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Curriculum and national identity: Evidence from the 1997 curriculum reform in Taiwan

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ABSTRACT

This paper examines the causal effects of textbook content on individuals' national identity, by exploiting a curriculum reform that introduced a new perspective on Taiwan's history for students entering junior high school after September 1997. Using a repeated nationally representative survey and a regression discontinuity design, we show that students exposed to the new textbooks were more likely to hold exclusive Taiwanese identity rather than dual identity (i.e. Taiwanese and Chinese). The effect was greater for academic track students and those living in neighborhoods where fewer people identify as Taiwanese. In addition, our results suggest that the new curriculum had little impact on people's political preferences related to Taiwan independence. Finally, we find that the probability of reporting as Taiwanese among old textbook readers converges with that of people reading new textbooks in the long run since the perspectives of old textbooks are in conflict with the recent social trends.

1. Introduction

The more homogeneous the people, the easier it is to manage a nation. As a result, state leaders are incentivized to use the education system as an instrument for cultivating national identity—an essential step toward nation-building (Aghion et al., 2018).[1] The extensive literature on the theory of nation-building in economics and political science suggests that governments can homogenize their people through education (Weber, 1976; Billig, 1995; Anderson, 2006; Besley and Persson, 2010; Alesina and Reich, 2015). However, the causal effects underlying the intuition and the transmission mechanism behind the effect of education on national identity formation lack detailed scrutiny. National identity trends in society, and cohort effects, pose challenges to the identification of educational content effects. Specifically, these two effects interact with each other in the sense that students in different cohorts experience societal development and political events in different ways.

In this paper, we overcome these difficulties by exploiting a junior high school curriculum reform in Taiwan. In September 1997, the Taiwanese government published its *Knowing Taiwan* series of textbooks for social subjects, namely, History, Geography, and Society. The History curriculum, in particular, adopted a new perspective on the nation's past and provided abundant Taiwan-related content, all of which had been absent from previous textbooks. The education system in Taiwan mandates that children born after 1 September must enter the education system the following year, such that people born in September will enter later than those born in August. This means that those born in September 1984 (i.e. 13 years old in 1997) would have been the first month's cohort to have studied the new textbooks (i.e. *Knowing Taiwan* series), while those born in August 1984 would have studied the old ones.

These institutional features give us a unique opportunity to identify the causal effects of the junior high school curriculum (i.e. textbook content) on people's national identity in later life, since those born either side of the cut-off would have experienced similar social events and political developments. In addition, the birth timing decisions of parents should be predetermined, which is unlikely to be affected by this reform. Therefore, we can isolate curriculum effect from other

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[1] Empirical evidence has shown that, in the past 150 years, investments in mass education by governments have appeared in response to military threats, when patriotic people are required to prepare for future wars (Aghion et al., 2018).

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confounding factors by comparing the national identities of those born just before and just after September 1984, using a regression discontinuity design. Due to their historic, cultural, and political connections to China, the peoples of Taiwan are confused about their national identity (Jacobs and Kang, 2017). This "identity confusion" or "national identity conflict" means that some identify as Taiwanese whilst others identify themselves as Chinese—or a combination thereof (Jacobs and Kang, 2017).[2] We measure national identity by using a self-reported identity question from a repeated nationally representative survey—the Taiwan Social Change Survey—which has consistently asked respondents about their national identity through the question "Do you consider yourself Taiwanese, Chinese, or both?" over a long period of time.

We obtain three key findings from our research. First, our results suggest that students who studied the new textbooks are more likely to report themselves as Taiwanese than those who read old textbooks when they were around the age of 20 (18 to 23 years old). The magnitude of the effect is 18 percentage points, which accounts for a 30% increase in the control group mean of 61%. Based on our estimates, we can calculate the persuasion rate, using the formula employed to deduce the persuasive effects of media communications (DellaVigna and Gentzkow, 2010; DellaVigna and Kaplan, 2007). The estimated persuasion rate is 46%, which is much larger than the estimates (i.e., around 2% to 20%) for news media (Enikolopov et al., 2011; Gentzkow, 2006; DellaVigna and Kaplan, 2007; DellaVigna et al., 2014; Yanagizawa-Drott, 2014; Adena et al., 2015; Blouin and Mukand, 2019; Chiang and Knight, 2011; Gerber et al., 2009; Gentzkow et al., 2009).[3] This result should be reasonable, since the intensity of exposure is greater for educational content than for media. Especially, students spend substantial time and effort (i.e. three years) on reading these textbooks to prepare for high school entrance exams. In fact, our result is consistent with Cantoni et al. (2017), suggesting the persuasive effects of the school curriculum are quite significant.

Second, we investigate the possible mechanisms through which school curricula can affect an individual's national identity. Our subgroup analysis suggests that these curriculum effects only appear in academic track students, who generally put more effort into studying textbook materials. This result implies that memorizing and synthesizing textbook content is a possible channel of curriculum effect. In addition, we find that the new curriculum has greater impacts on individuals living in neighborhoods or families where fewer people identify as Taiwanese.[4] The result aligns with the predictions made by "belief-based models", in that people with weaker prior belief (i.e. weaker Taiwanese identity) are more likely to be persuaded by new information (DellaVigna and Gentzkow, 2010).

Finally, we study the long-term effects of junior high school curricula on people's national identity around the age of 30 (i.e. 24 to 33 years old). Our results suggest that, a decade after the students left junior high school, people who studied the old textbooks hold a similar level of Taiwanese identity to those who studied the new textbooks, and the Taiwanese identity level held by new textbook readers did *not* decline. Since the perspectives of old textbooks are in conflict with the recent social trend, our interpretation is that in the long run the old-textbook readers eventually "catch up" with the general trend and the identity of individuals who studied the new textbook.

Our paper stands apart from the previous literature in the following ways. First, we provide one of the first pieces of evidence on the effect of a school curriculum (i.e. textbook content) on an individual's national identity. The formation of national identity has drawn substantial attention in the social sciences (Turner et al., 1987; Tajfel and Turner, 1979; Akerlof and Kranton, 2000; Alesina and Fuchs-Schündeln, 2007; Bisin and Verdier, 2010; Manning and Roy, 2010; Bisin et al., 2011a; Masella, 2013; Constant and Zimmermann, 2013; Georgiadis and Manning, 2013; Jia and Persson, 2019; Durante, 2020). Previous studies in this stream of the literature have focused on how ethnic diversity affects national identity.[5] The context of the present study is interesting, because the national identity of people in Taiwan has changed dramatically in the last two decades—the proportion of Taiwanese identity increased rapidly from 17% in 1992 to 60% in 2015, as shown in Fig. 1[6]; however, the ethnic composition in Taiwan has been quite homogeneous and stable since 1949.[7] Our results suggest that the revision of educational content could play an important role in shaping people's national identity in Taiwan.[8]

There is a small but growing body of literature identifying the causal effects of education policies on people's political behavior and identity formation. Recently, several studies have examined how language use in education affects ethnic identity (Clots-Figueras and Masella, 2013; Fouka, 2019),[9] whether additional schooling affects civic participation or political attitudes (Milligan et al., 2004; Friedman et al., 2016), the impact of authoritarian education on political ideology (Bai and Li, 2018), and the effect of patriotic activities in school on the assimilation of immigrants (Mitrunen, 2018).[10] Our research complements these

[3] The estimated persuasion rates in the literature for news media, such as TV programs (Enikolopov et al., 2011; Gentzkow, 2006; DellaVigna and Kaplan, 2007), radio (DellaVigna et al., 2014; Yanagizawa-Drott, 2014; Adena et al., 2015; Blouin and Mukand, 2019), and newspapers (Chiang and Knight, 2011; Gerber et al., 2009; Gentzkow et al., 2009) are around 2% to 20%. One noticeable exception is Enikolopov et al. (2011), who utilized idiosyncratic variations in the signal availability of an independent television station (NTV) in Russia and found that people who had access to an NTV were less likely to support the pro-government party in the 1999 election. The estimated persuasion rate was 65%, i.e. around 65 percent of the pro-government party supporters who watched NTV changed their mind and voted for other parties.

[4] In Section 6.2, we use ethnic composition at the township level as a proxy for the intensity of Taiwanese identity in individuals' home towns. We also use the variation in ethnic composition of individuals' parents as a robustness check and obtain consistent results.

[5] For example, Constant and Zimmermann (2013) offers a thoughtful and thorough discussion on identity formation and its consequences for economic behavior. Masella (2013) suggests that ethnic diversity might not necessarily weaken the intensity of national feeling, whilst Durante (2020) finds that a victory by a country's national team can strengthen national identity and weaken ethnic identity.

[6] Note that there is a substantial increase in the share of respondents reporting themselves as Taiwanese in 1997. We think this could be related to the fact that Taiwan held its first presidential election in 1996. In addition, China fired a series of missiles in response to Taiwan's President Teng-hui Li visiting the United States (i.e., the 1996 Taiwan Strait crisis). These events might have strengthened Taiwanese identity.

[7] According to government statistics (Hsiau, 2003; Copper, 2019), over 95% of Taiwan's population consists of the Han people, split into three main groups: Hoklo, Hakka, and Mainlander. Around 2.3% are Austronesian peoples (i.e. Taiwanese aborigines). Due to the Chinese Civil War (i.e. the Kuomintang-Communist Civil War), more than two million Mainlanders retreated from China in 1949.

[8] One recent study (Chiang et al., 2019) empirically examined how economic integration with China affected Taiwanese identity formation. They found that rising investment in China has strengthened Taiwanese identity, especially for unskilled workers.

[9] Clots-Figueras and Masella (2013) found that changing from single-language (Spanish) to bilingual (Spanish and Catalan) education in Catalonia provided students with a stronger sense of Catalan belonging, which led further to changes in political party preferences in elections. Fouka (2019), on the other hand, documented that children of German immigrants who experienced language prohibition in elementary school were more likely to marry Germans, choose more 'German' first names for their children, and be less likely to volunteer in World War II.

[10] Bai and Li (2018) examined the long-term effects of education under the authoritarian regime in Taiwan, finding that one additional year of exposure to authoritarian education during youth could substantially affect an individual's political behaviors, such as their preference for democracy or voting for an authoritative party.

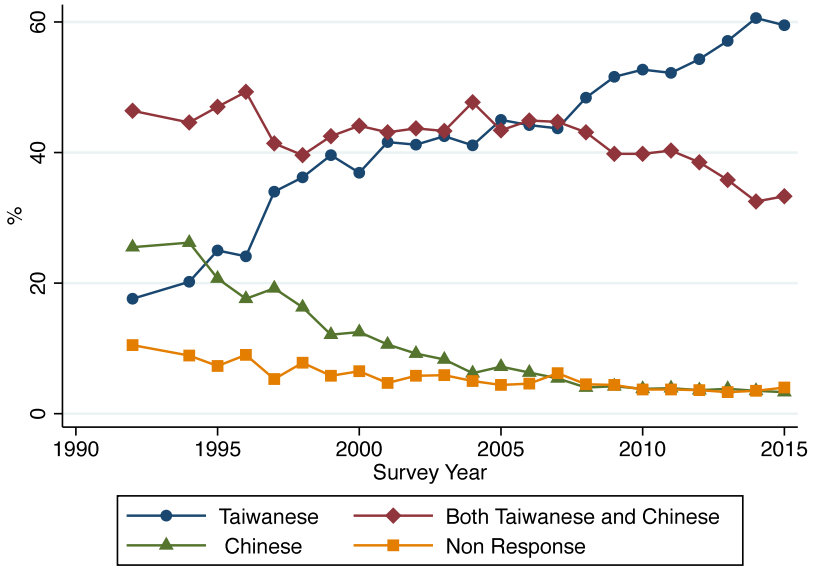

Fig. 1. Trends of national identity in Taiwan: 1992–2015. *Source:* Election Study Center, National Chengchi University.

works by focusing on the impact of school curricula, which should be the key component of the educational process. Compared to other educational policies, changes in textbook and course contents are more common across the world, so understanding their impacts could have more implications. In addition, the reform used in this study only adjusted the textbook contents of social subjects and was not associated with other changes in the educational system, such as the languages of instruction. This feature allows us to clearly estimate the curriculum effect.[11]

One noteworthy exception is Cantoni et al. (2017), who examined the effect of the school curriculum on individuals' political attitudes by exploiting a high school textbook reform program in China. They conducted a survey of students at Peking University (i.e., elite students) and found that those exposed to the new textbooks showed more trust in government and more skepticism toward unconstrained democracy and free markets, which is consistent with the political aims of a new curriculum. This new curriculum also aims at promoting Chinese ethnic unity. However, their results suggest that the new curriculum had insignificant impacts on people's national identity and ethnic identity. In contrast to the findings in Cantoni et al. (2017), our results indicate that people's national identity can be shaped effectively by the content of a textbook.

Second, using nationally representative survey data, our paper examines the impact of educational content on identity for the more general population. The results in previous studies are usually based on a specific subgroup, such as elite students (Cantoni et al., 2017) or immigrants (Fouka, 2019; Mitrunen, 2018). Nevertheless, these results might not be generalized to the whole population or other groups of individuals; in fact, our subgroup analysis shows that the effect of educational content can be heterogeneous across different types of people. The curriculum only affects the identity of specific subgroups, such as individuals who spend more time on reading textbooks or those with less prior belief. These results help us understand the potential mechanisms of curriculum effects.

Finally, we contribute to the existing literature by investigating the long-term effects of the school curriculum. Understanding long-term effects on political preferences has important implications. Recent evidence shows that significant political events in people's 15–24 (i.e., impressionable years) can influence the political attitudes in their entire lives (Ghitza and Gelman, 2022). It is possible that the school curriculum also has persistent impacts. Different from Cantoni et al. (2017), who examine the short-term impacts of textbook contents (i.e., 1 to 2 years after reading textbooks), our repeated survey data allows us to know how the curriculum effects evolves 10 to 20 years after individuals have read the textbooks.

The paper proceeds as follows. In Section 2, we discuss the background of the curriculum reform and analyze the differences between the old and new curricula. Section 3 describes the data and the sample used in this paper, and Section 4 discusses our identification strategy—a regression discontinuity design. Section 5 presents our main results, following which we then explore potential mechanisms through a subgroup analysis in Section 6 and long-term effects in Section 7. Finally, Section 8 concludes.

2. Policy background

2.1. The curriculum reform of the Knowing Taiwan series

In 1994, the Taiwanese government announced a new curriculum for the junior high school social subjects: History, Geography, and Society. The major change lay in the design of the first-year content. In earlier textbooks, Taiwan-related content accounted for only a small proportion of the text and was scattered through different volumes. However, the new curricula, especially in terms of the History subject, aimed to provide not only much more Taiwan-related knowledge, but also different angles on the history and social development of the nation.[12] After three years of writing and editing, the government

[11] For example, the reform used in Clots-Figueras and Masella (2013) involves adjustments in languages of instruction and textbook contents. Therefore, their results are mixed with both language and curriculum effects.

[12] The Geography and Society volumes in the *Knowing Taiwan* series introduce extensive knowledge about Taiwan's geographical features, social values, culture, and religions. This knowledge may indeed also affect people's national identity, but the History textbook is likely to play a major role in identity formation. Wang (2001) discussed how the *Knowing Taiwan* series, namely, the History volume, strengthened Taiwanese consciousness.

published the new textbooks, and students entering junior high school in September 1997 were expected to utilize them accordingly.[13]

The reform was comprehensive, in that students across Taiwan who entered junior high school after September 1997 would study the series. Though the major changes applied mainly to first-year textbooks, the second- and third-year textbooks were also adjusted. An Online Appendix A provides more details on this issue. Senior high school/vocational school entrance examination for students born after September 1984, compared to examinations for earlier cohorts, were therefore based on different textbooks for all three years, thus ensuring that earlier education cohorts were not exposed to the *Knowing Taiwan* series. Herein, we define the education cohort as students entering the compulsory education system in the same year, and we label them with the year they entered junior high school. For example, the 1997 education cohort entered junior high school in September 1997. They were the first to study the *Knowing Taiwan* series and were born between September 1984 and August 1985.

2.2. Comparison between the old and the new curricula

This curriculum reform aroused politicians' attention, because it brought to awareness the stark differences between two imagined nationalities, namely Chinese consciousness and Taiwanese consciousness (Liu et al., 2005; Wang, 2001). In particular, the new history textbooks moved away from the "China-oriented" angle seen in earlier textbooks, to a "Taiwan-oriented" view. In general, there are two main differences between the old and new textbooks: (1) The amount of content about Taiwan and (2) the context given about the relationship between Taiwan and China. Therefore, the new history textbook may have cultivated Taiwanese identity in two ways: First, there may have been a priming effect, due to students reading the word "Taiwan" more often, and second, the distinction made by describing Taiwanese and Chinese history separately may have provided students with different information to associate with the two imagined groups, and hence helped them differentiate between Taiwanese and Chinese.

2.2.1. A substantial increase in Taiwan-related content

Under the old curriculum, junior high school students studied the history of China for a year and a half, and then the history of the world for another year and a half, whereas under the new curriculum they studied the history of Taiwan in the first year (i.e. the History textbook in the *Knowing Taiwan* series), the history of China in the second year, and world history in the third year. In other words, content on the history of China and the rest of the world in the old version was condensed in the new version so that new materials about Taiwan could be added.

In terms of time, teachers utilizing the new textbooks might have spent much more on the history of Taiwan than they did previously. Under the old curriculum, teachers spent three semesters on the history of China (25 chapters), with only one chapter and a section related to Taiwan.[14] Assuming that teachers spent the same amount of time on each chapter and section in a volume, we approximate that they would have spent less than one-fifth of a semester on history related to Taiwan. In contrast, the *Knowing Taiwan* History volume was designed to cover two semesters, with 116 pages of content. For comparison, the old textbooks contained only 16 pages on the subject.

The explicit aim of the *Knowing Taiwan* series History volume was emphasized by its editors as follows:

> This book aims to introduce students to **the history about how ancestors of different ethnic groups made developments in Taiwan.** As a result, students are expected to cultivate a cooperative spirit, patriotic feelings, and worldwide horizons. Also, it is hoped this will augment their understanding of **Taiwanese cultural assets**, and make them appreciate and treasure them accordingly.[15]

The intention of acquainting students with Taiwanese development was not apparent in the old version—as seen from the editors' preface to the old textbook on the history of China:

> The history of China describes **the evolution of Chinese nationality, the change of the territory, and the development of politics, society, economics, and culture**. In particular, it stresses the long history and the blending of the culture of nationality, in order to strengthen patriotic feelings and a cooperative spirit, and to understand the nation's traditions, its position and the responsibility of the population.

2.2.2. Distinguishing between Taiwan and China

The new textbook not only contained a substantial increase in content about Taiwan, but it also clearly distinguished between the concepts of Taiwan and China, in a contextual change. Basically, the new textbook treated the history of Taiwan as an entity completely detached from the history of China. In contrast, the old textbook did not emphasize this difference. Furthermore, depending on the context, the old textbook sometimes used "our country" to refer to China but sometimes also to refer to Taiwan. Thus, studying the old textbook could have confused students about their national identity.

In their first grade of junior high school, students studying the old textbooks started to learn the history of "our country (i.e. China)" through the statement that the earliest human beings lived in "our country (i.e. China)", namely *Homo erectus pekinensis*, in the Palaeolithic age. The "common ancestor" of *Chinese nationality* was Huang Di, and the first dynasty of "our country (i.e. China)" was the Xia Dynasty. The history of "our country (i.e. China)" therefore proceeded through sequential dynasties, from Xia to Qin, to Tang, and all the way to Qing.[16] Interestingly, the old textbook also used "our country" to refer to Taiwan when it mentioned the development of the Kuomintang government in Taiwan after the 1949 Chinese Civil War (i.e. the Kuomintang-Communist Civil War).

In contrast, the term "our country" is used less in the History textbook in the *Knowing Taiwan* series or for the textbook on the

[13] This reform aroused fierce debate among political parties on whether the books were "appropriate". Political factions at that time were divided into two groups, with the likes of the Kuomintang and the New Party following the "successor to China" ideology, while the Democratic Progressive Party advocated "Taiwan independence" and considered the Kuomintang government, which had ruled Taiwan since 1945, a foreign regime. Discussions at the time, about whether the History textbook in the *Knowing Taiwan* series should be adopted, centered around three perspectives in the textbook: the "relationship between Taiwan and Japan in history", the "relationship between Taiwan and China in history", and the "judgment of contemporary political events and politicians" (Wang, 2001). According to Wang (2001), in just two months, from June to August 1997, 341 articles (five articles every day on average) about *Knowing Taiwan* appeared in the nation's four main newspapers.

[14] In the old textbook series, these 25 chapters were spread across three volumes, i.e. one volume per semester. Only a section in the 15th chapter, entitled "The rebellion of Koxinga against the Qing Dynasty and the development of Taiwan", and the 25th chapter, entitled "The achievement and vision of a base for revival", included Taiwan-related content.

[15] Emphasis in this paragraph is added by the authors.

[16] Between the Ming and Qing dynasties in this straightforward development line, students saw the first appearance of "Taiwan", identified by the editors as a basis for Koxinga's fight against the Qing regime. It is worth noting that Koxinga is written as "recovering" Taiwan from the Dutch. The usage of the verb demonstrates explicitly the ideology behind the old textbook, showing that the editors viewed the ruling Dutch in the 17th century as a "foreign regime". Simultaneously, this implicitly claimed Taiwan as the territory of "our country (i.e. China)" before Dutch rule.

history of China in the new curriculum; "Taiwan" and "China" are used instead. More precisely, "our country" only appears in descriptions of Taiwan. Following the divided usage of terms, Taiwanese history stands out not as part of the history of China but as an individual entity in the new History textbooks. In the Online Appendix B, we use several sample paragraphs from such textbooks to show the differences in historical perspectives between the old and the new curriculum. Basically, in the old curriculum, "Taiwan" was virtually ignored, and "our country" usually referred to "China". In the new curriculum, "Taiwan" and "China" were explicitly separated so that readers had the chance to distinguish between the two.

2.3. The role of teachers

So far, we have not discussed the role of teachers in this curriculum reform. For example, teachers might change how they conduct a lecture according to the new curriculum. To the best of our knowledge, the Ministry of Education did not request teachers to utilize different ways to teach new textbooks. Basically, they followed the content of the textbooks. In addition, junior high school education in Taiwan is exam-oriented, and the senior high school entrance examination is fully based on textbook content. Therefore, we believe the role of teachers is relatively minor.

3. Data and sample

3.1. Data

The data used in this paper is taken from the Taiwan Social Change Survey (TSCS), which is a nationally representative repeated cross-sectional survey for respondents aged above 18 in Taiwan. The sample size of each TSCS wave is around 1800 to 2200 respondents.

Three features of the TSCS make it suitable for our analysis. First, it asks respondents consistently about their national identity through the following question:

- In our society, some people call themselves Taiwanese, some Chinese, and some both. Do you consider yourself Taiwanese, Chinese, or both?

This feature allows us to combine different survey waves, in order to compare the short- and long-term impacts of curriculum reform on national identity. Second, the TSCS records the birth year *and* birth month of respondents. Since the school year in Taiwan starts in September, by exploiting this feature, we can identify the correct educational cohort, which is crucial for our regression discontinuity design. Third, the TSCS holds rich demographic information about respondents, which helps us investigate the mechanism further through subgroup analysis.

3.2. Sample

The first educational cohort exposed to the 1997 curriculum reform, born in September 1984 or later, was first surveyed in 2003.[17] To balance out regression analysis respondents before and after the reform, we hence include surveys held from 2003 onward, which contain the national identity question and enough demographic information: These are the 2003, 2004, 2005, 2010, 2012, 2013, 2014, and 2015 waves.[18]

We drop any respondents who reported being born outside Taiwan and those who reported that the place they had lived the longest before they were 15 was outside of the country, since we could not be sure that they had entered junior high school and hence been exposed to the curriculum reform. In addition, we drop respondents whose answer to the national identity question was "Other". These selection rules remove 2% of the main regression sample (i.e. the short-term sample). The main results in this paper are not influenced by the sample selection.

3.3. Construction of outcome variable

Based on the TSCS's national identity question, we create the outcome variable as a dummy variable *Identity* by assigning one to respondents answering "Taiwanese" and zero to those answering "Chinese" or "Both".[19] In our main regression sample, only 3.8% of respondents answer "Chinese", indicating that, in this generation, very few people identify as exclusively Chinese. Most of the respondents have an exclusively Taiwanese identity (64.8%) or a dual identity (31.4%), considering themselves to be both Chinese and Taiwanese.[20]

4. Empirical specification

4.1. Graphical evidence

Fig. 2 plots the simple mean of *Identity* in each educational cohort, using all available data. We observe a roughly 10% increase in Taiwanese identity between the 1996 and 1997 education cohorts (i.e. between the last to study the old textbooks and the first to study the *Knowing Taiwan* series). Two important caveats should be noted in the above analysis. First, compared to people who enter school earlier, those who enter school later are less likely to have been surveyed in the early years, since they are too young to become respondents. In addition, people's national identity might be affected by social events happening in the survey year, so the above change in Taiwanese identity could be confounded by survey year effects. Second, the result in Fig. 2 might be mixing up the short- and long-term effects of the school curriculum on Taiwanese identity. Since we use all available survey waves from 2003 to 2015 to plot Fig. 2, this implies that some in the sample would have been surveyed in the early stages of their life, and some in the later stages. To alleviate the above concerns, we control for the survey year fixed effect and restrict our sample to fewer education cohorts in the rest of our analysis, namely, those born between September 1982 and August 1986 (four education cohorts, two of which would have studied the *Knowing Taiwan* series). In addition, we first analyze these cohorts when they were relatively young, aged from 18 to 23 and surveyed from 2003 to 2005 (henceforth **short-term sample**, 5 to 10 years after reading textbooks). To examine if the curriculum effect is persistent, we examine the same education cohorts surveyed from 20010 to 2015, when aged between 24 and 33 (henceforth **long-term sample**, 11 to 20 years after reading textbooks).

[17] Some of birth cohorts (e.g., those born in 1985 or 1986) were not surveyed since they were below 18 years old in 2003 and 2004.

[18] Note that 2009 TSCS had an identity question but did not include the demographic information we need in our regressions. Hence, we do not include this wave in the RD design. In addition, the TSCS held two waves in 2014.

[19] Since the measurement of national identity is based on a self-reported response, the natural question is: Does this measurement truly reflect respondents' national identity? One possible explanation for a change in *Identity* (if observed) is that previous students were afraid to respond that they felt Taiwanese. The new textbooks provided not only a Taiwanese identity, but also the message that viewing oneself as Taiwanese was no longer taboo. We provide two counterarguments to this explanation. First, the simple mean of *Identity* for the control group in our main analysis sample is 0.6. When over half of one's peer group identify themselves as Taiwanese, it is hard to believe that the Taiwanese identity was indeed taboo. Second, the change in *Identity* should be visible in different subgroups if this explanation were indeed true, but in Section 6 we find this is not the case.

[20] Note that in the 2005, 2010, 2014, and 2015 waves, TSCS further categorizes "both" into two alternatives: (1) Both Taiwanese and Chinese; (2) Both Chinese and Taiwanese. When we construct our outcome variable, these two alternatives refer to "both". In the later section, we show that the estimation is not affected by a particular framing of the questions.

Fig. 2. Taiwanese identity and education cohorts.
Notes: We pool all available TSCS data (i.e. 2003, 2004, 2005, 2009, 2010, 2012, 2013, 2014, and 2015 waves) and include education cohorts from 1992 to 2001. We include the 2009 wave, which is not included in our regression analysis, since we do not require demographic information to draw the graph. Taiwanese identity is measured by a dummy variable *Identity*. It assigns one to respondents answering "Taiwanese" and zero to those answering "Chinese" and "Both". Each dot represents average Taiwanese identity (*Identity*) for specific education cohorts.

4.2. Regression discontinuity design

Different cohorts of students would have been exposed to different societal trends, which in turn may have affected their national identity formation. Thus, we use a regression discontinuity (RD) design to eliminate this problem by comparing the identities of people born close together (i.e. around September 1984). The reason this work is that close birth cohorts should experience almost the same societal developments while growing up. The major difference is that those born just after September 1984 would have studied the *Knowing Taiwan* series, while those born just before this date would have studied the old textbooks. At first glance, we should conduct an RD design on an education cohort (i.e. academic year) basis, since the treatment status varies at that level. However, people in the same education cohort may have experienced different events that could have altered their national identity.

An example of this relates to voting. Elections in Taiwan are generally held in December, January, and March, and the age at which one becomes eligible to vote is 20. In some elections, people born in the first half of the education cohort would have been eligible, while those born later would not have been. Students in the first cohort exposed to the curriculum reform offer one example in this regard. The sixth legislative election was held on December 11, 2004, splitting the education cohort into two groups: People who had the voting right (born before December 11, 1984) and people who did not have it (born after December 11, 1984). Students in the last cohort studying the old textbook provide another example. The event in this case was the presidential election that took place on March 20, 2004. The reason this is important is that politicians in Taiwan debate fiercely on the subject of national identity in elections. Thus, different "first vote" experiences may affect people's national identity formation. Bearing in mind such differences embedded in respondents within an education cohort, we measure birth cohort at the year–month level and estimate the following regression:

$$Identity_{it} = \alpha_0 + \alpha_1 TextBook_i + f(m;\beta) + X_i'\gamma + \lambda_t + \epsilon_{it} \quad (1)$$

where $Identity_{it}$ indicates the dummy variable defined in Section 3.3, for individual i interviewed at year t. The variable $TextBook$ indicates whether the respondent was exposed to the curriculum reform and takes the value one if the respondent reported himself born after September 1984, and zero otherwise.[21] We use birth cohort measured by year–month as our running variable, and we center it on September 1984, the first year–month affected by the reform. In our main specification, we estimate Eq. (1) within a bandwidth of 24 months before and 24 months after September 1984 (i.e. we use the sample born between September 1982 and August 1986).[22] In addition, we specify $f(m;\beta)$ as a linear function but allow the slope to be different on either side of the cut-off. That is, $f(m;\beta)$ is the first-order polynomial of birth cohort m interacting fully with $TextBook$.[23] In a later section, we examine whether our main results are sensitive to the bandwidth choices and different specifications.

Our primary interest is in α_1, which measures any deviation away from the relationship between the birth cohort and Taiwanese identity $Identity_{it}$ at the cut-off (i.e. when the treatment variable $TextBook$ switches from 0 to 1). If all factors except textbook content did not change around the cut-off, α_1 can be interpreted as the causal effect of the junior high school curriculum on students' Taiwanese identity.

In order to single out the overall effect of societal trends in each survey year, we include the survey year fixed effect (λ_t) in all specifications. We also include a set of covariates (X_i) which might influence national identity formation, including gender, age, parents' education, parents' ethnicity, share of Hoklo people in the respondents' hometown, and a set of dummy variables indicating the region where an respondent lived in before his/her 15 years-old. The parents' ethnicity and education level capture the family's influence on the respondents' national identity.

Four major ethnicities live in Taiwan: Hoklo, Mainlanders, Hakka, and Aborigines. Using 1992, 1995, and 1998 TSCS data, we display a breakdown of these four ethnic groups in Figure C.1 of the Online Appendix. About 70% of the Taiwanese people descend from Hoklo immigrants, who originated from Xiamen, Quanzhou and Zhangzhou, China, and arrived on the island around 400 years ago. As the largest ethnic group, compared to other ethnicities, the Hoklo people are more likely to have a Taiwanese identity (i.e., call themselves Taiwanese only).[24] Figure C.2 in the Online Appendix indicates that about 39%

[21] Although the enrollment cutoff is nationally mandated, it is possible that some parents do not follow the rule. However, we are unable to examine this concern directly, since TCSC data does not provide information about an individual's school enrollment status. Instead, we use 2006–2018 PISA (Programme for International Student Assessment) data, which contains a student's birth year–month and enrollment status, to investigate this issue. We find that most students (around 95%) follow the nationally mandated enrollment cutoff. Thus, we believe the variable $TextBook$ can represent whether the respondent was exposed to the new curriculum or not.

[22] Junior high education curriculum reforms in Taiwan have happened every five to ten years since 1968, when compulsory education was extended from six to nine years. The exact years new curricula were introduced were 1968, 1972, 1983, 1986, 1995, 2001. Note that the new curriculum we looked at was published in 1995, but the textbooks were not adopted until 1997. Curriculum reforms for senior high education happened on average every decade. The exact years were 1962, 1971, 1983, 1995, 2005. The only curriculum reform experienced by the four education cohorts we focused on is the one we looked at. The next closest reform to them was from 1995 for senior high education. The senior high textbooks, edited according to the 1995 curriculum, were adopted in 1998. Hence, each of the four education cohorts we focused on studied the same senior high school textbooks if they entered the academic track. As far as we know, the reform we are looking at is the first since 1968 in junior high education to center on social objects.

[23] We also include a second-order polynomial of the birth cohort m interacting fully with $TextBook$, for a robustness check.

[24] Since 1945 (the end of Japanese colonization in Taiwan), construction of the concept of Taiwanese has centered on ethnicity groups living in Taiwan before 1945. This includes Aborigines (in Taiwan for thousands of years), Hoklo and Hakka (migrated from southern China since 400 years ago) but

Table 1
Descriptive statistics for treatment group and control group.

	Born after September 1984	Born before September 1984	Difference (after - before)
Female	0.445	0.445	0.000
	(0.498)	(0.498)	(0.049)
Age	19.578	20.954	−1.376***
	(0.659)	(0.995)	(0.080)
Years of schooling (self)	13.566	13.894	−0.327
	(2.130)	(1.936)	(0.202)
Years of schooling (father)	10.827	10.445	0.382
	(3.246)	(3.580)	(0.334)
Years of schooling (mother)	10.075	9.760	0.315
	(3.424)	(3.232)	(0.330)
Proportion of Hoklo in the hometown	0.711	0.734	−0.023
	(0.227)	(0.206)	(0.022)
Hoklo father	0.786	0.768	0.018
	(0.411)	(0.423)	(0.041)
Hoklo mother	0.827	0.823	0.004
	(0.38)	(0.383)	(0.038)
# of individuals	173	254	

Notes: We pool data from the 2003, 2004, and 2005 TSCS waves and use the sample born between September 1982 and August 1986. The definitions of the individual characteristics are as follows: (1) Female: If an individual is female assigned 1, otherwise 0. (2) Respondent/Father/Mother's schooling years: (a) no education (zero years of schooling); (b) elementary school (6 years of schooling); (c) junior high school (9 years of schooling); (d) senior (vocational) high school (12 years of schooling); (e) two-year college (14 years of schooling); (f) University or vocational university (16 years of schooling). (3) Hoklo fathers/mothers: If an individual's father/mother is Hoklo assigned 1, otherwise 0. In the Online Appendix D, we provide detailed definition of proportion of Hoklo people in the hometown. Standard deviations in parentheses, and standard errors in brackets. *** significant at the 1 percent level, ** significant at the 5 percent level, and * significant at the 10 percent level.

of Hoklo people identify as Taiwanese, which is much higher than the other main ethnic groups, namely Aborigines (27%), Hakka (25%), and Mainlanders (8%).[25] Therefore, in some specifications, we include the share of Hoklo people in the respondents' hometown to control the intensity of Taiwanese identity in individuals' hometowns.

The inclusion of dummy variables for regions help us control for regional factors possibly influencing national identity formation, such as local support for a certain political party.[26] In the Online Appendix D, we provide detailed definition of these individual characteristics. Finally, standard errors are clustered at the birth cohort level (i.e. birth year–month).

Table 1 reports the summary statistics of related individual characteristics in the empirical analysis, such as the respondent's gender, age, and years of schooling, their fathers'/mothers' education level, their fathers'/mothers' ethnicity (i.e. whether they are Hoklo people), and the share of Hoklo people in the respondents' hometown. We find both treatment and control groups are similar in terms of these variables except for the respondent's age. The treatment group is 1.4 years-old younger than the control group. This result is not surprising since our research design essentially compares the young and old educational cohorts. In the empirical analysis, we will control for the effects of birth cohorts on outcomes using a linear function of birth year–month. To sum up, our findings from Table 1 suggest that the characteristics of treatment and control groups are quite balanced.

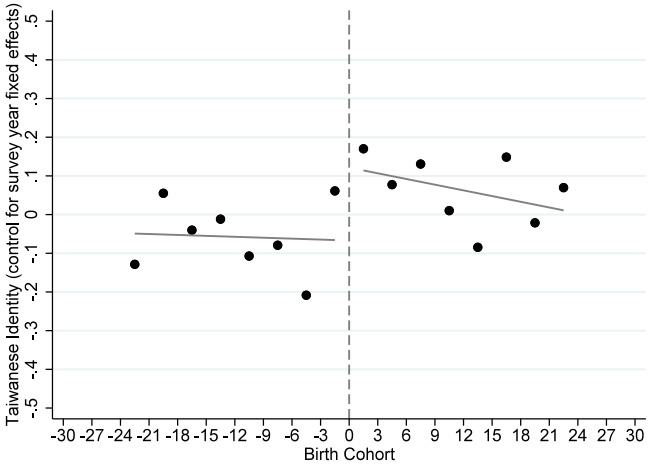

Fig. 3. Taiwanese identity and birth cohorts: Main results.
Notes: We pool data from 2003, 2004, 2005 TSCS and use the sample born between September 1982 and August 1986. We first regress *Identity* on survey year dummies and then collapse the residuals at birth year–quarter level (i.e. three birth year–month cohorts) to derive the dots. Thus, the first dot in this figure represents average *Identity* (after controlling for the survey year fixed effect) for those born in September, October, and November 1982 and the last dot represents average *Identity* (after controlling for the survey year fixed effect) for those born in June, July, and August 1986. Fitted lines are from regression of the dots on a first order polynomial of birth year–quarter interacted with $TextBook$ dummy variable.

5. Results

5.1. The effect of curriculum reform on Taiwanese identity

Fig. 3 displays the relationship between Taiwanese identity and the birth cohort. We group up the sample by every three birth year–months to increase the sample size of each dot. Thus, each dot in Fig. 3 represents the average of variable *Identity* (i.e. Taiwanese identity) by three birth year–month cohorts (i.e. the birth year–quarter cohort), after it has been regressed on the survey year dummies (i.e. controlling

excludes Mainlanders (who have migrated from all over China since 1945). Politically, the Hoklo people account for the majority of the population, and they play a more important role in political movements, which often mobilize people via identity politics, than Hakka and Aborigines.

[25] We also use 1992, 1995, and 1998 TSCS data and restrict the sample to people who are 25 years old or above, in order to make sure that the respondents are not affected by curriculum reform.

[26] There were 23 county/city in Taiwan during the sample period. We categorize them into four regions: northern, middle, southern, and eastern regions. Northern region includes Taipei City, New Taipei City, Yilan County, Taoyuan City, Keelung City, Hsinchu County, Hsinchu City. Middle region includes Miaoli County, Taichung City, Taichung County, Changhua County, Nantou County. Southern region includes Yunlin County, Chiayi County, Chiayi City, Tainan City, Kaohsiung City, Tainan County, Kaohsiung County, Penghu County and Pingtung County. Eastern region includes Hualien County and Taitung County. We use the eastern region as a reference group.

Table 2
The effects of the curriculum reform on Taiwanese identity: Main results.

	Taiwanese Identity			
	(1)	(2)	(3)	(4)
TextBook	0.162**	0.173**	0.183**	0.182**
	(0.080)	(0.081)	(0.082)	(0.084)
Baseline Mean	0.608	0.608	0.608	0.608
Persuasion Rate	41.3	44.1	46.6	46.4
Sample Size	427	427	427	427
Linear Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool data from the 2003, 2004, and 2005 TSCS waves and use the sample born between September 1982 and August 1986. The above table reports the coefficient of *TextBook* based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. All columns include the survey year fixed effect and the first-order polynomials of birth year–month m interacting fully with *TextBook* (i.e. linear spline). Column (2) adds the ethnic variables, such as parents' ethnicity and share of Hoklo in the hometown. For parents' ethnicity, we include a set of dummy variables indicating a respondent's father/mother is Mainlanders, Hakka, Aboriginal and Other. We use Hoklo as a reference group. Column (3) further includes demographic variables, such as gender, fathers'/mothers' education level. For fathers'/mothers' education level, we include a set of dummy variables indicating a respondent's father's/mother's highest degree is junior high school, senior high school, vocational high school, college, university, military school. We use elementary school as a reference group. Column (4) adds a set of dummy variables indicating the region where an respondent lived in before age 15. There were 23 county/city in Taiwan during the sample period. We categorize them into four regions: northern, middle, southern, and eastern regions. We use the eastern region as a reference group. The baseline mean is the simple average of *Identity* of respondents born between September 1982 and August 1984. Standard errors are clustered at birth year–month level in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

for the survey year fixed effect).[27] The lines in Fig. 3 represent fitted regressions of the cell's mean dots, using first-order polynomials interacting with the dummy variable *TextBook*. In so doing, we eliminate the potential confounding effect of the survey years. The fitted line in Fig. 3 suggests that the discontinuity of *Identity* is roughly 20 percentage points around the cut-off.

Table 2 shows the regression results of the estimating specification (1). The first-order polynomials of birth cohort m fully interact with *TextBook*, and the survey year fixed effects are included in all regressions. Column (1) reports our baseline results. Consistent with the graphical evidence in Fig. 3, the estimate of the coefficient on *TextBook* is 0.16 and statistically significant. In other words, studying the new textbook (i.e. the *Knowing Taiwan* series) can increase one's probability of reporting oneself as Taiwanese by around 16 percentage points.

In columns (2) to (4), we gradually include ethnic/demographic variables to increase the precision of the estimates and lessen any potential bias due to discontinuities in observables at the cut-off. In general, we find qualitatively similar estimated coefficients on *TextBook* across the different specifications. Our results suggest that new curricula significantly increase the likelihood of identifying as Taiwanese by around 18 percentage points. Compared to the baseline mean of *Identity* (i.e. around 61%),[28] the magnitude of the estimated effect is sizeable—accounting for a 30% increase.

Note that the changes in the 1997 curriculum reform include: (1) More materials covering Taiwan and fewer covering China; (2) The wording used in the textbook distinguishes between Taiwan and China.

[27] The graph is at the birth year–quarter level, so the first dot in Fig. 3 represents average *Identity* (after controlling for the survey year fixed effect) for those born in September, October, and November 1982, and the last dot represents average *Identity* (after controlling for the survey year fixed effect) for those born in June, July, and August 1986. In the later sections, we use a similar way to display Figs. 7, 9, and 10.

[28] This is the mean of *Identity* across all those in the sample who were born between September 1982 and August 1984 (i.e. the control group).

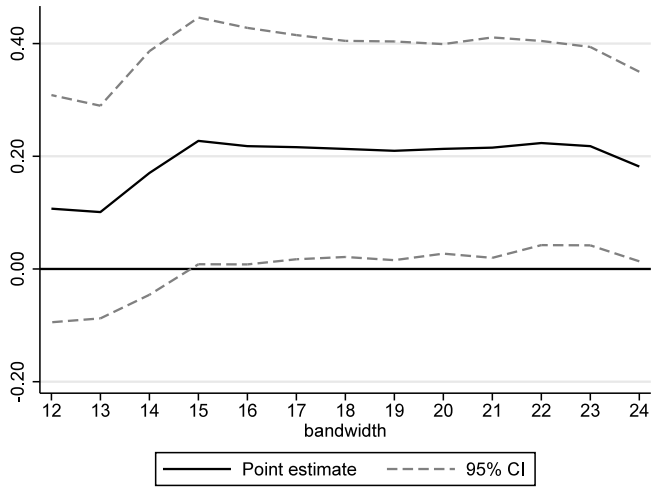

Fig. 4. RD Estimates across different bandwidth choices.
Notes: We run regressions as column (4) in Table 2 with different bandwidths: 12 to 24 months on each side of the cut-off, i.e., two education cohorts. The solid line represent the point estimates of coefficients on the *TextBook* dummy variable and the dotted line represents the corresponding 95% confidence interval derived from standard errors clustered at birth year–month level.

One important caveat is that the estimated effect bundles up all changes in the reform. We need to stress that our research design and data cannot identify which key element within the curriculum reform leads to changes in Taiwanese identity. Thus, the results provide a global evaluation of the 1997 curriculum reform.

5.2. Discussion: Persuasion rate

In this section, we provide the persuasion rate, calculated by the formula used in the literature on persuasive communications (DellaVigna and Gentzkow, 2010):

$$100 \times \frac{y_t - y_c}{e_t - e_c} \times \frac{1}{1 - y_c},$$

where e_i denotes the share of group i receiving the message (the textbook content in our case), and y_i the share of group i adopting the behavior (i.e. considering themselves Taiwanese in our case). The subscripts t and c represent the treatment and control groups. The persuasion rate measures the degree to which the treatment persuades people to adopt the behavior, scaled by the share of people receiving the messages and the share of the control group "to be persuaded" $(1 - y_c)$. In our case, since all students born after September 1984 were exposed to the new textbook, $e_t - e_c = 1 - 0 = 1$. The persuasion rate reported in the first column in Table 2 is calculated as $100 \times \frac{0.182}{1} \times \frac{1}{1-0.608} = 46.4$. This 46% persuasion rate is quite high compared to persuasion rates found in the literature studying the persuasive effects of media communications, which are barely higher than 20% (Enikolopov et al., 2011; Gentzkow, 2006; DellaVigna and Kaplan, 2007; DellaVigna et al., 2014; Yanagizawa-Drott, 2014; Adena et al., 2015; Blouin and Mukand, 2019; Chiang and Knight, 2011; Gerber et al., 2009; Gentzkow et al., 2009). Our estimate, however, aligns with the persuasion rate found in Cantoni et al. (2017), in which more than a quarter of the persuasion rates were higher than 20%, and the highest was 50%. The high persuasion rate is not that surprising after taking into account the degree of exposure: Students had to study the *Knowing Taiwan* series for at least a year, and they also spent three years memorizing the materials for the high school admission examinations. This exposure is much greater than typically occurs with specific newspaper, TV, or radio programs.

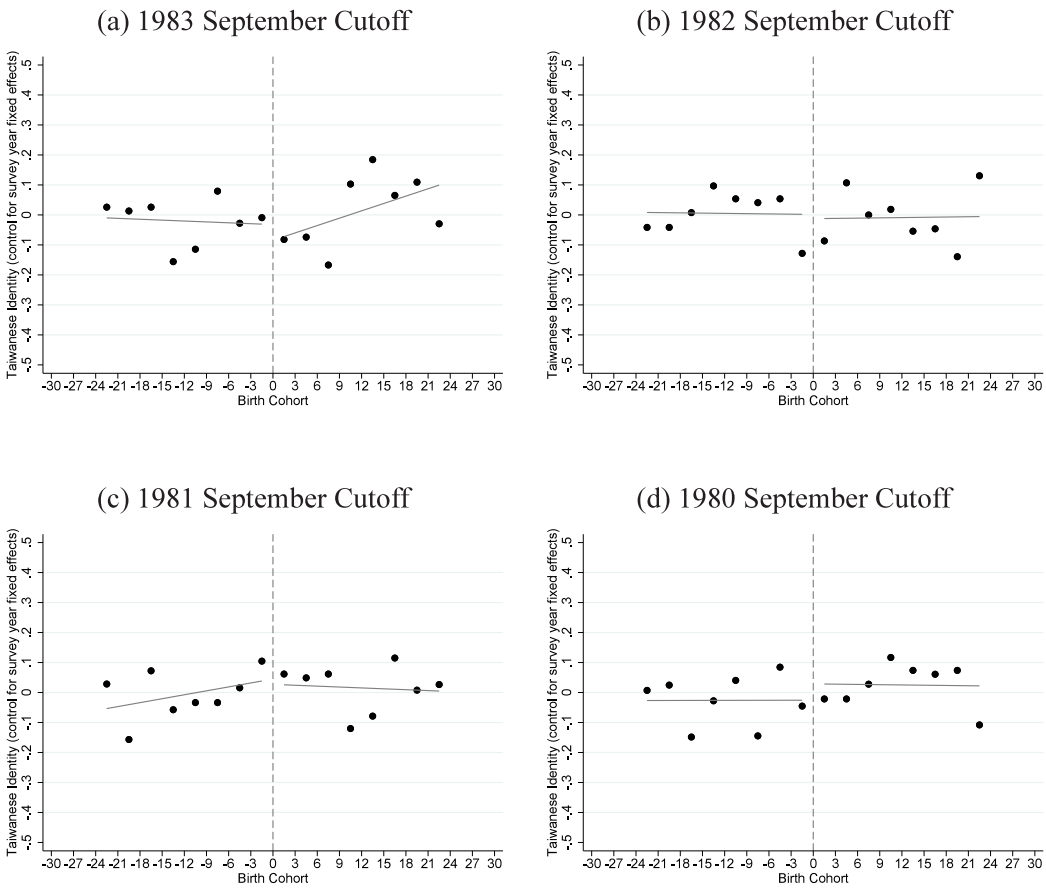

Fig. 5. RD graph for placebo tests.
Notes: We pool the 2003, 2004, and 2005 TSCS data. We first regress *Identity* on survey year dummies and then collapse the residuals at birth year–quarter level (i.e. three birth year–month cohorts) to derive the dots. Fitted lines are from regression of the dots on a first order polynomial of birth year–quarter interacted with $TextBook$ dummy variable. Fig. 5(a) uses the sample born between August 1981 and September 1985; Fig. 5(b) uses the sample born between August 1980 and September 1984; Fig. 5(c) uses the sample born between August 1979 and September 1983. Fig. 5(d) uses the sample born between August 1978 and September 1982.

5.3. Robustness check

We validate the robustness of the main results in two ways. First, we discuss their sensitivity to different empirical settings, such as the inclusion of higher polynomial orders, the choice of bandwidth, and sample selection. Second, we investigate the validity of the identification assumption for RD design, by examining the smoothness of observable covariates and conducting a series of falsification tests.

5.3.1. Choices of polynomial order and bandwidth

To examine whether our results are sensitive to different parametric specifications, Table 3 displays estimates based on a specification with a second-order polynomial (i.e. quadratic spline). The estimated results suggest that studying new textbooks, on average, can increase Taiwanese identity by 19–21 percentage points, which is a range quite similar to our main estimates. Next, we examine the robustness of our estimates over a wide range of bandwidths. Fig. 4 shows the point estimates of the coefficient on $TextBook$ and their corresponding 95% confidence intervals, using the same specification as in column (4) of Table 2, with bandwidths ranging from two education cohorts (i.e. 24 months) to one (i.e. 12 months) on each side of the cut-off. The magnitudes of the point estimates remain similar as we narrow down the birth year–month window, showing that the results in Table 2 are not sensitive to bandwidth choice.[29]

5.3.2. Exclude specific birth cohorts

Based on Fig. 3, it seems that our RD results is driven by the birth cohorts between −6 to −4 (i.e. individuals born between March to May 1984). In order to investigate this concern, Panel B of Table 3 reports the estimates based on the sample excluding these cohorts. We find that the RD estimate decrease slightly to 0.13. But the estimate is still statistically significant and suggests that new curricula raises the likelihood of identifying as Taiwanese by around 13 percentage points.

5.3.3. Wording of the identity question

The framing of the identity question in TSCS varies slightly across years. In addition, the theme of the survey is sometimes "national identity", while it is "civil rights" or "religion" in other years. Specifically, the wording of the identity questions used in the 2003 and 2004 waves is slightly different from the 2005 wave. The identity question for the 2005 TSCS categorizes "both" in two ways: (1) Both Taiwanese and Chinese; (2) Both Chinese and Taiwanese. Therefore, we conduct our RD estimations based on the questions in the 2003–2004 waves and 2005 wave, respectively. Panels C and D of Table 3 and Figure

[29] The confidence intervals of point estimates increase slightly. The estimated standard errors increase from 0.083 (bandwidth: 24 months) to 0.097 (bandwidth: 12 months).

Table 3
Robustness check: Different specification, sample, identity questions.

	Taiwanese Identity			
	(1)	(2)	(3)	(4)
Panel A: 2nd Order Polynomial				
TextBook	0.186	0.199*	0.188	0.209*
	(0.112)	(0.116)	(0.120)	(0.120)
Sample Size	427	427	427	427
Panel B: Exclude Specific Birth Cohorts				
TextBook	0.123	0.131	0.136*	0.133*
	(0.075)	(0.078)	(0.076)	(0.076)
Sample Size	408	408	408	408
Panel C: Identity Question – 2003–2004 Waves				
TextBook	0.179*	0.196*	0.211*	0.240**
	(0.098)	(0.106)	(0.106)	(0.113)
Observations	243	243	243	243
Panel D: Identity Question – 2005 Wave				
TextBook	0.207	0.193	0.225	0.190
	(0.140)	(0.145)	(0.154)	(0.156)
Observations	184	184	184	184
Linear/Quadratic Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool data from the 2003, 2004, and 2005 TSCS waves and use the sample born between September 1982 and August 1986. The above table reports the coefficient of $TextBook$ based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. All panels include the survey year fixed effect and the first-order polynomials of birth year–month m interacting fully with $TextBook$ (i.e. linear spline). Panel A additionally includes quadratic spline. Other covariates are the same as in the corresponding columns in Table 2. Standard errors are clustered at the birth year–month level in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

C.3 in the Online Appendix suggests that the estimated magnitudes of textbook effect are fairly similar across different waves.[30]

5.3.4. Smoothness of observable covariates at cutoff

A key identification assumption of RD design is that the individuals' characteristics should be similar on both sides of the cut-off (i.e. born in September 1984). In other words, no other confounding factors should change in September 1984. To investigate this issue, we examine whether the selected observable characteristics are balanced on both sides of the cut-off. We use these characteristics as outcome variables and estimate Eq. (1) without controlling for the covariates X_i. The regression results are shown in Table 4. Most observable characteristics do not exhibit significant discontinuities at the cut-off.

The only exception is the share of Hoklo people in the hometown. The sixth column of Table 4 suggests this variable exhibits a drop at cutoff, with a size of 7.5 percentage points (i.e. less than 10% decline from baseline mean). In other words, it is more likely that we will observe a respondent who lived in a town with fewer Hoklo people on the right-hand side of the cut-off. However, we find that the statistical significance of this estimate is only marginal at 10% level. Furthermore, Table 1 suggests that the change in share of Hoklo people at cutoff is not significant when comparing the observations of two-sides around cutoff directly. Therefore, we think the finding of discontinuity in share of Hoklo people in the hometown is not very conclusive. Finally, in order to lessen any potential bias, we include this variable in the specifications and find that our estimates are robust to its inclusion.

[30] The RD estimates based on 2003–2004 waves are around 0.18 to 0.24. Due to smaller sample size, the estimates using 2005 wave is not statistically significant but within the same range (i.e., 0.19 to 0.23).

5.3.5. Density of the running variable around cutoff

Although the running variable of our RD design – birth cohort – is predetermined and unlikely to be affected by the reform in 1997, it is still possible that the survey might have sampling biases and the number of individuals different around cutoff (i.e., September 1984). We implement a density discontinuity test to examine this issue (Cattaneo et al., 2020, 2018; McCrary, 2008). Figure C.4 displays the results for the density test and suggests that there is no discontinuity in the distribution of the running variable at the threshold.

5.3.6. Placebo tests

In this section, we further examine our identification assumption, namely, that no other confounding factors change at the cut-off, by conducting a series of placebo tests. One potential confounding factor could be the mental age effect: People who were born on the left-hand side (i.e. August) of the birth year–month cut-off would have been more mentally mature than those on the right-hand side (i.e. September), since they had entered the school system earlier and thus, at any given time, may have had more work or social experience, which might have affected their Taiwanese identity. That being the case, we should observe similar jumps in September for every birth cohort. To examine this hypothesis, we estimate Eq. (1) for three fake reforms.

We take 1996, 1995, 1994, and 1993 as academic years for the fake curriculum reforms and thus treat September 1983, 1982, 1981, and 1980 as birth year–month cut-offs for placebo tests.[31] We then replicate the results in Table 2 for each fake curriculum reform, using the same TSCS waves in 2003, 2004, and 2005. Note that we only include two education cohorts (i.e. 24 months) on each side of the fake birth year–month cut-off, to make the falsification results comparable to our main results.

Panel A to D of Table 5 show the results of the falsification regressions. The estimated "treatment effects" are generally insignificant and the magnitudes are quite small. Fig. 5 show the consistent graphical evidence. Thus, the results of the above placebo tests suggest our main estimates might not be driven simply by the mental age effects or other confounding factors.

Since the choice of these years is rather arbitrary, we also generalize the above analysis to a permutation test, as in Cantoni et al. (2017), by assigning the fake reform to all possible months and years – from January 1950 to September 1983 – to obtain the distribution of the placebo estimates. Fig. 6 compares the real estimates with these placebo ones. We find that among the estimates based on 405 fake reforms, only four of them are larger than the estimated curriculum effect (0.18). The real estimates are way above the placebo ones, and the p-value is only 0.01. In sum, these placebo tests indicate that the significant estimates in Table 2 should be treated as causal and are not just findings made by chance.

Finally, we conduct another type of placebo test by repeating the same RD analysis, but on this occasion we look at the different survey questions that could capture attitude towards other social values (e.g., opinions on social welfare or family issues). We list these questions and alternatives in the Online Appendix E.1. The idea behind this placebo test is that the curriculum reform should not affect these cohorts differently on other social values — only on national identity. Table 3 in the Online Appendix suggests that the new curriculum had a negligible impact on other social values, thereby further verifying that our main result in terms of identity is not a chance finding.

[31] They are 13 years old in 1996, 1995, 1994, and 1993, respectively.

Table 4
Robustness check: Validity of regression discontinuity design.

VARIABLES	Female	Age	Years of Schooling	Father's Schooling years	Mother's Schooling years	Share of Hoklo people	Hoklo Fathers	Hoklo Mothers
$TextBook$	0.044	0.002	−0.219	0.015	0.115	−0.075*	−0.017	−0.053
	(0.065)	(0.005)	(0.250)	(0.599)	(0.431)	(0.043)	(0.076)	(0.059)
Sample Size	427	427	427	427	427	427	427	427

Notes: We pool data from the 2003, 2004, and 2005 TSCS waves and use the sample born between September 1982 and August 1986. The above table reports the coefficient of $TextBook$ based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. Note that we do not include any covariates X_i since they are outcome variables now. All columns include the survey year fixed effect and the first-order polynomials of birth year–month m interacting fully with $TextBook$ (i.e. linear spline). The definitions of the individual characteristics are as follows: (1) Female: If an individual is female assigned 1, otherwise 0. (2) Respondent/Father/Mother's schooling years: (a) no education (zero years of schooling); (b) elementary school (6 years of schooling); (c) junior high school (9 years of schooling); (d) senior (vocational) high school (12 years of schooling); (e) two-year college (14 years of schooling); (f) University or vocational university (16 years of schooling). (3) Hoklo fathers/mothers: If an individual's father/mother is Hoklo assigned 1, otherwise 0. In the Online Appendix D, we provide detailed definition of proportion of Hoklo people in the hometown. Standard errors are clustered at the birth year–month level in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

Table 5
Robustness check: Placebo test of fake textbook reform.

	Taiwanese Identity			
	(1)	(2)	(3)	(4)
Panel A: Use September 1983 as Cut-Off				
$TextBook$	−0.055	−0.070	−0.049	−0.043
	(0.073)	(0.075)	(0.079)	(0.076)
Sample Size	487	487	487	487
Panel B: Use September 1982 as Cut-Off				
$TextBook$	−0.009	−0.006	−0.027	−0.026
	(0.092)	(0.100)	(0.094)	(0.094)
Sample Size	509	509	509	509
Panel C: Use September 1981 as Cut-Off				
$TextBook$	−0.018	−0.023	0.012	0.006
	(0.069)	(0.071)	(0.073)	(0.074)
Sample Size	519	519	519	519
Panel D: Use September 1980 as Cut-Off				
$TextBook$	0.052	0.062	0.006	0.003
	(0.080)	(0.076)	(0.088)	(0.088)
Observations	506	506	506	506
Panel E: Difference-in-Differences Design				
$AfterSep \times B_{1984}$	0.150	0.164	0.171	0.176*
	(0.103)	(0.104)	(0.106)	(0.104)
Observations	656	656	656	656
Linear Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool the 2003, 2004, and 2005 TSCS data. Panel A uses the sample born between August 1981 and September 1985; Panel B uses the sample born between August 1980 and September 1984; Panel C uses the sample born between August 1979 and September 1983. Panel D uses the sample born between August 1978 and September 1982. The above table reports the coefficient of $TextBook$ based on Eq. (1). In each placebo test, we define dummy variable $TextBook$ as respondents born after following cutoffs: September 1983 (Panel A), September 1982 (Panel B), September 1981 (Panel C), or September 1980 (Panel D). Panel E reports the coefficients of $AfterSep \times B_{1984}$ in the Eq. (2). In this specification, we combine all available cutoffs used in the main estimation and placebo tests to implement a DID design. Specifications in each column are the same as in the corresponding columns in Table 2. Note that in DID design, we allow the linear spline of running variable to be cohort-specific. Standard errors are clustered at the birth year–month level in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

5.3.7. Difference-in-differences design

In this section, we generalize the placebo tests in Table 5 by using a difference-in-differences design. Specifically, we combine all available cutoffs used in the main estimation and placebo tests, following which we narrow down the bandwidth to 6 months before and after September in each year and estimate the following regression:

$$Identity_{it} = \kappa_0 + \kappa_1 AfterSep_i + \kappa_2 B_{1984} + \kappa_3 AfterSep_i \times B_{1984} + s(m;\beta) + X_i'\gamma + \delta_t + \epsilon_{it} \quad (2)$$

where $AfterSep_i$ is a dummy indicating that individuals were born within the 6 months after September. That is, $AfterSep_i = 1$ if an individual's birth month is between September and the following year's February. $AfterSep_i = 0$ if an individual's birth month is between March and August. Similar to the standard DID design, we include a dummy variable B_{1984} indicating the 1984 cohort – individuals born between March 1984 and February 1985 (i.e. $B_{1984} = 1$) – since they were exposed to different curricula, depending on whether they were born before or after September. For other cohorts (i.e. $B_{1984} = 0$), the textbooks they read are independent of their birth month.[32] We also allow the linear spline of the running variable to be cohort-specific $s(m;\beta)$.

The key variable is an interaction term between $AfterSep_i$ and B_{1984}, which compares the cutoff of students born in 1984, net of the same cutoff differences for neighboring birth cohorts. If our RD estimate is mainly driven by the curriculum effect, we should expect that the jump from August to September would systematically only exist for the 1984 cohort. The remaining notations are defined in the same way as those in Eq. (1).

Panel D of Table 5 shows that the estimated coefficients on $AfterSep_i \times B_{1984}$ range from 0.15 to 0.18. Since our treated cohort only includes those born within six months before and after September 1984, the estimates are less statistically significant, but the magnitudes of the curriculum effect are close to the RD estimates. Our preferred estimate (Column (4)) suggests that new curricula significantly increase the likelihood of identifying as Taiwanese by around 18 percentage points.

5.4. The effect of curriculum reform on other political outcomes

So far, we have found that people who read new textbooks are more likely than old-textbook readers to consider themselves as Taiwanese. In this section, we investigate the impact of curriculum reform on other political preferences and attitudes which might be related to the change in national identity. People holding stronger Taiwanese identity could be more likely to support independence or the parties who are against unification with China.[33] Indeed, Clots-Figueras and

[32] There are four other cohorts in the DID design. 1980 cohorts: individuals born between March 1980 and February 1981. 1981 cohorts: individuals born between March 1981 and February 1982. 1982 cohorts: individuals born between March 1982 and February 1983. 1983 cohorts: individuals born between March 1983 and February 1984.

[33] People in Taiwan aged above 20 are eligible for voting. In the first cohort who studied new textbooks, only half of the cohort who were born before 1985 March became eligible for voting in the president and national legislative election in March 2004; also, the observed turnout for the cohort is extremely low, which limits the sample size that reports voting choice in the short-run data (2003–2005). We thus do not analyze direct voting choices in this section.

Masella (2013) found that individuals who had experienced greater exposure to teaching in Catalan not only had stronger Catalan identity, but also were more likely to vote for a Catalan regionalist party and had stronger separatist attitudes. The TSCS has a question in which respondents are asked about their opinion on whether they support Taiwan independence, the status quo, or the unification of mainland China and Taiwan:

- Concerning the future Taiwan mainland-China relationship, some think that Taiwan should be independent, while others think we should unify with mainland China. Which comes closer to your view? (1) Declare independence as soon as possible; (2) Maintain the present condition, but go towards independence in the future; (3) Maintain the present condition forever; (4) Maintain the present condition, but go towards unification in the future; (5) Unify with mainland China as soon as possible.

We create a dummy variable which is equal to one if the respondent selects the first two alternatives (i.e. support for Taiwan independence), zero otherwise. In addition, the TSCS includes a question in which individuals are asked which political party they support:

- Political parties in Taiwan have their own supporters. Among these political parties, which one do you support? (1) Kuomintang; (2) Democratic Progressive Party; (3) People First Party; (4) Taiwan Solidarity Union; (5) New Party; (6) Taiwan Independence Party; (7) Other political party; (8) Pan-blue; (9) Pan-green.

Democratic Progressive Party, Taiwan Solidarity Union, and Taiwan Independence Party, which are so-called "Pan-green" parties, support Taiwan independence. Thus, we construct a dummy variable equal to one if the respondent chose these parties, zero otherwise. To examine the effect of curriculum reform on individuals' preferences over Taiwan independence, we estimate Eq. (1) and use the above dummy variables as outcomes. Panel A and B of Table 6 displays the estimated effect of the new curriculum on people's preferences over Taiwan independence. RD estimates in this regard suggest that the curriculum reform does not induce people to support Taiwan independence or vote for a political party which is against unification. In contrast to the results for national identity, all estimated coefficients on *TextBook* in Panel A and B of Table 6 are quite small and statistically insignificant. There are two possible reasons why our results are distinct from the findings in Clots-Figueras and Masella (2013). First, Catalan reform is more comprehensive than the curriculum reform used in this paper. According to Clots-Figueras and Masella (2013), Catalan reform not only changed language use in class, but also modified course contents, which might affect more political outcomes. Second, the political situations of Taiwan and Catalonia are quite different, in that the former has her own army and sovereignty, while Catalonia belongs to Spain and has limited autonomy. Declaration of independence in Taiwan's context, is thus likely not as important as in Catalonia.

Finally, we argue that the military threat from China might explain the lack of increase of *unconditional* support of independence. People's subjective probabilities on high-stake events is an important input in determining observed political preferences in societies that face huge uncertainty at macro level. It is a non-trivial probability that declaration of Taiwan's independence would trigger a war between Taiwan and China. We utilize the data from the following survey question in TSCS to try to partial out the influence of military threat from China on people's support of independence:

- Some think that if the independence of Taiwan would not lead to war, we should declare independence. To what extent do you agree or disagree with this point of view? (1) Agree strongly; (2) Agree; (3) Disagree; (4) Disagree strongly.

We create a dummy variable which is equal to one if the respondent selects the first two alternatives, and zero otherwise. Panel C of Table 6 reports RD estimates using this dummy variable as an outcome. The estimation results suggest that people who studied new textbooks were on average 5 percentage points more likely to support Taiwan's independence in a hypothetical situation where the declaration of Taiwan's independence will not result in war. However, the estimate is not statistically significant.

Since the proportion of respondents whose answers are the first two alternatives accounts for more than 70%, we create a new outcome indicating only the first alternative, in order to capture the shift from modest support for independence to a strong one. In this case, the baseline mean for the share of individuals strongly agreeing with Taiwan's independence if it would not lead to war is only 13%. Our preferred estimate in Panel D of Table 6 suggests that new curricula significantly increase the likelihood of strongly supporting Taiwan's independence by around 13 percentage points (see Column (4)). Our research design rules out the possibility that the results are driven by differential malleability of perception about the possibility and the costs of a war. Taken together, exposure to a new textbook did not directly translate into higher *unconditional* support for independence, but it did translate into higher support in a hypothetical state of the world where the major cost of declaring independence is removed. This is consistent with our interpretation of the influence of textbooks:

Table 6
Effects of the curriculum reform on preferences for Taiwan's independence.

	(1)	(2)	(3)	(4)
Panel A: Support Taiwan Independence Unconditionally				
TextBook	0.037	0.048	0.056	0.056
	(0.036)	(0.036)	(0.037)	(0.040)
Baseline Mean	0.107	0.107	0.107	0.107
Sample size	424	424	424	424
Panel B: Support Parties that Prefer Taiwan Independence				
TextBook	−0.103	−0.084	−0.078	−0.074
	(0.080)	(0.073)	(0.081)	(0.082)
Baseline Mean	0.353	0.353	0.353	0.353
Sample size	354	354	354	354
Panel C: Support Taiwan Independence if There is no War				
TextBook	0.027	0.035	0.044	0.045
	(0.050)	(0.051)	(0.060)	(0.063)
Baseline Mean	0.714	0.714	0.714	0.714
Sample size	422	422	422	422
Panel D: Strongly Support Taiwan Independence if There is no War				
TextBook	0.109	0.111	0.127*	0.131*
	(0.066)	(0.069)	(0.068)	(0.068)
Baseline Mean	0.131	0.131	0.131	0.131
Sample size	422	422	422	422
Linear Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool the 2003, 2004, and 2005 TSCS data and use the sample born between September 1982 and August 1986. The above table reports the coefficient of *TextBook* based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. Panel A displays the results for the preferences on Taiwan independence. Panel B displays results for the preference on the parties supporting Taiwanese independence. Panel C displays the results for the preference on Taiwanese independence under the condition that the independence of Taiwan would not lead to war. Panel D displays the results for the strong preference on Taiwanese independence under the condition that the independence of Taiwan would not lead to war. Specifications in each column are the same as in the corresponding columns in Table 2. The baseline mean is the simple average of outcomes of respondents born between September 1982 and August 1984 in the corresponding subgroup. Standard errors clustered at the birth year–month level are in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

people have a clearer distinction between the two nations Taiwan and China.[34]

6. Mechanisms

In this section, we explore the possible mechanisms through which school curricula (i.e. textbook contents) might affect an individual's national identity, by conducting subgroup analysis along two dimensions: Education track and the ethnic distribution of one's hometown. For each subgroup, we estimate Eq. (1) and conduct a similar RD analysis to that seen in Section 5.1.

6.1. Memorization: Subgroup analysis by education track

One possible channel through which school curricula might affect one's national identity is memorization. Students who paid more attention to studying their textbooks should be associated with higher treatment intensity, in the sense that they may have memorized more Taiwan-related texts. Specifically, we examine this mechanism by utilizing a subgroup analysis based on intensity of exposure to the new textbooks. The ideal proxy for this intensity is the grade of social subjects in the high-school entrance exam.[35] Unfortunately, the TSCS data does not include such information, so instead we use students' choice of education track to distinguish roughly between high and low levels of effort devoted to academic subjects in general.

After completing compulsory education, students in Taiwan are divided into two educational streams: The academic track and the vocational track. The choice of track is highly correlated with the effort students put in to studying when in junior high school. Students who were motivated to pursue more academic knowledge would have studied the textbooks far more, to give them a better chance of being selected by their preferred senior high school. On the other hand, common wisdom suggests that parents in Taiwan encourage students who lack motivation but are adept at obtaining excellent grades (for example, they memorize the material more quickly than the average person) to opt for the academic instead of the vocational track. Consequently, the education track implies something about the students' exposure to the content of textbooks. We categorize the respondents into two groups: academic track and vocational track.[36]

Fig. 7 displays the relationship between Taiwanese identity and birth cohorts by academic track (Fig. 7(a)) and vocational track (Fig. 7(b)) respondents. We observe a distinct jump around the cut-off in Fig. 7(a) but no such pattern in Fig. 7(b). Table 7 presents RD estimates based on Eq. (1) for academic track respondents (Panel A) and vocational track respondents (Panel B), respectively. The estimates for academic track respondents suggest that new curricula significantly increase the probability of such students having a Taiwanese identity, by around 31 percentage points. In contrast, the results for vocational track students are small and statistically insignificant.

Following Ito (2015), we formally test the statistical significance of differences in the curriculum effect between the two subgroups by

Table 7
Subgroup analysis: By education track.

	Taiwanese Identity			
	(1)	(2)	(3)	(4)
Panel A: Academic Track				
TextBook	0.279**	0.293**	0.309**	0.308**
	(0.113)	(0.115)	(0.137)	(0.138)
Baseline Mean	0.583	0.583	0.583	0.583
Sample Size	219	219	219	219
Panel B: Vocational Track				
TextBook	0.055	0.069	0.052	0.040
	(0.104)	(0.104)	(0.109)	(0.114)
Baseline Mean	0.639	0.639	0.639	0.639
Sample Size	208	208	208	208
Panel C: Test Heterogeneity				
TextBook	0.055	0.059	0.028	0.017
	(0.104)	(0.101)	(0.096)	(0.095)
TextBook × *Academic*	0.225	0.239	0.307*	0.323**
	(0.163)	(0.158)	(0.164)	(0.160)
Sample Size	427	427	427	427
Linear Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool the 2003, 2004, and 2005 TSCS data and use the sample born between September 1982 and August 1986. The above table reports the coefficient of *TextBook* based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. Panel A includes respondents whose final education level is senior high school or university. Panel B includes respondents whose educational level is junior high school, vocational high school (including military school), and vocational university. Specifications in each column are the same as in the corresponding columns in Table 2. The baseline mean is the simple average of *Identity* of respondents born between September 1982 and August 1984 in the corresponding subgroup. Panel C tests the statistical significance of difference in curriculum effect between two subgroups by showing coefficient on the interaction term of *TextBook* and a dummy for the academic track students *Academic*. Compared to Eq. (1), this specification also includes (1) a dummy for the academic track students *Academic*; (2) the interaction term of *TextBook* and *Academic*; (3) the interactions between *Academic* and running variable; (4) the interactions between *Academic* and survey year fixed effects. Standard errors clustered at the birth year–month level are in parentheses. *** p<0.01, ** p<0.05, and * p<0.1.

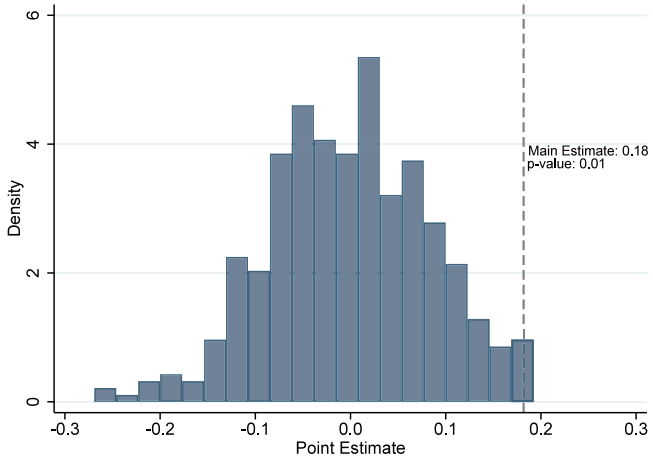

Fig. 6. Permutation test.
Notes: We pool data from the 2003, 2004, and 2005 TSCS waves and assign the fake reform to all possible months and years — from January 1950 to September 1983 (405 fake reforms). This figure display the distribution of placebo estimates (see the histogram) and compare them with our main RD estimate (see the dash line).

[34] In the Online Appendix E.2, we also examine the impact of curriculum reform on the responses to questions regarding political participation. We look at the questions, such as "Do you agree that you have the power to affect governmental decisions?" or "How often do you discuss politics with your friends?" or "How often do you read political news in newspaper/TV/internet?" Our results suggest that new curriculum have small and insignificant effect on individuals' willingness for political participation.

[35] These junior high school graduates in our sample, no matter which education track they proceeded with, took the same national examination and used the grade they achieved to apply for senior or vocational high school.

[36] The academic track includes respondents whose final education level is senior high school or university. The vocational track includes respondents whose educational level is junior high school, vocational high school (including military school), and vocational university.

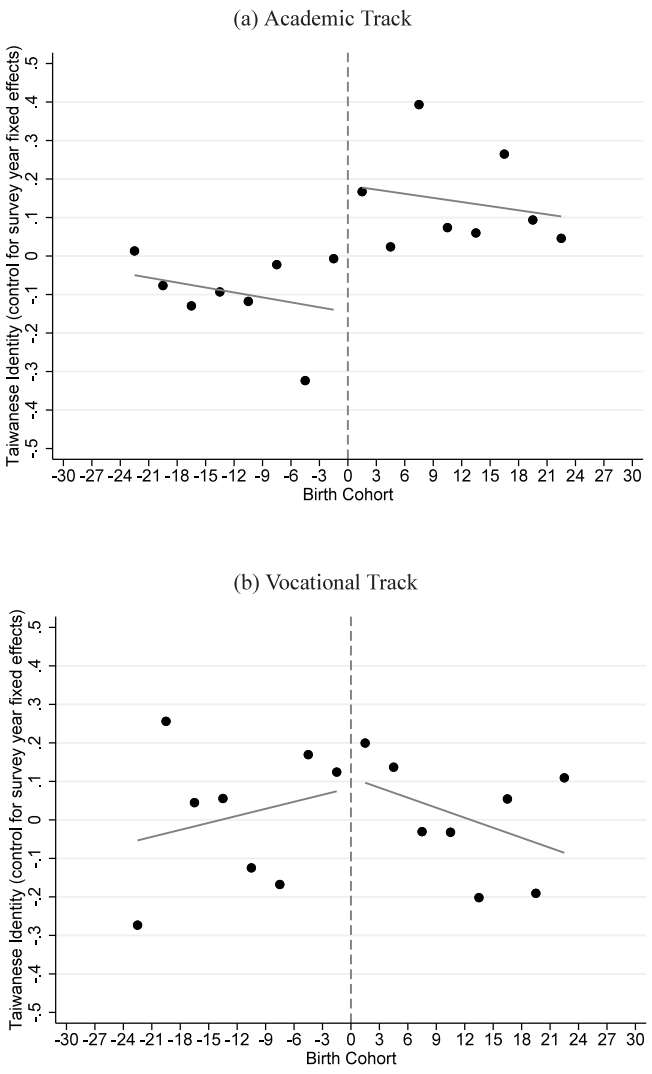

Fig. 7. Taiwanese identity and birth cohorts: By education track.
Notes: We pool data from 2003, 2004, 2005 TSCS and use the sample born between September 1982 and August 1986. Fig. 7(a) includes respondents whose final education level is senior high school or university. Fig. 7(b) includes respondents whose educational level is junior high school, vocational high school, and vocational university. We first regress *Identity* on survey year dummies and then collapse the residuals at birth year–quarter level (i.e. three birth year–month cohorts) to derive the dots. Thus, the first dot in this figure represents average *Identity* (after controlling for the survey year fixed effect) for those born in September, October, and November 1982 and the last dot represents average *Identity* (after controlling for the survey year fixed effect) for those born in June, July, and August 1986. Fitted lines are from regression of the dots on a first order polynomial of birth year–quarter interacted with $TextBook$ dummy variable.

adding the interaction term $TextBook$ and a dummy for the academic track students $Academic$.[37] Specifically, we estimate the following regression.

$$Identity_{it} = \delta_0 + \delta_1 Academic_i + \delta_2 TextBook_i + \delta_3 TextBook_i \times Academic_i + g(m;\beta) + X_i'\gamma + \mu_t + \epsilon_{it} \quad (3)$$

Panel C of Table 7 display the estimated coefficient on $TextBook \times Academic$. The result indicates that there is substantial and statistically significant heterogeneity in curriculum effect between academic and vocational tracks students. This subgroup analysis complements existing evidence provided by Cantoni et al. (2017) of a curriculum effect. Since Cantoni et al. (2017) conducted their survey at Peking University (i.e. an academic track school), their sample consisted of students who excelled at memorizing textbook materials. Thus, they could not tell whether the school curriculum would influence those who do not put too much effort on studying the textbooks. Our results suggest that the effect of a curriculum varies substantially according to the degree of exposure to textbook content.

6.2. Prior belief: Subgroup analysis by hometown ethnicity composition

According to "belief-based" models, people who possess less prior belief can be affected more by new information (DellaVigna and Gentzkow, 2010). In our case, this leads to a prediction that treatment effect is *decreasing* in the dimension of students' familiarity of Taiwanese identity prior to the exposure of the textbook. We proxy this familiarity by the ethnicity distribution of students' hometown and try different ways to present the treatment effect heterogeneity on this dimension.

As discussed earlier, ethnicity is correlated with Taiwanese identity. Due to historical reasons, Hoklo people hold the strongest Taiwanese identity, followed by Aborigines and Hakka (see Figure C.2 in the Online Appendix). Since children may randomly pick up cultural ideas from parents or role models in the neighborhoods in which they live (Bisin et al., 2011b), a child growing up in a town with higher share of ethnicity who hold stronger Taiwanese identity is more likely to be exposed to Taiwanese identity and Taiwan-related knowledge before junior high school. Another source of Taiwanese identity exposure in such towns may come from daily political discussions (e.g., election campaigns). People living in towns with fewer Hoklo people would have been exposed to fewer Taiwan-oriented speeches, since politicians running for local elections have to cater to local people's political preferences, including those related to identity.

Our first approach to test the "belief-based" models focus on the distribution of Hoklo people, which hold the strongest Taiwanese identity historically, in a discrete way. We categorize students into two groups: People who lived in towns with high and low proportions of Hoklo people. The definition of towns with high (low) proportions of Hoklo people is that the share of Hoklo people in one's hometown is more (less) than the population median (77.1%). In Online Appendix G, We provide a map demonstrating Hoklo ethnicity distribution and find the towns with a high proportion of Hoklo people are located in the southern and western parts of Taiwan (see the white-colored area).

To show that this subgroup criterion distinguishes between local environments with different levels of Taiwanese identity, we utilize the 1992, 1995, 1998, and 2000 TSCS waves and calculate the mean of *Identity* in the towns with high and low shares of Hoklo people during different survey years.[38] Fig. 8 suggests that people living in towns with low proportions of Hoklo people, on average, would be less likely to report themselves as Taiwanese than those living in towns with a low Hoklo count (i.e. around 10%–15% less). This assures us that students living in these two types of area would have faced significantly different social environments in terms of issues regarding national identity when in junior high school and elementary school—the time when they would have absorbed this information from the environment in which they were living. We argue that the curriculum effect would have been greater for students living in the towns with a low proportion of Hoklo people, according to "belief-based" models, since they would have been less familiar with Taiwan-related knowledge beforehand.

[37] Eq. (3) also includes (1) interactions between a dummy for the academic track students $Academic$ and a running variable and (2) interactions between $Academic$ and survey year fixed effects.

[38] In order to include those adults whom children are more likely to meet, we drop any respondents aged below 25.

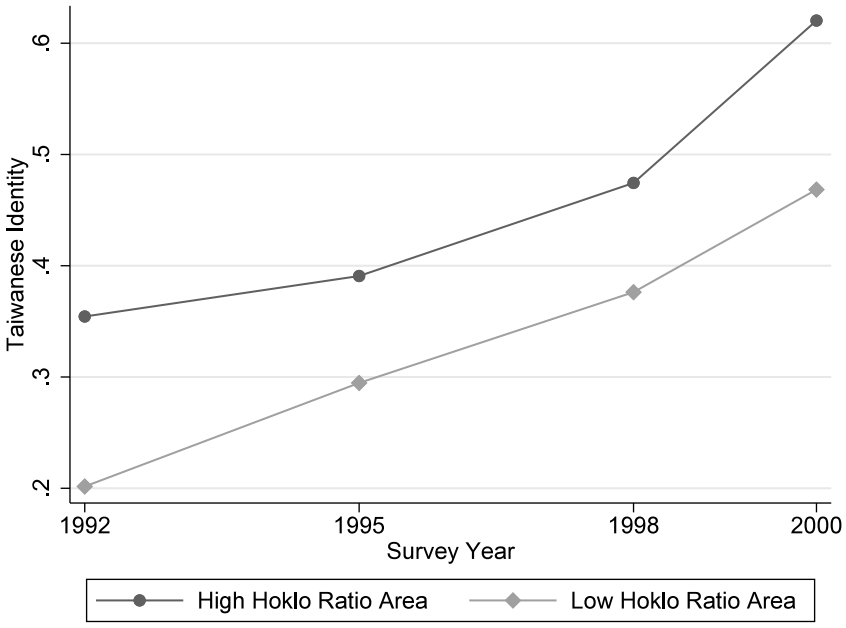

Fig. 8. Taiwanese identity trend in townships with high/low share of Hoklo people in 1990s.
Notes: We pool data from 1992, 1995, 1998 and 2000 TSCS waves. In order to include those adults whom children are more likely to meet, we restrict the respondents aged 25 or above. Each dot represents share of people reporting Taiwanese identity in given survey year and area. The circle symbol represents the area with high share of Hoklo people. The diamond symbol represents the area with low share of Hoklo people.

Fig. 9 displays the relationship between Taiwanese identity and birth cohorts separately for respondents living in the towns with a low Hoklo share (Fig. 9(a)) and a high Hoklo share (Fig. 9(b)). For the former group of respondents, Fig. 9(a) suggests there is a substantial increase in Taiwanese identity at the cut-off. However, for the latter group, we find little evidence of any change in Taiwanese identity around the cut-off (see Fig. 9(b)). Consistent with the graphical evidence, Panel A of Table 8 suggests that the new curriculum significantly increased the Taiwanese identity of respondents living in towns with a low proportion of Hoklo people but had little impact on those living in towns with a high Hoklo share (see Panel B of Table 8).

Similar to subgroup analysis by education track, we test the statistical significance of differences in the curriculum effect between two subgroups by estimating Eq. (3) but replacing the interaction term $TextBook \times Academic$ with $TextBook \times LowHoklo$, where $LowHoklo$ is a dummy variable for individuals from the low-Hoklo area. Panel C of Table 8 reports the estimated coefficient on $TextBook \times LowHoklo$ and suggests that the difference in the curriculum effect between individuals from the high-/low-Hoklo area is large and statistically significant.

Since we categorize proportions of Hoklo people (i.e., continuous variables) into discrete groups (i.e., hometowns with high and low Hoklo shares), people might be concerned that this arrangement may be arbitrary. We examine treatment effect heterogeneity in RD designs using the method proposed by Hsu and Shen (2019). Consistent with the above findings, Table F.1 in the Online Appendix suggests that we can reject the null hypothesis that the effect of exposing to new curriculum on Taiwanese identity does not vary in line with the share of the Hoklo ethnic group in the respondents' hometown (p-values are between 0.02 to 0.10).[39] In other words, the curriculum effect is heterogeneous for individuals living in the area with different proportions of Hoklo people.[40]

To explore other parts of the ethnicity distribution, we also do an analysis based on the distribution of both Hoklo and Hakka, the two groups with stronger Taiwanese identity. We now divide towns based on whether their added share of Hoklo and Hakka people is higher than the population median (88.2%). The RD estimates shown in Table F.2 of the Online Appendix suggest that our results are robust for this grouping. Reading the new curriculum significantly increased the Taiwanese identity of respondents living in neighborhoods with lower proportions of Hoklo and Hakka people (see Panel A of Table F.2) but had a small impact on those living in areas populated with larger Hoklo and Hakka ethnic groups (see Panel B of Table F.2). Figures C.5a and C.5b show the corresponding RD graphs. Although the difference in the curriculum effect between the two subgroups is not statistically significant, the estimated magnitude is still substantial (i.e., 17 percentage points, see Panel C of Table F.2). We think this result is reasonable, since the Hakka people do have a weaker Taiwanese identity. Therefore, the gap in prior belief between the two subgroups is smaller (see Figure C.6 in the Online Appendix).[41]

The above analysis might be confounded with other social, political, and economic factors at the regional level. To deal with this concern, we exploit variations in the ethnicity of the respondents' parents, dividing respondents into those whose parents both have Hoklo ethnicity, and others. Figure C.7 in the Online Appendix shows that the ethnic

[39] Specifically, we test whether conditional treatment effects estimated from different subgroups are all the same as the treatment effect estimated from the whole sample. The construction of the subgroups is as follows. We first set the largest number of subgroups (Q). Second, we form the subgroups by: (1) form Q subgroups which evenly divide the hometown's Hoklo share, (2) form $Q-1$ (q) subgroups which evenly divide the hometown's Hoklo share, (3) so on until q equals to one. For example, when Q equals to 4, we have 10 overlapping subgroups. We then collect all these overlapping subgroups, estimate conditional treatment effects within each group, and test if all conditional treatment effects equal to the average treatment effect. We tried three possible Q, which equals to two, three, and four. We also try different bandwidth 24 months or 12 months. The p-value becomes bigger as Q increases. This is reasonable since larger Q divides the sample into smaller subgroups.

[40] We cannot apply Hsu and Shen (2019)'s method to the curriculum effect by education track, which is a categorical variable (i.e., vocational or academic track).

[41] The differences in Taiwanese identity between areas with a low/high share of Hoklo and Hakka people are 5% to 10%, which is smaller than the result shown in Fig. 8 using variations in the share of Hoklo people.

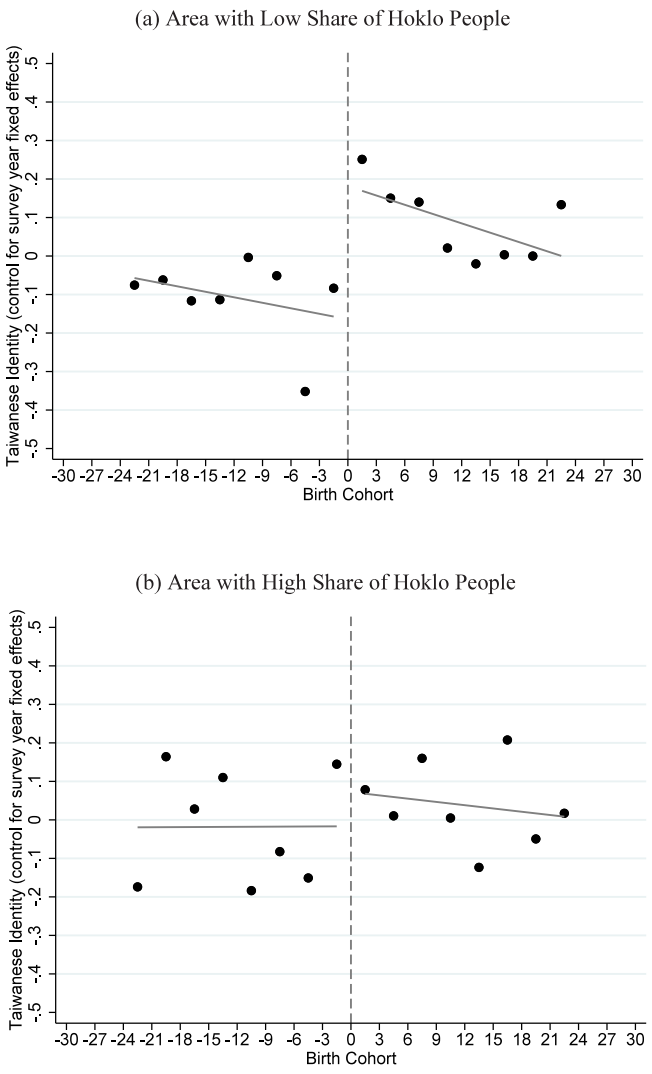

Fig. 9. Taiwanese identity and birth cohorts: By high/low *Hoklo Proportion* areas.
Notes: We pool data from 2003, 2004, 2005 TSCS and use the sample born between September 1982 and August 1986. Fig. 9(a) includes respondents living in the towns with low share of Hoklo people before age 15. Fig. 9(b) includes respondents living in towns with high share of Hoklo people before age 15. We first regress *Identity* on survey year dummies and then collapse the residuals at birth quarter level to derive the dots. Thus, zero in the figure represents September, October, and November 1984. Fitted lines are from regression of the dots on a first order polynomial of birth year–quarter interacted with $TextBook$ dummy variable.

composition of parents is related to people's Taiwanese identity — individuals with at least one non-Hoklo parent are 20% less likely to report themselves as Taiwanese than people whose parents are both Hoklo. (18% v.s. 39%).[42] Consistent with the results based on regional ethnic distribution, we find that the new curriculum significantly increased the Taiwanese identity of respondents with at least one parent who was non-Hoklo (see Panel A of Table F.3). The corresponding RD graph is displayed in Figure C.8a. Note that there is an outlier (see the rightmost dot in Figure), which consists of only two individuals. Both did not have Taiwanese identity so that it is particularly negative compared to other dots. However, our result is robust to exclusion of these two respondents (see Panel B of Table F.3). In contrast, the curriculum reform had little impact on respondents whose parents had

[42] Again, we use 1992, 1995, and 1998 TSCS data and restrict the sample to people who are 25 years old or above.

Table 8
Subgroup analysis: By hometown ethnicity distribution.

	Taiwanese Identity			
	(1)	(2)	(3)	(4)
Panel A: Hometown with Low Hoklo Proportion				
$TextBook$	0.328***	0.343***	0.381***	0.351***
	(0.113)	(0.120)	(0.122)	(0.123)
Baseline Mean	0.559	0.559	0.559	0.559
Sample Size	193	193	193	193
Panel B: Hometown with High Hoklo Proportion				
$TextBook$	0.024	0.008	0.030	0.057
	(0.103)	(0.107)	(0.101)	(0.104)
Baseline Mean	0.65	0.65	0.65	0.65
Sample Size	234	234	234	234
Panel C: Test Heterogeneity				
$TextBook$	0.024	0.013	0.016	0.028
	(0.103)	(0.109)	(0.103)	(0.104)
$TextBook \times LowHoklo$	0.304*	0.338**	0.349**	0.309**
	(0.152)	(0.164)	(0.159)	(0.152)
Sample Size	427	427	427	427
Linear Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool the 2003, 2004, 2005 TSCS data and use the sample born between September 1982 and August 1986. The above table reports the coefficient of $TextBook$ based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. Panel A includes respondents whose hometown has a lower proportion of Hoklo people compared to the median of the population in the National Hakka Population Basic Information Survey Research, while Panel B includes respondents whose hometown has higher proportion of Hoklo people. Specifications in each column are the same as in the corresponding columns in Table 2. The baseline mean is the simple average of *Identity* of respondents born between September 1982 and August 1984 in the corresponding subgroup. Panel C tests the statistical significance of difference in curriculum effect between two subgroups by showing coefficient on the interaction term of $TextBook$ and a dummy for the individuals from area with low share of Hoklo people $LowHoklo$. Compared to Eq. (1), this specification also includes (1) a dummy for the individuals from low-Hoklo area $LowHoklo$; (2) the interaction term of $TextBook$ and $LowHoklo$; (3) the interactions between $LowHoklo$ and running variable; (4) the interactions between $LowHoklo$ and survey year fixed effects. Standard errors clustered at birth year–month level are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Hoklo ethnicity (see Panel B of Table F.3 and Figure C.8b), thereby suggesting that the curriculum effect is greater for individuals with less prior information.

Two points should be noted about the exercise in this section. First, in our sample, the parents' ethnicity leans very heavily towards Hoklo, and the sample size for individuals with non-Hoklo parents is quite small. The results based on this subgroup analysis should be interpreted with caution. Therefore, we are more confident in the results looking at the hometown ethnicity dimension. Second, parents' ethnicity is highly correlated with hometown ethnicity distribution. Although we cannot clearly separate out the two dimensions, we do find that our evidence is strongly consistent with the belief-based models: proxied familiarity to Taiwanese identity is correlated with textbook treatment effect sizes.

7. Long-term results

Up to this point, we have found that the introduction of new textbooks can significantly increase students' Taiwanese identity when they are 18 to 23 years old (short-term sample). The natural question to ask, therefore, is whether or not the impact of the school curriculum was transitory or persistent. We explore this issue by examining the long-term sample, i.e. respondents who were surveyed during 2010 to 2015, when they were 24 to 33 years old (i.e. 11 to 20 years after reading textbooks). In the Online Appendix, Table H.2 compares the characteristics of long-term sample with the ones of main sample.

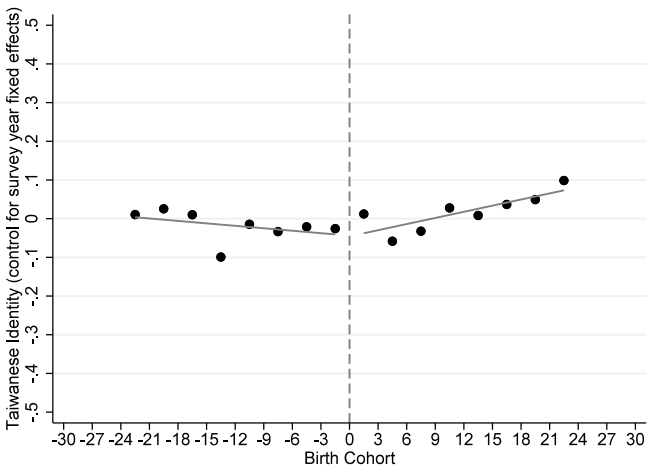

Fig. 10. Taiwanese identity and birth cohorts: Long-term results.
Notes: We pool data from 2010, 2012, 2013, 2014 and 2015 TSCS waves and use the sample born between September 1982 and August 1986. We first regress *Identity* on survey year dummies and then collapse the residuals at birth year–quarter level (i.e. three birth year–month cohorts) to derive the dots. Thus, the first dot in this figure represents average *Identity* (after controlling for the survey year fixed effect) for those born in September, October, and November 1982 and the last dot represents average *Identity* (after controlling for the survey year fixed effect) for those born in June, July, and August 1986. Fitted lines are from regression of the dots on a first order polynomial of birth year–quarter interacted with $TextBook$ dummy variable.

Table 9
The effects of the textbook reform on Taiwanese identity: Long-term results.

	Taiwanese Identity			
	(1)	(2)	(3)	(4)
$TextBook$	0.006	0.023	0.014	0.011
	(0.052)	(0.052)	(0.050)	(0.049)
Baseline Mean	0.794	0.794	0.794	0.794
Sample Size	822	822	822	822
Linear Spline	Yes	Yes	Yes	Yes
Survey Year FE	Yes	Yes	Yes	Yes
Ethnic variables	No	Yes	Yes	Yes
Demographic variables	No	No	Yes	Yes
Regional Dummies	No	No	No	Yes

Notes: We pool the 2010, 2012, 2013, 2014, and 2015 TSCS waves and use the sample born between September 1982 and August 1986. The above table reports the coefficient of $TextBook$ based on Eq. (1), which is one if the birth year–month of the respondent is after September 1984, zero otherwise. Specifications are the same as in Table 2. The baseline mean is the simple average of *Identity* of respondents born between September 1982 and August 1984. Clustered standard errors at birth year–month level are in parentheses.*** p<0.01, ** p<0.05, and * p<0.1.

Since the each wave of survey is nationally representative, we find that characteristics are broadly comparable across survey years. One notable exception is age. The average age and of long-term sample are larger than those of short-term sample (i.e. main sample). But the difference in age is reasonable since long-term sample includes individuals who were older.[43]

Fig. 10 displays the relationship between Taiwanese identity and birth cohorts for the long-term sample.[44] We find the mean level of Taiwanese identity to be quite similar on either side of the cut-off. Consistent with the graphical evidence, the regression results in Table 9 suggest the coefficients of *TextBook* are small and insignificant across all specifications, which are quite different from our main estimates. We find that in the long run, both old and new textbook readers hold similar levels of Taiwanese identity. In the Online Appendix H and I, we examine the validity of the RD design for the long-term sample (see Tables H.2 to H.3 and Figure I.2).[45] In addition, we conduct a series of robustness checks and find that our estimates are robust to different specifications (see Table H.4 and Figure I.3) and bandwidth choices (see Figure I.1).[46]

Based on our research design, there are two possible interpretations for this finding. First, the likelihood of a Taiwanese identity among people who read the new textbooks (i.e. *Knowing Taiwan* series) "retreats" to the original level (i.e. that in the control group) in the long run. Second, the likelihood of a Taiwanese identity among people who read the old textbooks "catches up" with that for those who read the new textbooks in the long run. Fig. 11 compares Taiwanese identity during 2003–2005 and 2010–2015 by treatment status. The result supports the second interpretation. We find that the probability of reporting as Taiwanese among old textbook readers (i.e. control group) catches up with that of people reading new textbooks (i.e. treatment group) during the sample period.[47]

One possible explanation is that although students who studied the old textbook would have weaker Taiwanese identity than students exposed to the new textbook in the short run, the old textbook readers might change their identity after receiving new information,[48] since the content of the old textbook substantially deviates from current situations and recent social trends. However, given our research design and data limitation, we are not able to verify this explanation directly.

8. Conclusion

In this study, we have shown that school curricula (i.e. the content of textbooks) can shape an individual's national identity. By utilizing a textbook reform which introduced a new perspective on Taiwan's history for students entering junior high school after September 1997, we use a regression discontinuity design to isolate curriculum effects from other confounding factors. Our results suggest that people who studied new textbooks are on average 18 percentage points more likely to report themselves as Taiwanese than those studying old textbooks. The estimated effect is sizeable and accounts for a 30% increase in the baseline mean. Moreover, our subgroup analysis indicates that the curriculum effects only appear in academic track students and those living in neighborhoods where fewer people identify as Taiwanese. Finally, we find that in the long run, both old and new textbook readers hold similar levels of Taiwanese identity since "old-textbook" effect is declined.

Our findings point towards some fruitful directions for future research. For example, we provide evidence aligned with "belief-based" models in the persuasion literature, but empirical evidence on whether people holding stronger or weaker prior beliefs are more affected by education policies is mixed. Voigtländer and Voth (2015), for instance, found that people who held a stronger prior anti-Semitic attitude were affected more by anti-Semitic indoctrination between 1933 and 1945 (i.e. they exhibited the largest increases in anti-Jewish attitudes). Why

[43] The schooling years of parents are also different. However, the difference is small (around 5% differences) compared to baseline mean.

[44] As in our main results, we measure birth cohorts at the year–month level and plot average *Identity* after controlling for survey year fixed effects.

[45] Based on the results in Tables H.2 to H.3, we find that the observable characteristics are fairly comparable between the treatment and control groups. Moreover, Figure I.2 suggests that the density of the running variable (birth cohort) is quite smooth at cutoff.

[46] We also implement similar placebo tests shown in Section 5.3.6 and find null effects.

[47] The difference in Taiwanese identity between two groups is 10 percentage points (61% v.s. 71%) in 2003–2005 but shrinks to 4 percentage points during 2010–2015 (79% v.s. 83%).

[48] For example, Taiwan has already gone through three presidential elections since 2008, with both Kuomintang and Democratic Progressive Party (i.e. two major political parties in Taiwan) won at least once. The successful experience of party alternation may also help build Taiwanese identity.

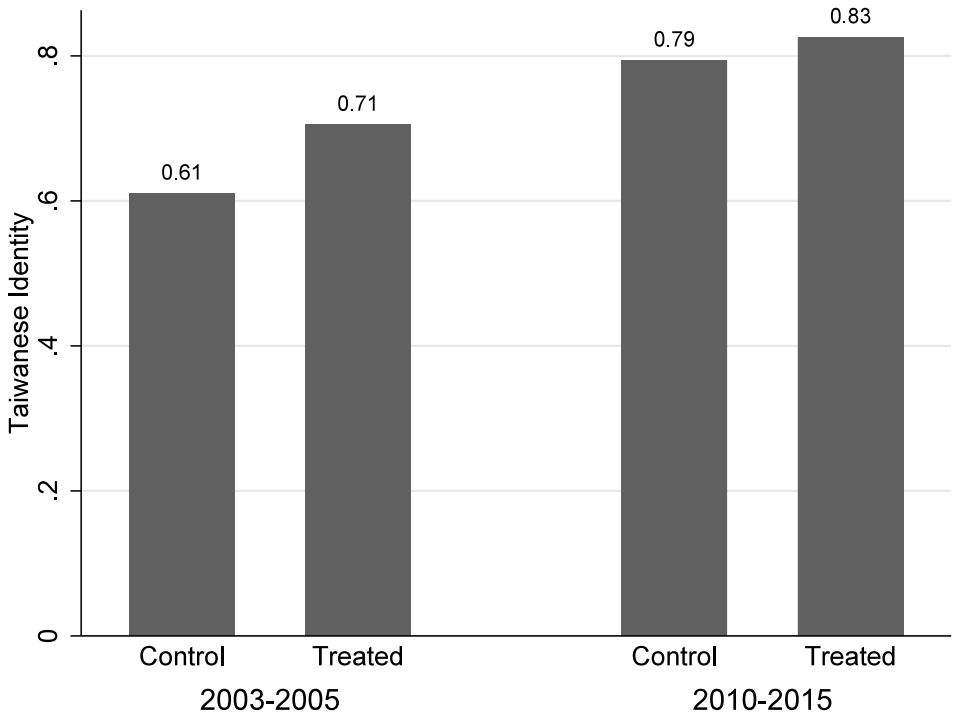

Fig. 11. Trend in Taiwanese identity: By treatment status.
Notes: We pool data from 2003, 2004, 2005, 2010, 2012, 2013, 2014 and 2015 TSCS and use the sample born between September 1982 and August 1986. Each bar represents simple mean of *Identity* during 2003–2005 or 2010–2015 by treatment status. Control group includes 1995 and 1996 education cohorts and treatment group includes 1997 and 1998 education cohorts.

persuasion is effective in different subgroups under different contexts is a potential research question for the future. In addition, one limitation of our analysis is that we cannot pin down which key element of the 1997 curriculum reform leads to the estimated effect. Identifying the major component of the reform that raised Taiwanese identity is an important issue for future research.

CRediT authorship contribution statement

Wei-Lin Chen: Writing – original draft, Conceptualization, Methodology, Software, Validation, Formal analysis, Resources, Project administration. **Ming-Jen Lin:** Supervision, Editing. **Tzu-Ting Yang:** Writing – review & editing, Conceptualization, Methodology, Software, Validation, Formal analysis, Resources, Project administration.

Data availability

The data used in this article can be obtained from the website of the Survey Research Data Archive (https://srda.sinica.edu.tw/). Additional replication materials are provided in the Online Appendix.

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Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.jdeveco.2023.103078.

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