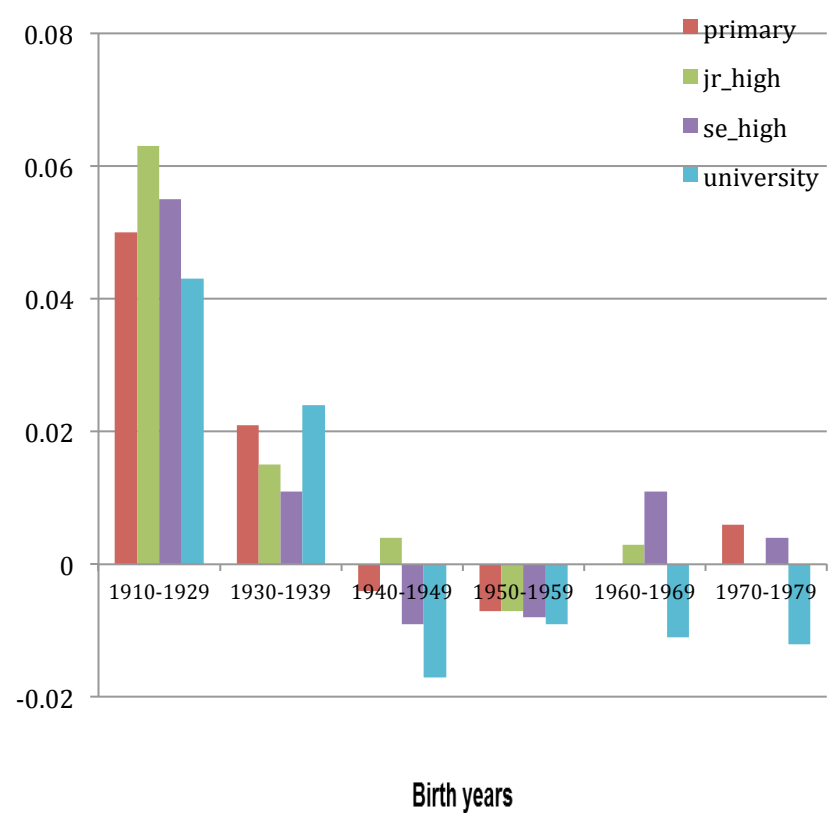
Quadratic time trends

Correlation between Information and Smoking Participation, by birth cohort and education category

Taiwan



China



The linear probability regression model also controls for price, year trend, year square, age, age square, education category, income category, cohort dummy, residency location, ethnicity.

- Life-course smoking pattern in Taiwan and China
 - Initiation
 - A narrow age window for smoking initiation
 - Older cohorts have lower rate of initiation
 - Cessation
 - Younger cohort has faster rate of quitting and they quit at earlier ages
- Influences of information on smoking status by cohort and education category
 - Cohorts before 1929(Taiwan) and 1939(China)
 - no significant difference of information-smoking gradients across education levels
 - Cohorts after 1930 (Taiwan) and 1940 (China)
 - people in highest education category are most responsive to information

Limitation/future research

- Need within region variation!
 - Price, income, unemployment
- Measure of tar/nicotine content
- Measure actual readership/circulation
 - By region/city/demographic group

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