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(分担)研究報告書

大学教育の健康リスク行動に対する影響
－丙午に係る迷信を操作変数とした実証分析－

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研究要旨

We investigated the causal effect of college education on smoking, drinking, sleeping, and cancer screening behavior in Japan. To estimate said effect, we leveraged a unique instrument in which a mismatch between Japanese superstition and school year in 1967 leading to an increase in college education attainment. We found that an additional year of college education led to reductions in smoking and drinking and improvements in sleeping and the use of cancer screening. We also explored heterogeneity across genders and found that women drive the causal relationship between college education and health behavior in Japan. Finally, we found that the causal relationship between college education and health behavior is mediated by better labor market outcomes, not social networks.

A. 研究目的

In 2015, across 25 Organization for Economic Co-operation and Development (OECD) countries, a college-educated person aged 30 years could be expected to live for another 53.4 years, whereas a non-college-educated person of the same age could only be expected to live for another 47.8 years, translating to a 5.6-year difference (OECD, 2017). This difference in life expectancy is consistent with research from past decades, in which higher education has been found to be causally associated with lower mortality (Lleras-Muney, 2005; Clark & Royer, 2013; Fischer et al., 2013; Buckles et al., 2016). Moreover, for instance, based on a rough calculation by Cutler & Lleras-Muney (2006) based on Cutler (2004), the health returns to education increase the total returns to education by 15-55 percent. Cutler and Lleras-Muney (2010) attributed these differences in health to the differences in health behavior between less educated and educated people. However, a substantive debate is ongoing

regarding the extent to which higher education can causally affect health behavior. Specifically, the literature offers little consensus on this relationship. For instance, some studies have found that higher education reduces risky behaviors such as smoking (Kenkel et al., 2006; de Walque, 2007; Grimard & Parent, 2007; Kemptner et al., 2011; Jürges et al., 2011), whereas others have found that higher education does not affect health behavior (Reinhold & Jürges, 2010; Li & Powdthavee, 2015; Silles, 2015; Dursun et al., 2018).

To further our understanding, we investigated the causal effect of education on health behavior in Japan. However, education is associated with unobserved cofounders that can correlate with health behavior, and thus, causality is difficult to establish. To address the endogeneity of education, we pursued an instrumental variable (IV) approach similar to that of previous studies. Relevant studies have leveraged natural experiments, such as compulsory schooling laws, expansionary schooling policy, and Vietnam War draft avoidance, as instruments for education. Compulsory schooling laws exploit the geographic- and time-variation of the minimum age at which individuals must stay in school, which increases an individual's exposure to educational systems; thus, an individual who has experienced a change in compulsory schooling laws would have a higher educational attainment than one who has not (Amin et al., 2013; Dursun et al., 2018; Kemptner et al., 2011; Kenkel et al., 2006; Li & Powdthavee, 2015; Silles, 2015; Xie & Mo, 2014). Another related instrument is expansionary schooling policy (Jürges et al., 2011; Park & Kang, 2008), which mandates an increase in the number of schools operating across geographic locations and time. An increase in the number of schools would allow more individuals to attain higher education; thus, it would effectively increase access to higher education through reduced competition. Regarding draft avoidance, relevant studies have employed Vietnam War draft avoidance as an instrument for college education (Buckles et al., 2013; de Walque, 2007; Grimard & Parent, 2007). Specifically, individuals were able to defer entry into the army to fight in the Vietnam War if they entered college or institutions of higher education (Card & Lemieux, 2001). Therefore, men under the age of 24 years had a strong incentive to attend colleges to avoid the draft, which led to an increase in college educational attainment among American men born in the 1940s and 1950s.

We departed from existing literature by examining a unique natural experiment in Japan that has not been studied before, namely Japanese people's superstitious belief in the zodiac signs. They believe that children born under a specific combination of zodiac signs will have undesirable personality traits that are difficult to deal with. Notably, a specific combination of zodiac signs known as "Firehorse" (FH) occurs every 60 years. Japanese people believe that women born under the FH sign will have a domineering personality that can affect their relationships throughout their lives. This induces parents to

avoid having children in the year of the FH, which resulted in a notably lower birthrate in 1966, the most recent FH year. This lower birthrate significantly reduced competition for college enrollment and improved the learning environment during early education due to smaller classroom sizes, leading to a higher enrollment rate for college institutions among individuals born in 1966, ceteris paribus. However, such a superstition may correlate with unobserved health-related confounders, which in turn may correlate with health behavior. To avoid this selection issue, we took advantage of a mismatch between the Japanese school year – which starts in April each year and ends the following March – and the calendar year. Specifically, we focused on a cohort of individuals born from January to March 1967, who enrolled in college together with those born in 1966 but were not affected by the FH superstition of 1966. Doing so minimized the effect of unobserved confounders associated with the superstition on education and health behavior.

Exploring the relationship between college education and health behavior, we focused on behaviors that are proven to have significant impacts on the health of the population. Specifically, we examined the effect of college education on smoking, drinking, sleeping, and cancer screening behavior. Smoking kills more than 7 million people annually worldwide (World Health Organization (WHO), 2017). Furthermore, poor sleep significantly increases traffic-related mortality (Gottlieb et al., 2018), depression (Tsuno et al., 2005), and cardiovascular diseases (Kronholm et al., 2011; Tobaldini et al., 2017). Moreover, cancer is the second-leading cause of death worldwide (WHO, 2021). The early detection of cancer through screening is beneficial because it significantly improves the survival of cancer patients (Hugosson et al., 2010; Kalager et al., 2010; Olsen et al., 2005).

As a preview, we found that 1 additional year of college education reduces the probabilities of having ever smoked and of being a current smoker by 14.7 and 9.1 percentage points, respectively. Regarding alcohol use, we found that 1 additional year of college education reduces the probabilities of having ever been a drinker and of being a current drinker by 19.1 and 20.8 percentage points, respectively. Moreover, we found that more years of college education have no effect on the probability of having good and adequate sleep. Regarding cancer screening behavior, college education was found to have no effects on the probabilities of getting stomach, lung, and ovarian cancer screenings; however, it was found to increase the probability of getting a breast cancer screening by 35.8 percentage points and a colon cancer screening by 23.3 percentage points. We also found that the causal relationship is mainly driven by women. Finally, we show that more college education predominately improves economic resources, not social networks. In particular, we found that college education increases the probability of being employed, being a fulltime worker, and being a civil servant by 8.7, 16.9, and 12.0 percentage points, suggesting better and stable employment are important meditators for the

causal relationship between college education and health behavior.

Our contribution to the literature is threefold. First, this study would add a new evidence the causal effect of higher level of schooling like college education on health behaviors. Although number of literatures have already shown significant causal impacts of lower levels of schooling on health behavior and/or health outcome, the returns to college education still remains unknown and it would be important for us to understand the heterogeneity of the returns of to various levels and/or qualities of education (Cutler & Lleras-Muney, 2006). Second, we depart from the existing literature by using a mismatch between the school year and a superstition as an instrument for our IV approach, whereas previous studies have used compulsory schooling laws or Vietnam War drafting as an instrument for their IV approach. Existing strategies rely on penalties associated with laws and war to increase educational attainment, whereas our strategy relies on a decline in competition to increase education attainment. This is the first study to leverage this strategy. Third, this is the first study to examine the effect of education on sleeping and cancer screening behavior. We are not aware of any study having examined these behaviors previously.

B. 研究方法

We employed an instrumental variable approach to instrument college education. College education is endogenous in that college education is likely to be correlated with unobserved confounders in the error term, such as parental education. This, in turn, would be correlated with health and behavior of the individual. To alleviate the endogeneity issue, We used the mismatch between the Firehorse superstition that ends at January of 1967 and the beginning of Japanese school year that begins at April of 1967 to instrument college education. The mismatch works as an instrument in that due to a mismatch between the beginning of school year and ending of the Firehorse in 1967. Those born between January and March of 1967 experienced a decline in college competition leading to an increased level of college enrollment. Given this fact, the mismatch can serve as a strong instrument for college education to investigate the causal effect of college education on health behavior in Japan. The data being analyzed is 2016 Comprehensive Living Condition Survey.

C. 研究結果

Overall, we found that the ordinary least squares (OLS) estimates underestimate the effect of college education sustainably. Accounting for endoegenity using two stage least squares (2SLS), we found that longer year of college education significantly reduces smoking, alcohol use, and cancer screening use. Unfortunately, no effect was observed for sleeping behavior. we further stratified the estimates by gender, and we showed that the effect is primary driven by women. Finally, we examined the potential mechanisms behind the relationship: economic resources and social networks. we showed that the mechanism that

is mediating the relationship is though better access to economic resources, such as employment, civil servant job, and full time. That is, college education significantly increased the employment stability of those highly educated compared to those who are less educated.

D. 考察

In this, we employed an instrumental variable approach to examine the causal effect of college education on health behavior in Japan. Using the mismatch between the Firehorse superstition and school year in Japan, we found that college education significant improves the health behavior of the population. Moreover, we found that college education improves access to economic resources, like labor market outcomes, of college-educated but not social networks. This suggests that college-education has benefits beyond the immediate economic benefits. Policymakers wishing to reduce the funding toward education needs to consider the costs and benefits of beyond just economic benefits.

E. 結論

Recently, the public have begun to question the value of college education. Our findings provide an answer to this question by showing that college education has beneficial effects beyond the immediate economic returns to college, such as higher wages and greater job security. And, college education can significantly benefit an individual's health through a reduction in health-disinvestment behaviors and an improvement in health-investment behaviors.

F. 健康危険情報

特に無し.

G. 研究発表

1. 論文発表

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2. 学会発表

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May/2021: Japanese Economic Association (Spring). "Does college education make us act healthier? evidence from a Japanese superstition". Online.

August/2020: Econometric Society World Conference. "Does college education make us act healthier? evidence from a Japanese superstition". Online.

March/2020: GRIPS-UTOKYO Workshop of Economics of Education. "Does college education make us act healthier? evidence from a Japanese superstition". Online.

H. 知的財産権の出願・登録状況(予定を含む)

1. 特許取得

特に無し.

2. 実用新案登録

特に無し.

3. その他

特に無し.

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Table 1. *Summary Statistics*

	All years	1947–1965 and 1968–1980			1967		
	All	Control	Mismatched	Difference: (3)-(2)	Control	Mismatched	Difference: (6)-(5)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years of College	1.419	1.454	1.318	-0.136***	1.530	1.507	-0.023
	(1.898)	(1.913)	(1.850)	(-21.728)	(1.907)	(1.932)	(-0.662)
Ever Smokers	0.305	0.305	0.300	-0.005**	0.330	0.316	-0.014
	(0.460)	(0.461)	(0.458)	(-3.142)	(0.470)	(0.465)	(-1.681)
Current Smokers	0.246	0.247	0.242	-0.005***	0.267	0.257	-0.010
	(0.431)	(0.431)	(0.428)	(-3.790)	(0.442)	(0.437)	(-1.223)
Ever Drinkers	0.687	0.688	0.682	0.713	0.692	0.678	-0.021*
	(0.464)	(0.463)	(0.466)	(0.452)	(0.462)	(0.467)	(-2.562)
Current Drinkers	0.671	0.672	0.665	0.701	0.678	0.687	-0.023**
	(0.470)	(0.469)	(0.472)	(0.458)	(0.467)	(0.464)	(-2.734)
Good Sleep	0.742	0.741	0.752	0.010***	0.674	0.676	0.002
	(0.438)	(0.438)	(0.432)	(6.991)	(0.469)	(0.468)	(0.231)
Adequate Sleep	0.026	0.026	0.025	-0.001	0.034	0.032	-0.002
	(0.159)	(0.159)	(0.156)	(-1.560)	(0.181)	(0.176)	(-0.456)
Stomach Cancer Screening	0.418	0.415	0.423	0.009***	0.443	0.446	0.004
	(0.493)	(0.493)	(0.494)	(5.233)	(0.497)	(0.497)	(0.406)
Lung Cancer Screening	0.472	0.468	0.479	0.011***	0.501	0.512	0.011

	(0.499)	(0.499)	(0.500)	(6.299)	(0.500)	(0.500)	(1.215)
Ovarian Cancer Screening	0.384	0.384	0.378	-0.006**	0.444	0.443	-0.001
	(0.486)	(0.486)	(0.485)	(-2.685)	(0.497)	(0.497)	(-0.096)
Breast Cancer Screening	0.366	0.364	0.365	0.001	0.419	0.447	0.028*
	(0.482)	(0.481)	(0.481)	(0.406)	(0.493)	(0.497)	(2.208)
Colon Cancer Screening	0.401	0.396	0.409	0.013***	0.420	0.447	0.027**
	(0.490)	(0.489)	(0.492)	(7.483)	(0.494)	(0.497)	(2.949)
Women	0.511	0.510	0.515	0.005**	0.517	0.521	0.003
	(0.500)	(0.500)	(0.500)	(3.006)	(0.500)	(0.500)	(0.387)
HH Structure – Couple	0.190	0.189	0.206	0.017***	0.090	0.105	0.015**
	(0.393)	(0.391)	(0.404)	(13.012)	(0.287)	(0.307)	(2.833)
HH Structure – Couple with Children	0.419	0.423	0.398	-0.025***	0.519	0.497	-0.022*
	(0.493)	(0.494)	(0.490)	(-15.318)	(0.500)	(0.500)	(-2.427)
HH Structure – Single with Children	0.065	0.064	0.063	-0.001	0.087	0.079	-0.009
	(0.246)	(0.246)	(0.243)	(-1.527)	(0.282)	(0.269)	(-1.718)
HH Structure – 3	0.145	0.143	0.147	0.003**	0.154	0.166	0.012

Generations							
	(0.352)	(0.350)	(0.354)	(2.851)	(0.361)	(0.372)	(1.887)
HH Structure – Other	0.096	0.095	0.101	0.006***	0.075	0.077	0.002
	(0.295)	(0.293)	(0.302)	(6.599)	(0.263)	(0.266)	(0.414)
Single	0.145	0.149	0.135	-0.014***	0.171	0.162	-0.008
	(0.353)	(0.356)	(0.341)	(-12.204)	(0.376)	(0.369)	(-1.256)
Widowed	0.029	0.029	0.032	0.004***	0.008	0.009	0.001
	(0.168)	(0.167)	(0.177)	(6.762)	(0.091)	(0.096)	(0.556)
Divorced	0.067	0.067	0.067	0.001	0.077	0.077	0.000
	(0.250)	(0.250)	(0.251)	(0.846)	(0.267)	(0.267)	(0.003)
Children Do Not Live Together	0.178	0.175	0.196	0.020***	0.070	0.086	0.016***
	(0.382)	(0.380)	(0.397)	(16.112)	(0.255)	(0.281)	(3.402)
Children Live Together	0.559	0.558	0.547	-0.011***	0.664	0.653	-0.012
	(0.497)	(0.497)	(0.498)	(-6.649)	(0.472)	(0.476)	(-1.364)
Children in Home – Unknown	0.016	0.016	0.017	0.001*	0.014	0.013	-0.002
	(0.126)	(0.125)	(0.129)	(2.402)	(0.119)	(0.111)	(-0.896)
Shared House	0.216	0.220	0.204	-0.016***	0.249	0.237	-0.012
	(0.412)	(0.414)	(0.403)	(-11.514)	(0.432)	(0.425)	(-1.510)
Observations	474872	332531	127490	460021	10540	4311	14851

Column (1) reports the means and standard deviations of the whole sample. Columns (2) and (3) report the means and standard deviations of the

non-1967 years, which were between 1947 and 1980, excluding 1966. Columns (5) and (6) report the means and standard deviations of the sample in 1967. Columns (4) and (7) report the differences between columns (2) and (3) and between columns (5) and (6), respectively. Except for columns (4) and (7), the standard deviations are reported in brackets. For columns (4) and (7), the t-statistics are reported in brackets. Control refers to individuals born between January and March, and mismatched refers to individuals born between April and December.

Table 2. *First-stage 2SLS Estimates for Effect of Years of College Education on Health Behavior*

	(1) Years of College	(2) Years of College	(3) Years of College	(4) Years of College	(5) Years of College	(6) Years of College	(7) Years of College	(8) Years of College	(9) Years of College	(10) Years of College	(11) Years of College
Mismatch × 1967	0.094***	0.094***	0.091***	0.091***	0.084***	0.085***	0.088***	0.092***	0.083***	0.085***	0.093***
	(0.023)	(0.023)	(0.023)	(0.023)	(0.023)	(0.027)	(0.024)	(0.024)	(0.022)	(0.022)	(0.026)
Corresponding dependent variable in the 2SLS *second-stage*:	Ever Smoker	Current Smoker	Ever Drinker	Current Drinker	Good Sleep	Adequate Sleep	Stomach Cancer Screening	Lung Cancer Screening	Ovarian Cancer Screening	Breast Cancer Screening	Colon Cancer Screening
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefectural FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666

Note: The table reports the first-stage 2SLS estimates. Each column reports a different first-stage estimate for a different dependent variable in the second-stage. The main dependent variable is years of college. Years of college education is a continuous variable that equals 0 if respondents graduate with an education level less than high school; 2 if vocational school or short-term college; 4 if bachelor's degree; and 9 if a master's degree or above. Socioeconomic controls include sex, marital status, household type, whether children lived together, and type of house owned. Prefectural FE is a vector of prefecture dummies where surveys were sampled, and survey-year FE is a vector of year dummies when surveys were sampled. Birth-month FE is a vector of month binary variables corresponding to January to December. Birth-year FE is a vector of year binary variables corresponding to the year an individual was born from 1947 to 1980, excluding 1966. The standard errors are clustered at birth month and year levels. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 3. *Effect of Years of College Education on Health Behavior for OLS and 2SLS*

	(1) Ever Smoker	(2) Current Smoker	(3) Ever Drinker	(4) Current Drinker	(5) Good Sleep	(6) Adequate Sleep	(7) Stomach Cancer Screening	(8) Lung Cancer Screening	(9) Ovarian Cancer Screening	(10) Breast Cancer Screening	(11) Colon Cancer Screening
Panel A: OLS											
Years of College	-0.032***	-0.033***	0.010***	0.010***	-0.001	-0.001***	0.029***	0.025***	0.027***	0.028***	0.025***
	(0.002)	(0.002)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
Panel B: 2SLS second-stage											
Years of College	-0.147**	-0.091	-0.191**	-0.208**	-0.030	-0.016	0.001	0.064	0.009	0.358**	0.233**
	(0.074)	(0.065)	(0.083)	(0.084)	(0.071)	(0.026)	(0.076)	(0.071)	(0.141)	(0.156)	(0.092)
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefectural FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F-statistics	135.501	135.501	128.592	128.592	115.288	120.235	103.337	115.598	140.257	138.035	106.282
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666

Note: Panel A reports the OLS estimates, and panel B reports the second-stage 2SLS estimates. Each column reports a different dependent variable. Years of college education is a continuous variable that equals 0 if respondents graduate with an education level less than high school; 2 if vocational school or short-term college; 4 if bachelor's degree; and 9 if a master's degree or above. Socioeconomic controls include sex, marital status, household type, whether children lived together, and type of house owned. Prefectural FE is a vector of prefecture dummies where surveys were sampled, and survey-year FE is a vector of year dummies when surveys were sampled. Birth-month FE is a vector of month binary variables corresponding to January to December. Birth-year FE is a vector of year binary variables corresponding to the year an individual was born from 1947 to 1980, excluding 1966. The standard errors are clustered at birth month and year levels. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 4. *Additional Tests for Instrumental Validity*

	(1) Ever Smoker	(2) Current Smoker	(3) Ever Drinker	(4) Current Drinker	(5) Good Sleep	(6) Adequate Sleep	(7) Stomach Cancer Screening	(8) Lung Cancer Screening	(9) Ovarian Cancer Screening	(10) Breast Cancer Screening	(11) Colon Cancer Screening
Panel A: Without January cohort											
Years of College	-0.100*	-0.054	-0.185**	-0.210**	-0.054	-0.012	0.004	0.095	0.095	0.388**	0.238***
	(0.055)	(0.055)	(0.094)	(0.094)	(0.058)	(0.032)	(0.081)	(0.068)	(0.163)	(0.175)	(0.088)
Observations	414451	414451	415158	415158	413088	312185	400439	399064	204090	204094	398071
Panel B: Overidentified with multiple instruments											
Years of College	-0.147***	-0.091***	-0.187***	-0.204***	-0.052***	-0.020***	0.006	0.064***	-0.007	0.364***	0.230***
	(0.020)	(0.016)	(0.022)	(0.023)	(0.019)	(0.007)	(0.026)	(0.023)	(0.045)	(0.062)	(0.037)
Hansen-J P-values	0.922	0.368	0.315	0.319	0.301	0.306	0.312	0.361	0.308	0.302	0.257
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666

Note: Panel A reports the second-stage 2SLS estimates without the January cohort, and panel B reports the second-stage 2SLS estimates with two instruments. Each column reports a different dependent variable. Years of college education is a continuous variable that equals 0 if respondents graduated with an education level less than high school; 2 if vocational school or short-term college; 4 if bachelor's degree; and 9 if a master's degree or above. Socioeconomic controls include sex, marital status, household type, whether children lived together, and type of house owned. Prefectural FE is a vector of prefecture dummies where surveys were sampled and survey-year FE is a vector of year dummies when surveys were sampled. Birth-month FE is a vector of month binary variables corresponding to January to December. Birth-year FE is a vector of year binary variables corresponding to the year an individual was born from 1947 to 1980, excluding 1966. The standard errors are clustered at birth month and year levels. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 5. *Effect of Years of College Education on Economic Resources and Social networks*

	Economic Resources					Social networks		
	(1) Employed	(2) Large Corporations	(3) Fulltime	(4) Civil Servant	(5) White Collar	(6) Talk to Relatives	(7) Talk to Friends	(8) Talk to Superior
Years of College	0.087*	0.150	0.169*	0.120*	0.043	-0.179	0.028	0.102
	(0.051)	(0.225)	(0.092)	(0.069)	(0.063)	(0.140)	(0.153)	(0.202)
Socioeconomic controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Birth-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Survey-year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Prefectural FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
First-stage F-statistics	112.635	33.481	77.342	68.707	138.655	80.584	80.584	80.584
Observations	473846	257095	254559	281307	332004	237995	237995	237995

Note: All columns report the second-stage 2SLS estimates. Each column reports a different dependent variable. Years of college education is a continuous variable that equals 0 if respondents graduated with an education level less than high school; 2 if vocational school or short-term college; 4 if bachelor's degree; and 9 if a master's degree or above. Socioeconomic controls include sex, marital status, household type, whether children lived together, and type of house owned. Prefectural FE is a vector of prefecture dummies where surveys were sampled, and survey-year FE is a vector of year dummies when surveys were sampled. Birth-month FE is a vector of month binary variables corresponding to January to December. Birth-year FE is a vector of year binary variables corresponding to the year an individual was born from 1947 to 1980, excluding 1966. The standard errors are clustered at birth month and year levels. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table 6. *Additional Robustness Check*

	(1) Ever Smoker	(2) Current Smoker	(3) Ever Drinker	(4) Current Drinker	(5) Good Sleep	(6) Adequate Sleep	(7) Stomach Cancer Screening	(8) Lung Cancer Screening	(9) Ovarian Cancer Screening	(10) Breast Cancer Screening	(11) Colon Cancer Screening
Panel A: Alternative definition of schooling (years of schooling)											
Years of Schooling	-0.047*	-0.029	-0.060**	-0.066***	-0.016	-0.005	0.000	0.020	0.003	0.121***	0.074***
	(0.025)	(0.021)	(0.024)	(0.025)	(0.018)	(0.009)	(0.023)	(0.023)	(0.047)	(0.045)	(0.025)
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666
Panel B: Binary variable of education (=1 if graduated from short-term and technical college or above)											
College or Above	-0.720***	-0.443**	-0.944	-1.026	-0.260	-0.082	0.006	0.309	0.039	1.520*	1.116**
	(0.246)	(0.205)	(0.633)	(0.672)	(0.333)	(0.125)	(0.365)	(0.438)	(0.583)	(0.786)	(0.566)
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666
Panel C: Binary variable of education II (=1 if graduated with bachelor or above)											
Bachelor's or Above	-0.763	-0.470	-0.979**	-1.065**	-0.279	-0.096	0.006	0.330	0.064	2.454	1.253**
	(0.532)	(0.430)	(0.430)	(0.429)	(0.292)	(0.166)	(0.401)	(0.315)	(0.953)	(2.134)	(0.586)
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666
Panel											
Panel D: Alternative imputation of graduate school (imputing graduate school to be 6 years)											
Years of College	-0.168**	-0.103	-0.218**	-0.237**	-0.061	-0.019	0.001	0.073	0.011	0.418**	0.266***
	(0.079)	(0.070)	(0.101)	(0.104)	(0.067)	(0.031)	(0.087)	(0.083)	(0.163)	(0.185)	(0.099)
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666
Panel E: Adjusted for multiple inference											

Years of College	-0.147*	-0.091	-0.191*	-0.208*	-0.054	-0.016	0.001	0.064	0.009	0.358*	0.233*
	[0.068]	[0.195]	[0.065]	[0.065]	[0.380]	[0.437]	[0.814]	[0. 380]	[0.814]	[0.065]	[0.065]
Observations	460888	460888	461631	461631	459327	346646	445306	443738	227297	227337	442666

Note: Panel A reports the estimates using years of college education, panel B the estimates using college or above, panel C the estimates using bachelor or above, panel D the estimates using an alternative imputation for graduate school education level, and panel E the estimates adjusted for multiple inference using the algorithm provided by Anderson (2008). The squared brackets report the adjusted p-values. All panels report the second-stage estimates. Each column reports a different dependent variable. Years of schooling is a continuous variable that equals 0 if respondents graduated with an education level less than junior high school; 3 if high school; 5 if vocational school or short-term college; 7 if bachelor's degree; and 12 if a master's degree or above. Socioeconomic controls include sex, marital status, household type, whether children lived together, and type of house owned. Prefectural FE is a vector of prefecture dummies where surveys were sampled and survey-year FE is a vector of year dummies when surveys were sampled. Birth-month FE is a vector of month binary variables corresponding to January to December. Birth-year FE is a vector of year binary variables corresponding to the year an individual was born from 1947 to 1980, excluding 1966. The standard errors are clustered at birth month and year levels. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

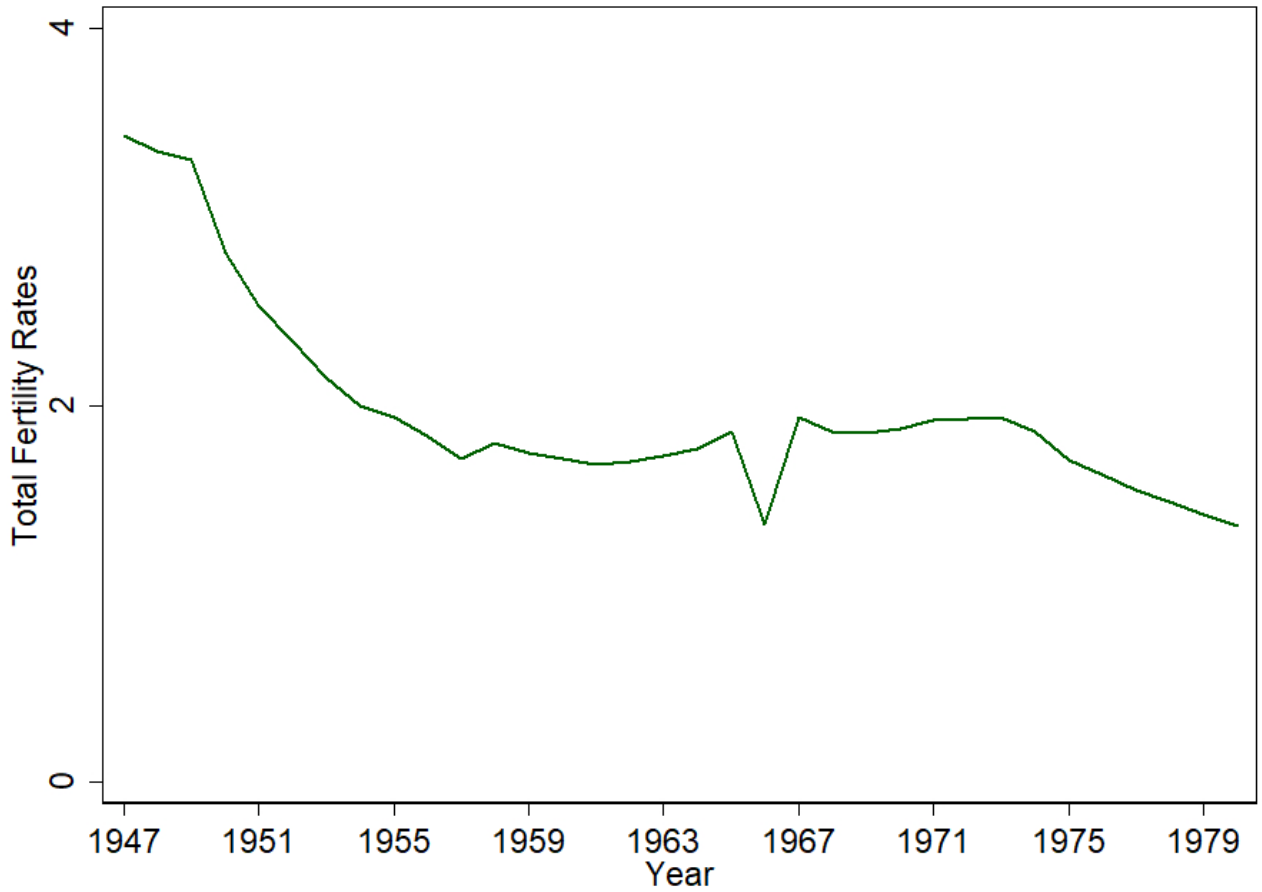

Figure 1. Total fertility rates from 1947 to 1980.
Source: Vital Statistics.

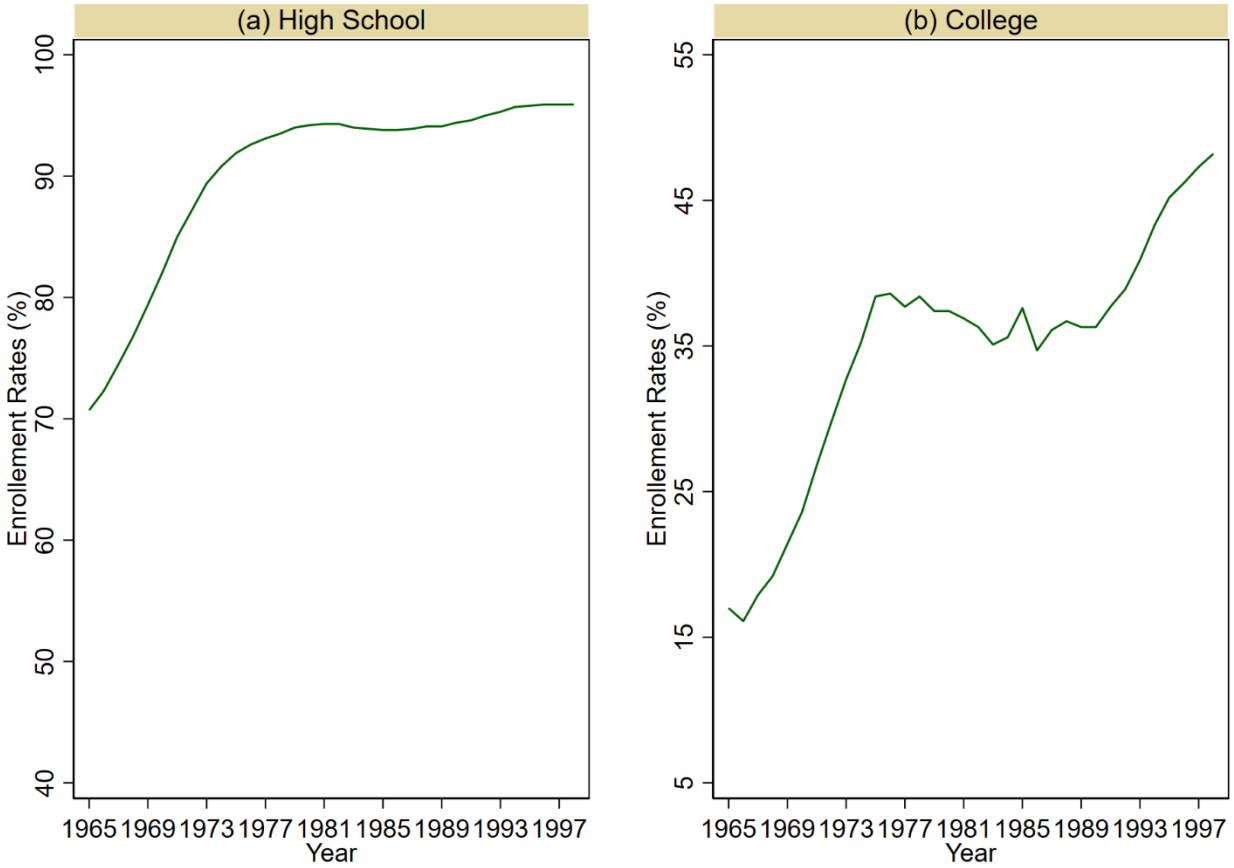

Figure 2. High school and college enrollment rates from 1965 to 1998.
Source: 1954–2008 Education Basic Survey.

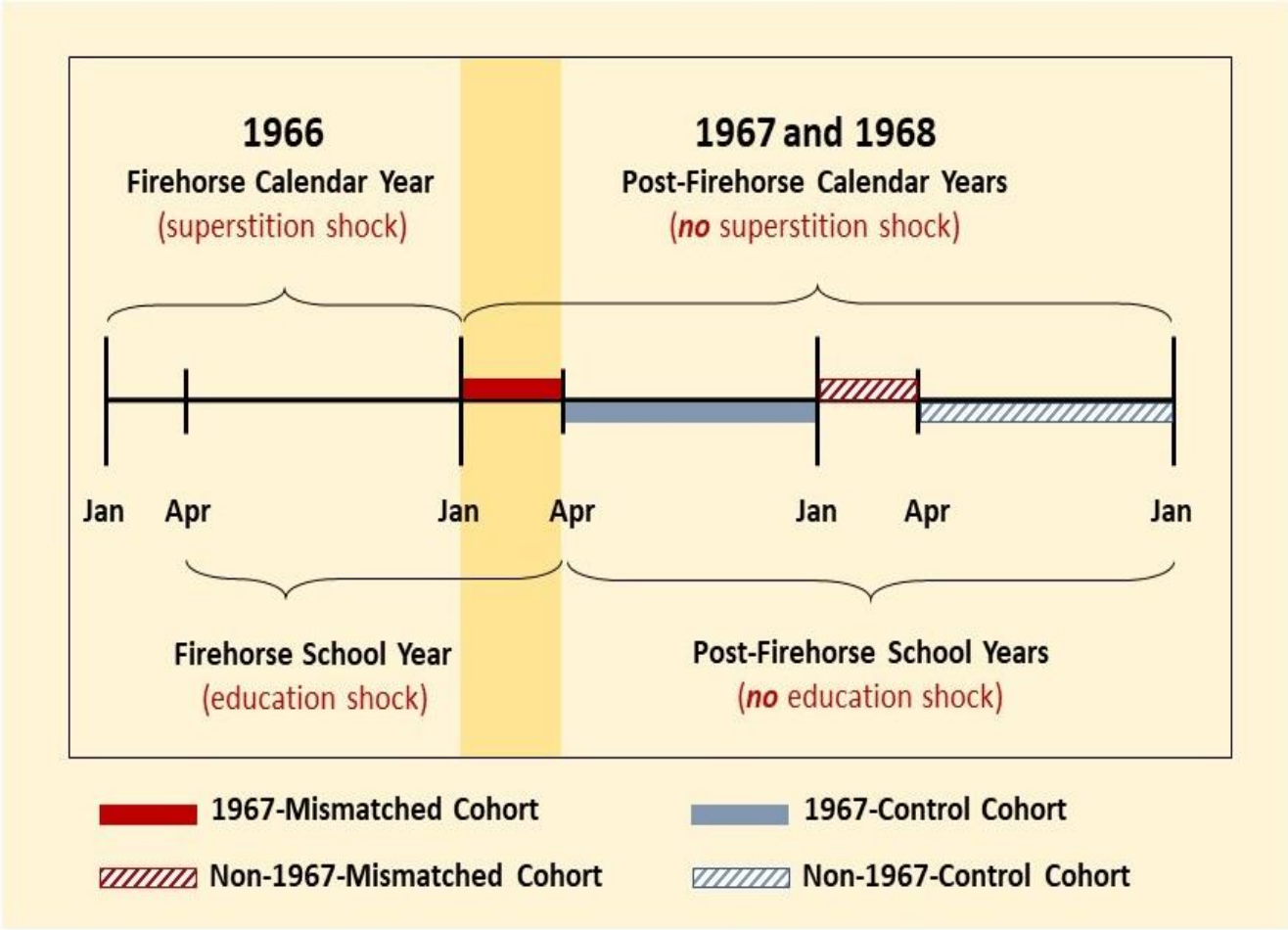

Figure 3. Mismatch between the calendar year and school year in Japan.
Source: Authors.

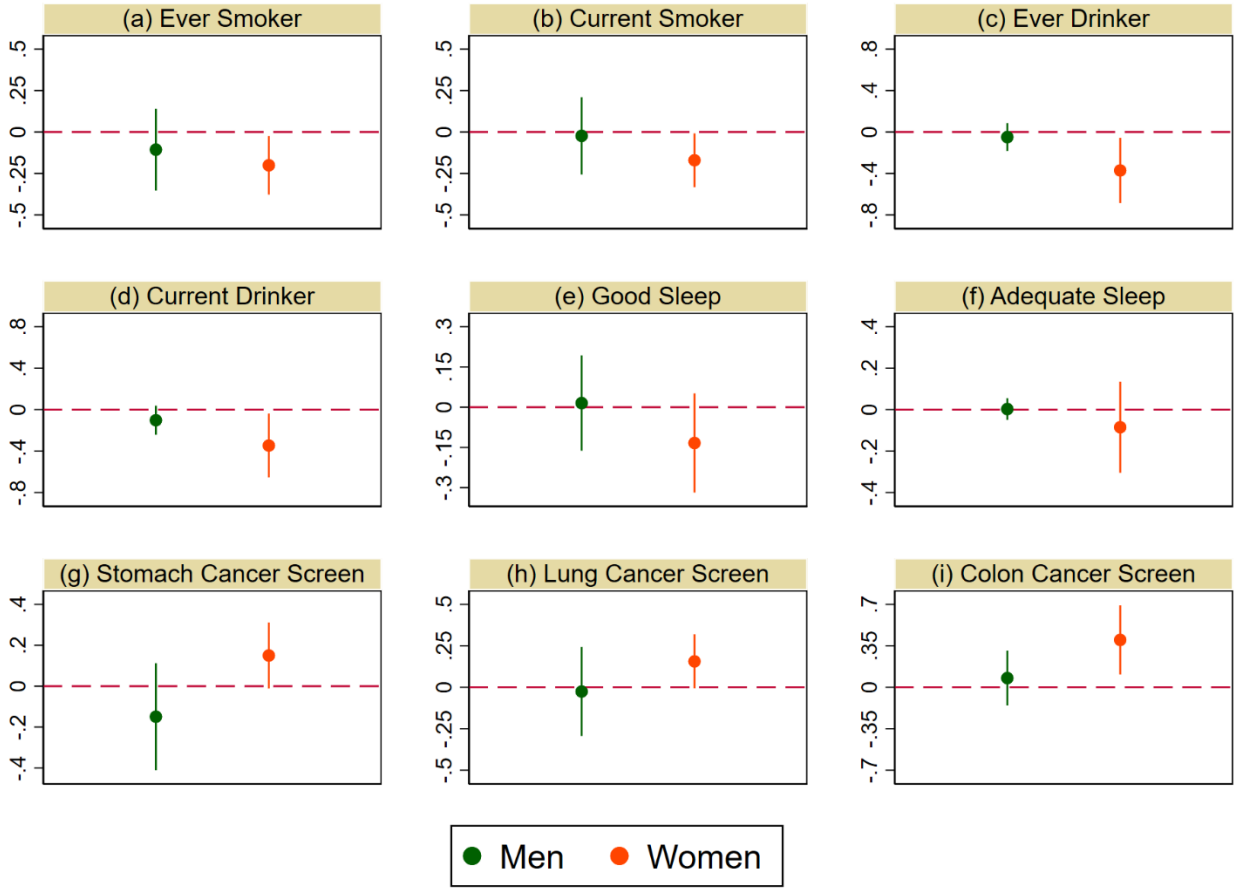

Figure 4. Effect of years of college education on health behavior by gender.

Note: Each panel represents a different dependent variable. Each line represents estimates for each gender. All estimates are the second-stage 2SLS estimates. All regression estimates control for socioeconomic variables, such as marital status and household type, as well as fixed effects. The standard errors are clustered at birth month and year levels.

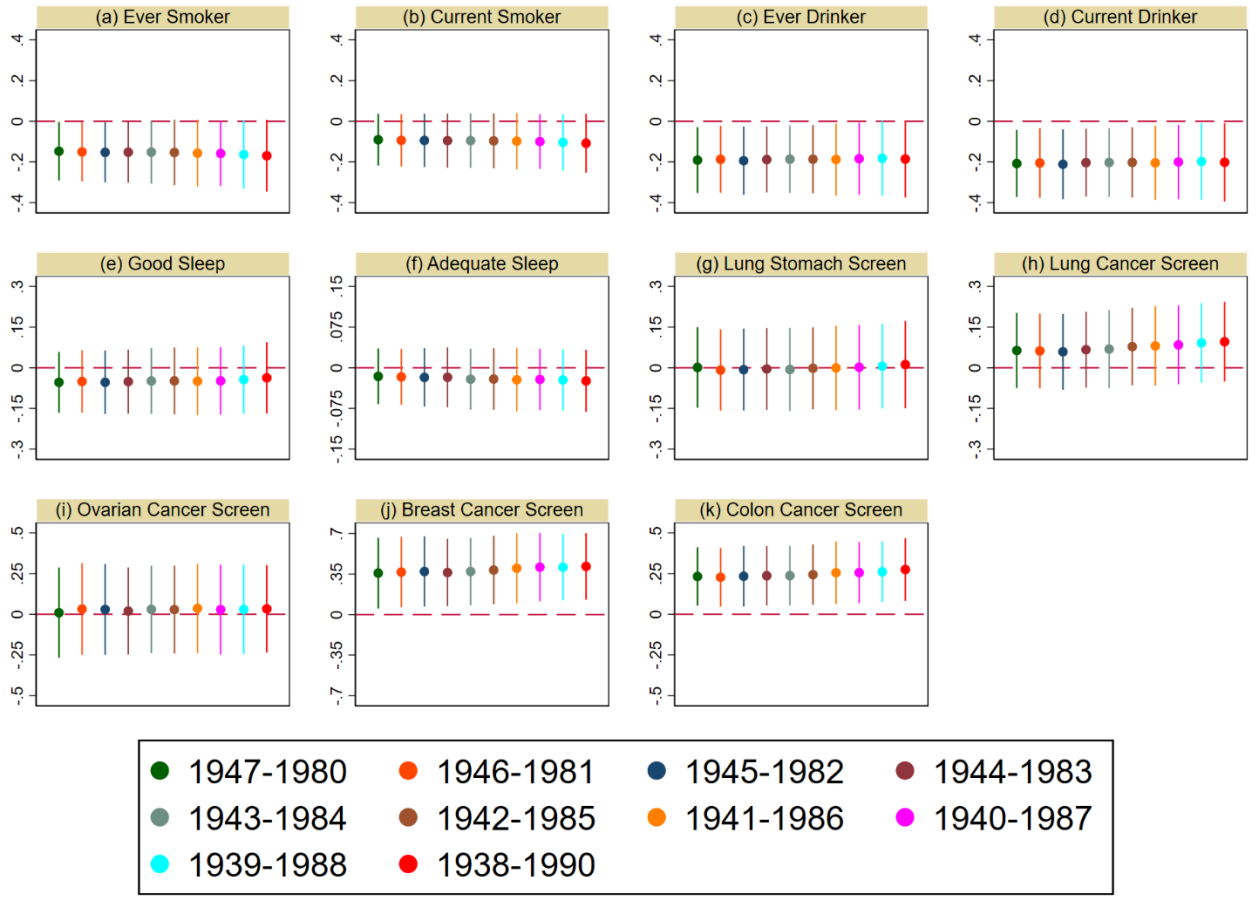

Figure 5. Alternative year ranges: expanding birth year range.
Note: Each panel represents a different dependent variable. Each line represents estimates for a different birth year range. All estimates are the second-stage 2SLS estimates. All regression estimates control for socioeconomic variables, such as marital status and household type, as well as fixed effects. The standard errors are clustered at birth month and year levels.

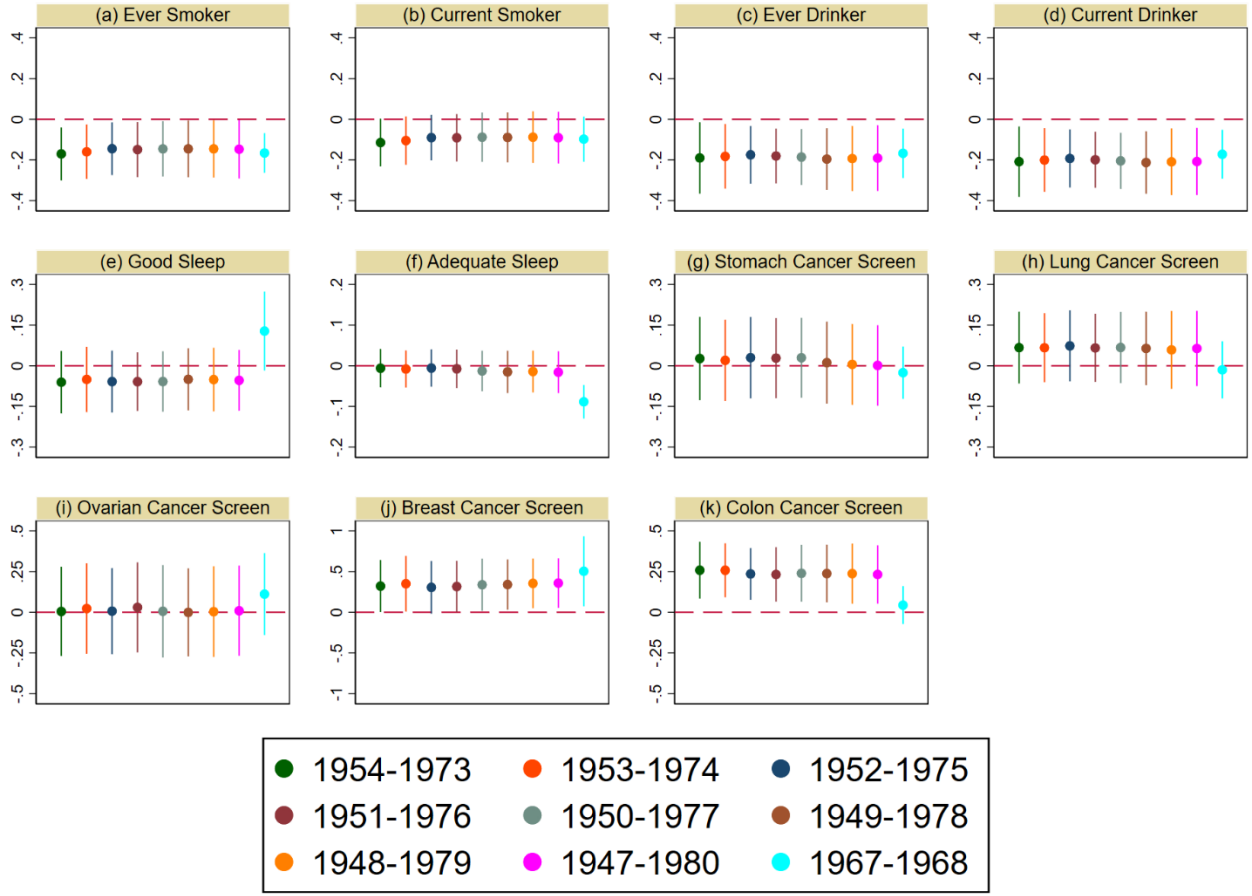

Figure 6. Alternative year ranges: restricting birth year range.
Note: Each panel represents a different dependent variable. Each line represents estimates for a different birth year range. All estimates are the second-stage 2SLS estimates. All regression estimates control for socioeconomic variables, such as marital status and household type, as well as fixed effects. The standard errors are clustered at birth month and year levels.

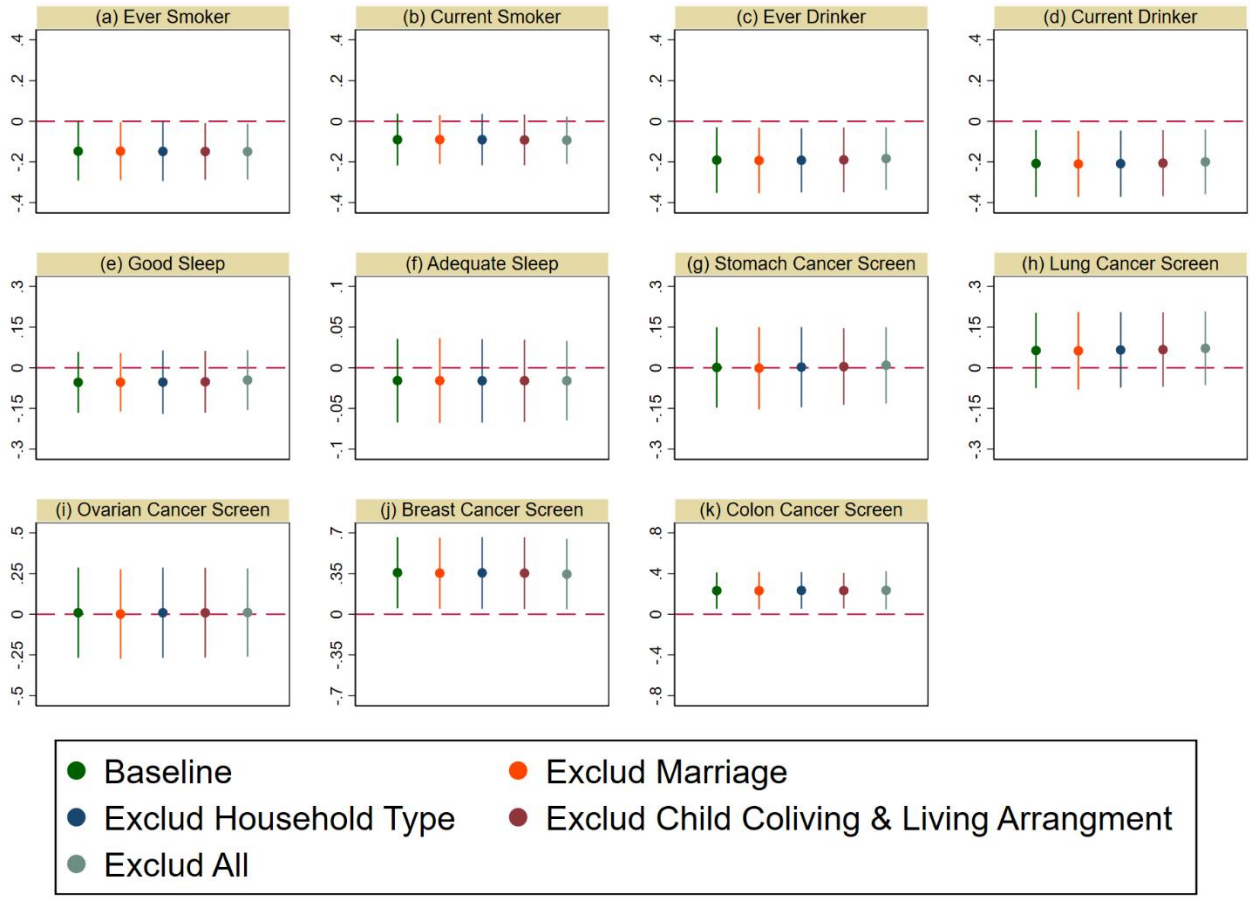

Figure 7. Inferring bias from unobserved omitted variables using observed variables.
Note: Each panel represents a different dependent variable. Each line excludes a different set of variables. All estimates are the second-stage 2SLS estimates. All regression estimates control for socioeconomic variables, such as marital status and household type, as well as fixed effects. The standard errors are clustered at birth month and year levels.

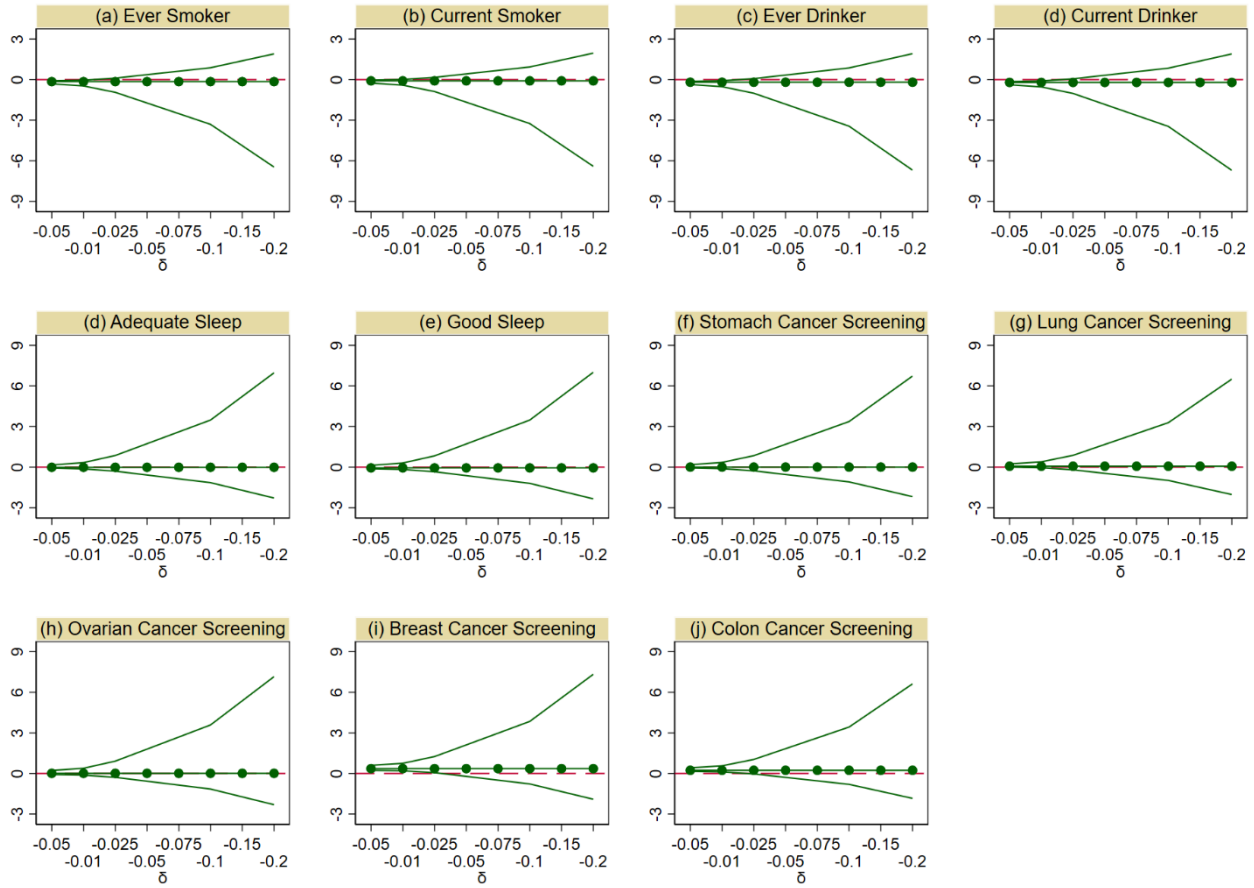

Figure 8. Relaxing the exclusion restriction using the method by Conley et al. (2012).
Note: Each panel represents a different dependent variable. Each figure shows the 95% confidence intervals that correspond to the upper and lower lines generated from the Conley et al.'s (2012) approach, and the point estimates of the original 2SLS corresponding to the midline. The red dash line represents the value of zero. The x-axis is the degree of violation of exclusion restriction, δ. Conley et al. (2012) pioneer the method, and the algorithm used is the local to zero. The distribution of δ is assumed to be Gaussian with mean of δ and variance of δ^2. All regression estimates control for socioeconomic variables, such as marital status and household type, as well as fixed effects. The standard errors are clustered at birth month and year levels.