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Does college education make people politically liberal?: Evidence from a natural experiment in South Korea

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ABSTRACT

Our study examines the impact of college education on individuals' ideological orientations (identifying as politically liberal or conservative) using a massive expansion of opportunities to attend college known as the graduation quota program in South Korea. A 1979 military coup in South Korea mandated that all public and private colleges expand their college admission quotas by thirty percent in 1981 and fifty percent in 1982. As an ideal natural experiment for our study, the mandatory increases in college enrollment happened quickly and exogenously in a short timeframe. We use the birth cohorts that were exposed to this abrupt policy change as an instrumental variable (IV) to identify the long-term effects of college education on political preferences. We find that the enrollment expansion caused those individuals who were induced to attend college by the graduation quota program to be more politically liberal.

1. Introduction

In the past decades, we have witnessed the collapse of several dictatorships in the Middle East and North Africa, also known as the Arab Spring. Even though many of those new democracies are not entirely consolidated yet, citizens are more concerned with the democratic political process, reflecting "the people's power". Meanwhile, it has been observed that college students exerted a major influence. In Egypt, for example, the violence and fraud of the general election which delivered President Mubarak's party 83% of Parliament unleashed Egyptian democratization in 2011 (Sallam, 2014). Particularly, college students were at the forefront in the Egyptian democratization movement.

Allegedly, young people in the Arab region have complained about low wages, high unemployment and growing living costs. Thus, it appears that such dissatisfaction partly motivated them to protest against their authoritarian government. The more important aspect, however, is the fact that they did not just conform to these poor economic circumstances, but they became aware of something wrong in their political system and pursued political reform. That is why the Arab Spring could be seen as democratization movement which has some universality among non-Western societies (Eom, 2011). Similarly, the Orange Revolution in Ukraine in 2004 and the Jasmine Revolution in Tunisia in 2010 both led to democratization. At the same time, Saudi Arabia experienced societal transformations driven by well-educated young people such as women's full right as citizens exercising suffrage in 2011 (Thompson, 2017).[1]

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[1] There have been growing opportunities for young people to experience Western-style higher education in Saudi Arabia. Thus, we carefully make a conjecture that they have been learning how democratic political system should work and how their own system underperformed (Jones, 2015; Koch, 2014).

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In Western societies, anti-war movements and civil right movements during the 1960s and 1970s in the United States, as well as events in May 1968 in France to resist existing social order including authoritarianism and conservatism, are prominent examples of social movements led by students and intellectual individuals in earlier years. Therefore, it is implied that these social changes were mainly driven by the rising generation and college students, regardless of geographic issues and differences.

Similarly, in South Korea, which we are focusing on, college students were highly involved in democratization movements during the authoritarian regimes. Particularly in 1987, enraged citizens, most notably college students and citizens with college education, rose up to fight for an amendment to the constitution, calling for a direct presidential election in South Korea. These historical events imply that college education plays a major role in democratization and consolidating democracies.

This study is interested in whether college education affects citizens' political ideology defined in the liberal-conservative dimension. Assuming that being politically liberal means individual ideological orientations to bring change of the current status of society, our findings may provide an important implication to the more practical question of whether college students and people who have graduated from college become politically more liberal and more likely to fight against authoritarian regimes. However, it has been difficult to show the causal relationship between college education and ideological orientations because the two factors are highly endogenous. For example, it is plausible that students with parents who have more economic resources and who are politically conservative may have a higher chance of going to college. If so, this would lead to negative bias in OLS estimation. On the other hand, Selznick and Steinberg (1969) and Lipset (1976) pointed out that those who majored in social science and humanities are likely to be more liberal than students in natural sciences or at professional schools. It would imply that more liberal student might be drawn to more liberal majors. Such self-selection behaviors among individuals could lead to estimation bias when we examine the effect of college education on liberal tendency by applying a typical OLS analysis. Due to this empirical challenge, the impact of college education on individuals' ideological orientations has been discussed in theory but has not been rigorously tested. Careful and rigorous investigation of this causal relationship would shed a light on understanding citizens' political predisposition.

This study focuses on identifying the causal impact of college education on ideological orientations (being politically liberal or conservative) by taking advantage of a massive expansion of opportunities to attend college, known as the graduation quota program in South Korea. A 1979 military coup in South Korea led to this policy intervention that all public and private colleges expand their college admission quotas by thirty percent in 1981 and fifty percent in 1982. These mandatory expansions lasted until 1985. This obligatory increase in college enrollment happened quickly in a short period, which is considered to be an ideal exogenous intervention to draw on as a natural experiment for our study. We use birth cohorts differently exposed to this sudden policy change as an instrumental variable (IV) to identify the long-term effects of college education on political preferences. In other words, our empirical strategy infers the college effect on individuals' political attitudes by utilizing the graduation quota program as an exogenous intervention to filter out the effect of college education itself.

Our study finds that the enrollment expansion caused those individuals, who were induced to attend college by the graduation quota program, to be more politically liberal. Our local average treatment effect estimates using the birth cohort IV are much larger than the OLS estimates, which confirm negative bias in OLS estimates. This paper provides direct relevance for other developing countries that need mature political environments for well-run democratic system.

The rest of this study proceeds as follows. This next section covers previous studies. The third section explains the graduation quota program in South Korea. The fourth section describes the data and presents descriptive statistics. The fifth section provides the statistical models and the sixth section explains empirical results. The concluding section discusses the results and their implications.

2. Previous studies

2.1. Ideological orientations

Political ideology refers to a set of beliefs on the normative values and proper order of society, and as a whole, the way how they should be achieved (Denzau and North, 1994; Erikson and Tedin, 2015). It is a framework shared by groups of individuals who use it to interpret society and suggests how it should be. Such sets of beliefs or attitudes have been conceptualized along a single continuum as left-right or liberal-conservative dimension. With respect to this left-right or liberal-conservative orientation, political ideology concerns the stability of political orders and it stems from primary human predispositions in social life (Jost et al., 2009a).[2] On the other hand, Converse (1964) offered an early definition of political ideology in the name of "mass belief system". According to his seminal work, ideology is a "configuration of ideas and attitudes in which the elements are bound together by some form of constraint or functional interdependence" (Converse, 1964). The former perspective on ideology regards ideology as the framework to understand and even rationalize current societal arrangement while the latter point of view emphasizes congruent attitudes on specific issues. Nonetheless, even if they take somewhat different viewpoints, political ideology from both perspectives could converge on left-right or liberal-conservative dimension.

[2] Since the era of the French Revolution, political ideology has been classified in terms of a single left-right dimension, as stated above (Carlisle, 2005; Jost et al., 2009b). This classification of ideology stemmed from a historical event in the late eighteenth century where the proponents who advocated the status quo sat on the right side of the French Assembly hall and its opponents sat on the left. In the United State, it has been gradually replaced by a liberal-conservative dimension. Therefore, political ideology can be classified on a continuum which contains the range of opinions from maintaining status quo to changing the current state of the society (Fuchs and Klingemann, 1990; Lipset and Raab, 1978; McClosky and Zaller, 1984; Rathbun, 2007).

Ideological orientations along the liberal-conservative continuum serve core aspects which are common across most societies and contexts as well as peripheral aspects which vary depending on the culture, historical contexts, and social cleavages in a given society at a given time (Lipset and Rokkan, 1967; Rae and Taylor, 1970; Jost et al., 2003; Jost, 2006). For example, previous studies have examined various aspects reflected by political orientations in the ideological continuum, such as citizens' attitudes towards civil liberties (Stouffer, 1955; Nunn et al., 1978), anti-Semitism (Selznick and Steinberg, 1969; Lipset and Schneider, 1978; Weil, 1985), political tolerance (Bobo and Licari, 1989; Golebiowska, 1995; Sullivan et al., 1994; Lawrence, 1976), democratic value (McClosky, 1964), anti-authoritarianism (Lipsitz, 1965; Kohn, 1969; Simpson, 1972), hawkish-dovish position (Sharvit et al., 2010), system-justifying or advocating status quo attitudes in a capitalist system (Jost et al., 2008), attitudes on social and cultural issues (Fiorina et al., 2011; Jost et al., 2008), pros and cons on redistributing income or implementing social program (Bardes and Oldendick, 2003; Mayer, 1992), and political liberalism (Lipset, 1981; Inglehart, 1977).

In the context of Korean politics, in particular, previous studies have identified that political ideology has been mainly comprised of a confrontation between authoritarian regimes and democratization movements as well as the attitudes towards North Korea (Kang, 2003; Kim and Lee, 2005; Park et al., 2012). These two fronts in political ideology have been developed by historical experiences of Korean people, such as the Cold War between South and North after the Korean War and the authoritarian regimes followed by the military coup.[3] Especially, democratization was the most prominent aspect until the 1987 democratization movement yielded the free presidential election after the lengthy authoritarian regimes from the 1960s–1980s.

Ultimately, although the country-specific components play a role in ideology, it is generally assumed that citizens' self-placement of ideological orientations have worked mainly on the single liberal-conservative ideological spectrum. This single continuum has been considered to be a reliable tool, providing parsimonious utility in many studies of social science which has focused on public opinion and political view (Wyckoff, 1980; Jacoby, 1988; Zaller, 1992; Abramson et al., 1982; Benoit and Laver, 2006; Haltom, 1990; Inglehart and Klingemann, 1976; Knight, 1999; Miller et al., 1976; Nie et al., 1976; Sani and Sartori, 1983; Stokes, 1963; Zschirnt, 2011).

2.2. College education and political ideology

With a broad consensus on the concept of ideological orientations and its theoretical properties, a wide range of empirical studies have concentrated on the effect of political ideology on individuals' political behavior and their opinion on political values (Converse, 1964; Ellis and Stimson, 2009). A considerable number of empirical studies have verified the effect of individuals' ideological orientations on political evaluation and political decision-making including vote choice in elections (Downs, 1957; Rabinowitz and Macdonald, 1989). However, only a few studies have examined how citizens place their ideological stance on the liberal-conservative dimension. Among those, the aging effect or life cycle effect has drawn attention to public opinion in existing research. For example, researchers have found that as citizens get older, they become more inclined towards conservative parties (Erikson and Tedin, 2015).

Higher education has long been considered relevant to people's political attitudes including ideology. Some studies theoretically argue that education may cause people to be more liberal through increased awareness, indoctrination, and enlightenment through the process of socialization in colleges although such theories do not apply to all contexts.[4] First, college educated people might have more awareness about social issues. According to Erikson and Tedin (2015), their deeper political knowledge and better use of media help them to act for social changes for women, racial minorities, and other socially disadvantaged individuals against conventional norms.

Second, college students might be influenced by indoctrination of liberal college faculty. It has been found that liberal faculty usually outnumber conservative faculty, and these liberal faculty tend to push their values on students, bringing about a left-skewed educational process (Bauerlein, 2004; Klein and Stern, 2004; Zipp and Fenwick, 2006). Thus, students would be socialized and educated under ideologically liberal circumstances in colleges. However, there are limitations to this theory since liberal college faculty are only found in some political settings. For example, in the United States, universities and colleges in the South states, military academies and religious-backed institutions may have more conservative faculty.

Lastly, and most importantly, the enlightenment argument asserts that education leads to enlightenment, which in turn leads to liberalization. It seems that college-educated citizens are more likely to reject stereotypes and prejudice, and they can promote tolerance of diverse life styles and social issues (Adorno et al., 1950; Lipset, 1981; Kohn, 1969). In addition, the better-educated are able to escape the folk culture related to intolerance, by being exposed to less-prejudiced enlightenment (Stember, 1961; Selznick and Steinberg, 1969; Lipset and Raab, 1978).

In this regard, some empirical studies reported the positive effect of higher education on ideologically liberal orientations. As stated above, they have been concentrated on citizens' attitudes on civil liberties (Stouffer, 1955; Nunn et al., 1978), political tolerance (Bobo and Licari, 1989; Golebiowska, 1995; Sullivan et al., 1994; Lawrence, 1976), democratic value (McClosky, 1964), anti-anti-authoritarianism (Lipsitz, 1965; Kohn, 1969; Simpson, 1972), and political liberalism (Lipset, 1981; Inglehart, 1977) as dependent variables signifying ideologically liberal orientations. According to them, those who are more educated tend to show more

[3] As has been shown in introduction, liberal-conservative ideology found in some countries which have recently experienced democratization seems to be more related to pros and cons of authoritarianism.

[4] This may apply to some countries, but not all. For example, the education systems of the Soviet Union or Maoist China have actively sought to control pedagogy at all levels to indoctrinate students into a more conservative ideology. Also, there is plenty of research about religious education models, which do not embrace, but challenge European "enlightenment" ideals.

support for these liberal attitudes than those with less education.

However, Jackman (1978) argued that the more educated are merely aware of what is the "right" answer. This concern would be more problematic if liberal attitudes are measured by some concepts which are not value-neutral such as tolerance, democratic values, or anti-authoritarianism. This is why we focus on liberal-conservative orientations defined in the more general context and involved in attitudes on authoritarian regimes and democratization in the context of Korean politics. Moreover, these earlier studies show only an association between people's higher education and their ideological orientations by applying an OLS regression analysis without considering selection bias. These methodological challenges might have contributed to no effect of education on liberal attitudes in some countries (Jackman and Muha, 1984; Weil, 1985). Thus, it seems that any empirical evidence of a causal relationship between higher educational attainment and liberal attitudes has not been found thus far.

To enhance our understanding of the relationship between education and ideological self-identification, this study investigates whether college education affects citizens' ideological orientations (being politically liberal or conservative), using a massive expansion of opportunities to attend college in South Korea. The findings of our study provide deep knowledge related to the causal link between education and political ideology, and encourage more future research.

3. The graduation quota program in South Korea

In South Korea, the central government has controlled the college admission process of public and private universities, including the number of admissions to each school. There have been several major changes in college admission policies driven by the central government and this study uses a graduation quota program that increased the admitted students to universities by more than thirty percent in 1981 and the following years.

On October 26, 1979, the Korean CIA director Jae-gyu Kim assassinated president Chung-hee Park who became a dictator by changing the constitution in 1972 and allowing himself to control all the political power in South Korea. Taking advantage of the political turmoil after the assassination, General Doo-hwan Chun successfully took political power through a military coup in 1979 and launched the Special Committee for National Security on December 12, 1979, which was a super-constitutional legislative body. As part of socio-economic reform, the graduate quote program was announced by this committee on July 30th, 1980, which was intended to expand the opportunity of higher education to the public and to improve the quality of higher education. Through this program, General Chun's regime forced all colleges to admit more students, 130% of each school's present admission level in March 1981 (the first month of the 1981 academic year in South Korea). This expansion was increased up to 150% in 1982 and afterwards.

Universities followed the order by lowering the admission scores to allow more students to be admitted. The Chun's regime also required tougher graduation guidelines of those admitted students to encourage the academic efforts of college students. In other words, the Chun's regime designed the program to admit more students but to let fewer students graduate by removing students who had poor college grade point averages (GPA). Contrary to the initial plan, the program admitted more students but failed to drop students with poor academic outcomes because universities, students and their parents were consistently against it (Kang, 1986). As a result, more people completed college education through this program.

It is also important to understand the broader influence of the Korean government on college education beyond the graduation quota program during that period. Although the authoritarian regime did not control the content of university courses, it closely monitored and suppressed college student protests as well as the free speech of faculty members. Specifically, the regime banned any student activities and monitored students using undercover cops on campus since it worried that student gatherings or protests would trigger new democratic movements (Chung, 2011; Kwag, 2015; Lee, 2013). Also, the regime censored the speech and writing of prominent figures including faculty members who attempted to criticize the authoritarian policies (Korea Democracy Foundation, 2010; Lee, 2013). During this period, many college students and faculty members resisting the regime were arrested and imprisoned.

In 1985, after many complaints about the program, the government decided to give more discretion to colleges and universities in enrollment size between 100 and 130 percent of their 1979 enrollment levels. Finally, in 1988, a newly elected president abolished the graduation quota program and allowed colleges and universities to admit any number of students below the upper bound of the total number of students set by the government. Since then, however, the national college admission level had kept rising during the 1980s and 1990s. As a result, although the graduation quota program was introduced and implemented by a military coup regime in South Korea, the program opened the elite higher education to the public by increasing access to higher education.

The graduation quota program directly affected students who applied for college admission in 1981. Among those applicants, some of them graduated from high school in 1981 but a large number of students graduated one or two years before. College admissions were highly competitive in South Korea during the 1970s and 1980s and it was common for students to apply for the college admission over multiple years after high school graduation. For instance, 40.5% of students applying for college admission in 1981 were students who failed to get admitted before.[5] Thus, the graduation quota program affected students who graduated from high school not only in 1981 but also at least in 1980 and 1979. This study pays attention to the spill-over effects of the program later in the empirical analysis.

[5] Please refer to an article in the Kyunghyang newspaper posted at: < http://newslibrary.naver.com/viewer/index.nhn?articleId = 1980070800329207010&editNo = 2&publishDate = 1980-07-08&officeId = 00032&pageNo = 7&printNo = 10699&publishType = 00020& from = news > .

Table 1
Descriptive statistics of the analysis sample (N = 1463).

	Mean	Std
Ideological scale (1–5) [1]	2.920	0.990
Ideologically liberal (=1) [2]	0.321	0.467
Some college or more (=1)	0.419	0.494
Male (=1)	0.485	0.500
Father: high school graduate (=1)	0.161	0.367
Father: some college or more (=1)	0.113	0.317
Mother: high school graduate (=1)	0.089	0.285
Mother: some college or more (=1)	0.017	0.130
Age in years	47.487	3.284

Notes: The analysis sample consists of men and women who were born from 1958 to 1962[1]; Ideological scale consists of 1 for most conservative, 2 for conservative, 3 for moderate, 4 for liberal, and 5 for most liberal [2]; Being ideologically liberal is 1 if ideological scale is 4 or 5 and is 0 if ideological scale is 1, 2 or 3.

4. Data

This study uses the 2003–2013 KGSS (Korea General Social Survey) data for statistical analysis. The KGSS data are repeated cross-sectional data that are based on a nationally representative, face-to-face interview survey including respondents' opinions on political issues and social values as well as their demographic information. The sampling and interviewing method comes from GSS (General Social Survey) in the United States which has long been considered relevant and reliable. Therefore, a wide range of studies have used KGSS data to deal with Korean social science questions (Chi et al., 2013; Ha and Kim, 2013; Hong and Kang, 2017; Hundt, 2016). This study pooled KGSS survey datasets from 2003 to 2013 which contained similar questions that are easily combined. As a result, our research becomes more reliable with enough observations to fit the IV regression model.

Rich information contained in the data allows us to generate the major variables for the study. First, the dependent variable is the respondents' ideological orientations reported with 5 categories as follows: 1 for very liberal, 2 for somewhat liberal, 3 for moderate, 4 for somewhat conservative, and 5 for very conservative. For the analytical convenience, the ideological scale variable is generated by recoding this variable to 1 for very conservative, 2 for somewhat conservative, 3 for moderate, 4 for somewhat liberal, and 5 for very liberal. We also create another outcome variable by dichotomizing their responses; ideologically liberal = 1 for very liberal and somewhat liberal while Otherwise = 0 for moderate, somewhat conservative, and very conservative.

The key variables in our research design are college education and birth cohort. We use a question about the respondents' final education and recode this education variable as a binary variable, 1 for some college or more and 0 for otherwise. We use a question asking respondents' birth age to make cohort variables. These cohort variables are used to sort each respondent' college entrance year by calculating backward according to the Korean educational system. So, we use five birth cohorts, 1958–1962 (aged 19 when individuals graduated from high school in 1977–1981). The array of cohorts plays a role to distinguish the different policy exposure of students. In addition, out statistical model includes several control variables which might be considered influential on respondents' ideological tendency: gender (male = 1); age in years; father's education using high school graduation (=1) and college education (=1) with less than high school as a reference group; mother's education using high school graduation (=1) and college education (=1) with less than high school as a reference group.

Table 1 presents the descriptive statistics of our analysis sample of men and women who were born in 1958 (aged 19 in 1977) to 1962 (aged 19 in 1981). The mean of ideological scale (1 for most conservative to 5 for most liberal), 2.92, indicates that individuals in the analysis sample are close to moderate on average while about 32% of the sample is politically liberal. About 42% is educated up to some college or more and about 49% is male. Their father's education level is higher than mother's education; about 28% of the respondents' fathers are a high school graduate or more while only about 11% of mothers are high school graduate or more. Individuals in the analysis sample are about 48 years old.

4.1. College attendance by birth cohorts

Table 2 shows the percentage of people with an education level of some college or more (third column) and its change by birth cohorts (fourth column) that were differently exposed to the graduation quota program. In the second column, the calendar years at age 19 when individuals graduated from high school are also presented. College education rates dramatically increased from about 34% in the 1958 birth cohort to about 49% in the 1962 birth cohort. As shown in the fourth column, there is no significant increase in the rate of college attendance between the 1958 and 1959 birth cohorts. However, the sharp jump in the college education rates happened in the 1960 (aged 19 in 1979) and 1961 (aged 19 in 1980) birth cohorts, 7.9 and 11.6 percentage points, compared to the 1958 birth cohort. These college education rates are statistically significant at $p < 0.1$ and $p < 0.01$, respectively. They are about 23%–34% increases when compared to the 1958 birth cohort.

After the 1960 birth cohort, the difference in the rate of college attendance between each birth cohort and the oldest birth cohort (born in 1958) becomes wider. It is evident that although the graduate quota program started in the 1981 academic year when the 1962 birth cohort graduated from high school, this program also affected the 1960 and 1961 birth cohorts who graduated from high

Table 2
College education rates by birth cohorts (N = 1463).

Birth	Year at Age 19		Difference
Year	(Year at High School Graduation)	Some college or more	from the 1958 birth cohort
1958	1977	0.344	0.000
1959	1978	0.357	0.013
1960	1979	0.423	0.079*
1961	1980	0.460	0.116***
1962	1981	0.489	0.144***

Notes: ***p < 0.01, **p < 0.05, *p < 0.1; The 1960, 1961 birth cohorts are shaded to show the sharp change in the rate of some college or more.

Table 3
Ideological Orientations by birth cohorts (N = 1463).

Birth Year	Year at Age 19 (Year at High School Graduation)	Ideological scale (1–5)[1]		Being politically liberal (=1)[2]	
		1 for most conservative to 5 for most liberal	Difference from the oldest cohort	1 for politically liberal and 0 for otherwise	Difference from the oldest cohort
1958	1977	2.824	0.000	0.279	0.000
1959	1978	2.848	0.024	0.272	−0.007
1960	1979	2.926	0.103	0.321	0.042
1961	1980	3.003	0.179**	0.364	0.086**
1962	1981	2.971	0.147*	0.354	0.075*

Notes: ***p < 0.01, **p < 0.05, *p < 0.1; The 1960, 1961 birth cohorts are shaded to show the sharp change of the ideological orientations [1]; Ideological scale consists of 1 for most conservative, 2 for conservative, 3 for moderate, 4 for liberal, and 5 for most liberal [2]; Being ideologically liberal is 1 if ideological scale is 4 or 5 and is 0 if ideological scale is 1, 2 or 3.

school in 1980 and 1979. As mentioned earlier, this seems to be driven by the fact that students in South Korea usually applied for the college admission one or two more years if they failed to get a college admission immediately after their high school graduation.

4.2. Ideological orientations by birth cohorts

Table 3 presents the ideological scale (third column), the percentage of people who identify as ideologically liberal (fifth column), and their changes by birth cohorts (fourth and sixth columns), compared to the oldest cohort born in 1958. Previous studies usually found that younger people are more liberal than the older people (Erikson and Tedin, 2015). However, Table 3 shows that the small age difference may not generate the ideological difference between older and younger people while the different exposure to the college education between birth cohorts could be responsible for the difference in ideological orientations. Specifically shown in this table, there is no significant difference in ideological orientations between the 1958 (older) and 1959 (younger) birth cohorts. For these birth cohorts, the mean of the ideological scale is about 2.82 in 1958 to 2.85 in 1959 and the average proportion of being ideologically liberal is about 27.9 percent in 1958 and 27.2 percent in 1959. The sharp increases in the average ideological scale and the proportion of ideologically liberal people are noticed among the 1960 birth cohort (age 19 in 1979) and afterwards. Particularly, the sharp jump in the 1960 and 1961 (aged 19 in 1979 and 1980) birth cohorts are about 0.103 (statistically insignificant) and 0.18 (statically significant at $p < 0.05$) in the political ideology scale as well as about 4.2 (statistically insignificant) and 8.6 percentage points (statistically significant at $p < 0.05$) in the proportion of being ideologically liberal. The same trends are observed in Table 2. The difference in ideological orientations between each birth cohort and the oldest birth cohort (born in 1958) becomes considerable after the 1960 birth cohort, which seems to be driven by the expansion of college education.

5. Statistical model

This study uses the exogenous increase in college enrollment by the graduation quota program to estimate the impact of the college education on individual's ideological orientations. As shown in our descriptive statistics, the 1960 or younger cohorts (19 years old in 1979 or after) show much higher college enrollment rates, compared with the 1959 or older cohorts (19 years old in 1978 or before). Assuming that the policy exposure to different cohorts affects individuals' ideological orientations only through college enrollment, we create an instrumental variable (IV) that is 1 for the 1960 or younger cohorts and 0 for the 1959 or older cohorts in our sample.[6] In other words, we assume that our IV using the military coup and consequential expansion of college admission is highly correlated with the increase in college attendance but does not affect individuals' ideological orientations except through its relations with college attendance. The first assumption of the strong relationship between the IV and the intervention variable

[6] This IV analysis is similar to the IV analysis used in Jung et al. (2016).

(college attendance) is testable in the first stage regression but the second assumption, the exclusion restriction assumption, cannot be statistically tested (Murnane and Willett, 2010; Angrist, 1991). In the next section, we carefully discuss the possible violations of the exclusion restriction assumption.

Using this IV, the two-stage least squares (2SLS) model is specified as follows. First, our outcome equation is

$$Y_{it} = \delta_0 + \delta_1 D_{it} + X_{it}\beta + u_{it} \quad (1)$$

whereY_{it} indicates the ideological scale (1–5) or being ideologically liberal (=1 or 0) for individual i in year t in our repeated cross-sectional data. D_{it} is a binary variable indicating 1 for having attended college or more and 0 otherwise. X_{it} is a vector of demographic variables including individuals i's age in years and dummy variables indicating the gender and the educational level of individual i's father and mother. δ_1 captures the effect of having attended college on identifying themselves as liberal in ideological orientations. β captures differences in demographic characteristics. We do not include the control function of birth years because the birth years before and after the cutoff are discrete and too short to be included in the linear function or other functional forms.

In the just-identified model where the binary variable of graduation year cohort (birth cohort) is the only instrument, the first-stage equation of 2SLS is

$$D_{it} = \alpha_0 + \alpha_1 Z_{it} + X_{it}\gamma + v_{it} \quad (2)$$

whereZ_{it} (1 if aged 19 in 1979–1981 and 0 if aged 19 in 1977–1978) as an instrumental variable for D_{it} (1 for college attendance or more and 0 for otherwise). From this regression, we obtain the predicted D_{it}. In the second stage of 2SLS, we use the predicted D_{it} in the outcome equation, instead of D_{it} itself, to consistently estimate the impact of college attendance on individuals' ideological orientations. We estimate robust standard errors for the first and second-stage equations to account for heteroscedasticity. The linear probability model is used over a logit or probit in the first-stage regression since using probit or logit regressions in the first stage of 2SLS may lead to inconsistent IV estimates unless the data generating process (DGP) is exactly following the probit or logit model. On the other hand, using the linear probability model would end up with consistent IV estimates no matter what model the DGP of the first stage follows (Angrist and Pischke, 2009).

On the other hand, our model cannot include other important individual characteristics such as their parent's income and wealth during childhood because those variables are not available in the data. Also, we note that our model intentionally does not include individuals' current family characteristics such as marital status, number of children and spouses' education because controlling for variables determined after college education (called over-controlling in the regression model) may block the causal path between college attendance and individuals' ideological orientations (Wooldridge, 2009).

Under the homogenous treatment effects assumption, the estimated impact from our 2SLS using IV can be interpreted as the impact of college attendance on individuals' ideological orientations. However, the homogenous treatment effects assumption has been criticized to be unrealistic because the impact of policy or intervention may vary between individuals (Heckman et al., 1999). Thus, relaxing this assumption, it is commonly assumed that the impact of policy or intervention is heterogeneous. Thus, under this heterogeneous treatment effects assumption, our IV estimates should be interpreted as the Local Average Treatment Effect (LATE) for individuals who were induced to attend college due to the graduation quota program (Angrist et al., 1996; Card, 1999). The consistent IV estimates for the LATE need another estimation assumption called monotonicity assumption (Angrist et al., 1996). In our analysis, this assumption implies that the graduation quota program induces individuals in one direction. That is, there are three types of individuals, those who: (1) only go to college due to the graduation quota program, (2) always go to college, or (3) never go to college. However, there is no one who goes to college without the program and does not go to college with the program. This is a plausible assumption for our analysis because people would like to have more education for their own good in South Korea.

Finally, we also examine whether Y_{it} is affected by Z_{it} by constructing the reduced form regression as follows:

$$Y_{it} = \pi_0 + \pi_1 Z_{it} + X_{it}\theta + \varepsilon_{it} \quad (3)$$

whereY_{it} indicates the ideological scale (1–5) or being ideologically liberal (=1 or 0) for individual i in year t in our repeated cross-sectional data. The Z_{it} and X_{it} are the same as equation (2). Thus, π_1 can capture the impact of the graduation quota program on those individuals exposed to the policy change.

6. Validity of instrumental variable

The exclusion restriction assumption for the valid IV states that our IV, 1 for the younger cohort and 0 for the older cohort, does not affect individuals' political orientations except through its relations with college attendance. Thus, if belonging in the younger cohort in the analysis is related to other unobserved personal and socio-economic changes that affected individuals' ideological preferences, this key assumption for the valid IV analysis could be violated.

In our study, other socio-economic changes driven by the authoritarian regime might shift the political orientations of the younger cohort more to the left or right than the older cohort. Also, observed or unobserved demographic characteristics, such as family backgrounds and parenting, between the younger and older cohorts could be different if the socio-economic changes affected individuals and their families when they were born in 1960 or after. This might affect the younger cohort more liberal or conservative. However, since the age difference between the younger and older cohorts in our analysis is relatively small, those individuals in our analysis sample seem to experience similar socio-economic conditions. Furthermore, the South Korean census indicates no considerable differences in family size, parental education, and family income between the younger and older cohorts. Also, here was no dramatic historical event that only affected the younger cohorts when they were born.

Table 4
First stage regression results.

	Some college or more (=1)	
High school graduation cohorts 1979 or later (=1): Born in 1960 or later (=1)	0.106***	0.118***
	(0.026)	(0.026)
Male (=1)		0.196***
		(0.024)
Father: high school graduate (=1)		0.169***
		(0.035)
Father: some college or more (=1)		0.472***
		(0.039)
Mother: high school graduate (=1)		0.112**
		(0.047)
Mother: some college or more (=1)		0.070
		(0.078)
Age in years		−0.002
		(0.004)
Constant	0.351***	0.266
	(0.021)	(0.187)
F statistic of IV	16.16	20.74
R squared	0.010	0.154
Number of observations	1463	1463

Notes: ***p < 0.01, **p < 0.05, *p < 0.1; Robust standard errors are used.

Along with the graduation quota program, the military regime also implemented two educational policy changes. One is the ban of the private tutoring for all students from elementary to high schools to strengthen the public education. The other is the ban of the college admission test by each college and the introduction of an annual government-controlled college entrance test for all potential college applicants, which should account for at least 50% of the college admission score. If such policy changes made the college admission easier for students with highly liberal or conservative characteristics, these two policies may lead to bias in our IV estimates. However, it is hard to believe that such education policy changes are associated with the selective admission of students with more liberal or conservative ideology.

The sudden college enrollment hike by the graduation quota program might lower the quality of college education. In 1981, college and universities faced the dramatic increase in students without preparation because the military coup and the consequential policy intervention were unexpected. As time passed, the shortage of facilities and faculty were resolved. However, during the early years after implementation, students might experience overcrowded classrooms and less qualified lecturers. If the lower quality of college education is mainly experienced by the younger cohort and is associated with being politically liberal or conservative, the exclusion restriction assumption of the IV could be violated. However, there is no strong reason to believe that the lower quality of college education is associated with students being ideologically liberal or conservative.

Finally, it is well studied that younger people are usually more liberal than older people. Thus, using the birth cohort (younger cohort = 1) as an IV may lead to positive bias due to the positive correlation between the IV and being more liberal as well as the positive correlation between the IV and the probability of college attendance. However, it is shown in Table 3 that the age difference in the age cohorts in our analysis is relatively small and the age is not strongly associated to ideological orientations before the policy intervention; there was no significant difference in the political ideology scale and the probability of being politically liberal between the 1958 and 1959 cohorts. Thus, it is not likely that our IV estimates are positively biased.

7. Results

Table 4 presents the first stage regression results of the IV two stage least squares (2SLS). The dependent variable is a binary variable indicating whether individuals have some college education or more. Our instrumental variable is whether individuals were aged 19 (high school graduation age) in 1979 or later. This is the same as whether those were born in 1960 or later. The first column presents the results without control variables and the second column is for those with control variables. The estimates of the instrumental variable are not much different between the two regressions. The estimate with the control variables indicates that being born in 1960 or later increases the probability of having some college education or more by 11.8 percentage points (statistically significant at $p < 0.01$). This is considerable in magnitude too because the college attendance rate was about 35 percent among the 1959 or older cohorts in the sample. As reported in the one of the last rows, the *F* statistic of this instrumental variable, 20.74, in the first stage with controls indicates that this IV is strong because it is much larger than 10 (Stock et al., 2002).

Table 5 presents the reduced form regression results of the ideology measure (ideological scale or ideologically liberal) on the instrumental variable (whether they were born in 1960 or later). The first and second columns are for ideological scale and the third and fourth columns are for ideologically liberal. The reduced form estimates are all statistically significant with and without control variables. The estimated coefficients of the instrumental variable in the second and fourth columns with controls indicate that the individuals exposed to the graduation quota program are higher on the ideological scale by 0.174 and a higher chance of being liberal by 8.4 percentage points. Both of them are statistically significant at $p < 0.01$.

Table 5
Reduced form regression results (N = 1463).

	Ideological scale (1 for most conservative to 5 for most liberal)		Ideologically liberal (=1)	
	(1)	(2)	(3)	(4)
High school graduation cohorts 1979 or later (=1): Born in 1960 or later (=1)	0.130**	0.174***	0.071***	0.084***
	(0.053)	(0.056)	(0.025)	(0.026)
Control variables	No	Yes	No	Yes

Notes: ***p < 0.01, **p < 0.05, *p < 0.1; Control variables include gender, educational attainment of father and mother, and age; Robust standard errors are used. The estimated probability of being ideologically liberal and the estimated ideological scale among people without college experience are about 0.3 and 2.9, respectively.

Table 6
The estimated impact of college education on ideological orientations (N = 1463).

	Ideological scale (1 for most conservative to 5 for most liberal)		Ideologically liberal (=1)	
	OLS	IV	OLS	IV
Some college or more (=1)	0.056	1.472***	0.043	0.713***
	(0.058)	(0.567)	(0.027)	(0.266)
Control variables	Yes	Yes	Yes	Yes
Hausman test at p < 0.01				
H_0: $\delta_{1OLS} = \delta_{1IV}$	Reject		Reject	

Notes: ***p < 0.01, **p < 0.05, *p < 0.1; Control variables include gender, educational attainment of father and mother, and age; Robust standard errors are used. The estimated probability of being ideologically liberal and the estimated ideological scale among people without college experience are about 0.3 and 2.9, respectively. Hausman test is testing whether our intervention variable, some college or more, is endogenous. Rejecting the null hypothesis indicates that this intervention variable is likely to be endogenous.

Table 6 reports the OLS and IV results for the two ideology measures in the first to fourth columns with control variables. Control variables are individuals' age and gender as well as the educational attainment of individuals' father and mother, as shown in Table 1. The OLS estimates with control variables in the first and third columns indicates that college education leads to about a 0.056 increase in the ideological scale and a 4.3 percentage point rise in the probability of being ideologically liberal, which are statistically insignificant. The IV estimates in the second and fourth columns indicates much larger increases than the OLS estimates, a 1.472 in the ideological scale and a 71.3 percentage point in the probability of being ideologically liberal. The Hausman test also confirms that the OLS estimate is statistically different from the IV estimate at p < 0.01. The Hausman test statistically tests whether our intervention variable, some college or more, is endogenous. Rejecting the null hypothesis indicates that this intervention variable is likely to be endogenous. Thus, the IV estimate is confirmed to be the superior method to consistently estimate the impact of college education on individuals' political preferences compared to the OLS estimate. Also, the difference between the IV and OLS estimates suggest that the bias direction of the OLS estimate is negative. Assuming that people with politically conservative characteristics or family background have more resources to invest in education including college education, the OLS estimate should be smaller than the true parameter (negatively biased) in this context.[7]

With the assumption that college education may affect individuals differently in shaping ideological orientations, our IV estimate should be considered to be the Local Average Treatment Effect (LATE) estimate. Thus, our IV estimate implies that having some college education or more increases the individuals' political ideology scale by 1.472 and the probability of being ideologically liberal by 71.3 percentage points, for those who were induced to go to college due to the graduation quota program.[8]

8. Discussion and conclusion

Political ideology such as being liberal or conservative has taken deep root in the field of social sciences. However, the concept of citizens' ideological preferences has mostly been considered as a determinant of their political behavior like opinion about political issues, vote choice, and so on. A question about the formation of political ideology *per se* has not been studied well empirically. Most of previous research has investigated the correlation between citizens' ideological orientations and their socio-economic characteristic such as age, income, or educational background. Particularly, college education, which this study focused on, has only been

[7] This assumption is supported by the strong association between income group and political preferences studied in Abramowitz and Saunders (1998), McCarty et al. (2006), Evans (2000), and Van de Waal et al. (2007).

[8] The IV estimates of heterogeneous treatment effects models provide Local Average Treatment Effects (LATE) estimates (Angrist et al., 1996).

considered as one of the main factors of ideological orientations by conventional wisdom.

There have been a few previous theoretical studies that depict the causal relationship between citizens' college education and their ideological orientations (Erikson and Tedin, 2015; Lottes and Kuriloff, 1994; Nie et al., 1996; Nunn et al., 1978; Stouffer, 1955). Some studies argue that college experience causes attitude change from evidence suggesting a more liberal attitude of college seniors than freshmen (Gross, 2013; Liu et al., 2009), and ideological differences between those with college degree and those without it (Chandler, 1972; Jennings and Niemi, 1981). From this perspective, several researchers have empirically tested the positive effect of higher education on ideologically liberal attitudes (Bobo and Licari, 1989; Golebiowska, 1995; Inglehart, 1977; Kohn, 1969; Lawrence, 1976; Lipset and Schneider, 1978; Lipset, 1981; Lipsitz, 1965; McClosky, 1964; Selznick and Steinberg, 1969; Sullivan et al., 1994; Simpson, 1972; Weil, 1985). They provide a keen insight into the possibility that college education leads to a change toward a more liberal worldview. However, there is hardly any empirical study on the causal effect of college education on ideological orientations at the individual level even though understanding whether higher education shapes ideological orientations would be an important question towards understanding citizens' political disposition.

Thus, this study investigates whether citizens' liberal political tendency is affected by college education. Particularly, this study postulates ideological orientations as two dependent variables, ideological scale (1 for most conservative to 5 for most liberal) and ideologically liberal (1 for liberal and 0 for otherwise), and tries to infer a causal relationship between college education and ideology. This study seizes on an exogenous event to control for selection bias in the empirical analysis. A college education policy called a "graduation quota" is used to develop the birth cohort as an instrumental variable, which enables a quasi-experiment analysis. Compared with earlier empirical studies which have mainly inquired into a matter of political tendency, this study takes into account the political/historical context as well as an advanced statistical method to infer a causal relationship.

Our IV analysis with 2SLS estimation finds that those individuals (compliers) who were induced to attend college by the graduation quota program became more politically liberal. Our LATE estimate using the birth cohort IV is much larger than the OLS estimate, which confirms negative bias in the OLS estimate. Also, the reduced form regression shows that the estimated impact of the graduation quota program on those individuals exposed to the policy change is not negligible, which supports the IV estimates.

Given the strong student movement in South Korea during the authoritarian regime in the 1980s, attending college also indicates that college students were exposed to political information or student activists which were not available to the same cohort who did not attend the college. Then, the effect of college attendance would not only be from the college education itself, but also from the college life they experienced. Particularly, it seems that the students reacted to the harsh suppression of the authoritarian regime on student protests and free speech. As result, they might have had a greater chance to develop the liberal mind. Also, it is possible that the group of compliers in the IV analysis might be more reactive to the treatment, college education, in general (Card, 1999). This seems to explain the relatively large IV estimates in our analysis. Thus the effect of attending college on ideological orientation from our findings should be cautiously interpreted.

Our study has some limitations. First, the data did not include rich demographic data about the individuals, such as parents' wealth and the number of siblings, which can help explain more about a person's decision about pursuing higher education. Second, since our estimated impact of college education on ideological orientations is the LATE, it cannot be directly applied to other policy contexts. Third, the definition of political ideology is hard to measure and not universally clear in western and eastern countries. Its definition is tied to the historical, social, and economic contexts in different countries. Thus, caution should be taken when attempting to generalize our findings to other countries with dissimilar political circumstances.

Fourth, controlling for parental birth year is important in our analysis because most of parents have faced two major and very decisive historical events, World War II and the Korean War, at different ages with potentially strong long-term effects for themselves and their offspring. Unfortunately, however, the dataset does not have the related variable. If individuals' age in the data is positively correlated with their parents' age and older parents were more exposed to the historical events, our IV could be positively or negatively biased depending on the possible correlation between older parents' degree of exposure to historical events and their political ideology. Fifth, as discussed earlier, the exclusion restriction assumption for our IV analysis is not guaranteed. If belonging in the younger cohort is not only associated with the more opportunity to go to college but also is related to other unobserved personal and socio-economic changes that affected individuals' political ideology, this key assumption for the valid IV analysis could be violated. Then, the IV estimates could overstate or understate the actual impact of college education on ideological orientations.

However, our study is one of the first studies to investigate the causal relationship between college education and citizens' political preferences, which sheds light on further discussion and research on the related topics. We hope that our study motivates more studies and discussions focusing on whether not only higher education, but also primary or secondary education affects citizens' ideological orientations.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ssresearch.2019.03.014.

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