

The Effect of Education on Subjective and Objective Well-Being: Evidence from the Chinese Family Panel Survey

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Abstract

This paper examines the dynamic effects of education on both subjective well-being and income using data from the Chinese Family Panel Survey (CFPS). Exploiting cohort-level variation in educational attainment, we find that the income returns to education are concentrated in the early stages of individuals careers, suggesting a strong signaling effect or initial labor market advantage. However, these economic benefits tend to fade over time. In contrast, the impact of education on mental health and life satisfaction emerges gradually and strengthens in the long run. Our findings reveal a temporal divergence in how education shapes different dimensions of well-being: while income effects are immediate but short-lived, psychological benefits develop more slowly yet persistently. These results offer new insights into the multifaceted and evolving returns to education, with important implications for education policy and lifelong human capital investment.

1 Research Question and Motivation

Education plays a important role in shaping both individual life trajectories and societal structures. As a cornerstone of human capital development, it not only equips individuals with the skills necessary for economic success but also fosters mental health. Furthermore, education often serves as a signaling mechanism, enhancing individuals employment opportunities and increasing their potential income.

However, relatively little research has examined whether this causal effect of education on income diminishes over time. In terms of subjective well-being, only a limited number of studies have investigated whether the benefits of education (particularly when acquired during adolescence) continue to influence mental health into later life.

Moreover, it remains critical to disentangle the impact of different education levels on both income and subjective well-being. Against this research gap, this study aims to answer **two central research questions**:

- RQ_1 : Will the impact of different education levels on peoples income **diminish** over time?
- RQ_2 : Will the impact of different education levels on peoples subjective well-being **persist** over time?

By addressing these questions, the research will contribute to our understanding of how education shapes long-term economic outcomes and subjective well-being, offering insights that may inform policy and practice.

This proposal will begin with a review of the relevant literature, followed by a description of the dataset and the econometric model we plan to use. We will then present some preliminary results and outline our future research plan. The final section will detail the funding foundation to which we intend to apply.

2 Literature Review

The first stream of literature concentrate on how to use the human capital theory to explain the correlation between the educational attainment and income. [Deming \(2022\)](#) demonstrates four facts about the human capital theory. The first fact is that human capitalthe skills, education, and training we accumulateexplains a substantial portion of earnings differences, both for people and across the countries ([Card, 1993](#); [Duflo, 2001](#); [Mincer, 1974](#)). The second fact is that investments in human capital yield high returns, especially during early childhood and young adulthood ([Heckman, 2006](#)).The third fact is that we know how to produce foundational skills like literacy and numeracy ([Jackson et al., 2015](#)), but resource

constraints often limit success (Hanushek, 2003). The final fact is that higher-order skill-like teamwork, problem-solving, and critical thinking are increasingly valuable in modern labor markets, but we don't fully understand how to develop them effectively (Deming, 2017; Weidmann and Deming, 2021). Therefore, according to human capital theory, the effect of education on income may diminish over time, as modern labor markets increasingly demand new skills that are not necessarily taught in formal education.

Another stream of literature mainly applies the signaling theory to explain the incentive of going to university. Bedard (2001) proves the existence of the signaling theory by showing a negative correlation between the college access and the high school drop out rate. On the contrary, Clark and Martorell (2014) utilize a cross-section data demonstrating that the high school diploma has no signaling value on people's income in Texas, USA. Therefore, signaling theory also predicts that the effect of education on income may decline over time, as its signaling value is strongest during the initial years of employment.

The third stream of literature concentrate on the indirect effect of education on people's mental health. Education can increase adult's mental health by more skills learned and more income (Kessler et al., 1995; Kondirolli and Sunder, 2022; Lantz et al., 2005; Mirowsky, 2017; Ritsher et al., 2001).

On the other hand, a good mental health can also decrease the early education drop out (Cornaglia et al., 2015), and improves college academic success (Eisenberg et al., 2009). Moreover, Agnafors et al. (2021) proves that mental health problems in early childhood and adolescence increase the risk for poor academic performance in the future, which is the time lagged effect of mental health on academic performance. Graph 1 is the simple summary of the previous literature.

Based on the existing literature, our research contributes in the following ways:

- It tests whether the predictions of human capital theory and signaling theory hold in the context of China.
- It explores the existence of alternative channels linking education to mental health, beyond income or skill acquisition as mediating factors.

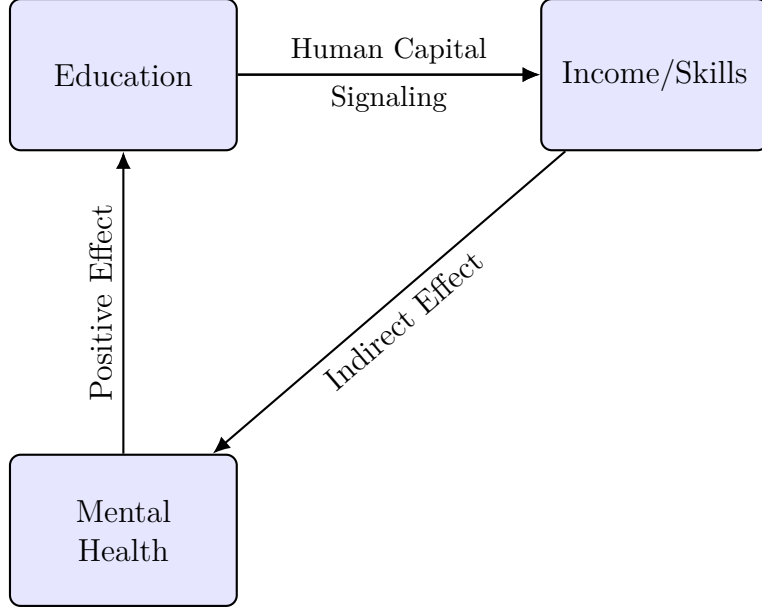


Figure 1: Current Literature Relation

3 Methodology

3.1 Data Source

In this project, we primarily utilize data from the Chinese Family Panel Studies (CFPS). Launched in 2010 by the Institute of Social Science Survey (ISSS) at Peking University, the CFPS is a nationally representative, biennial longitudinal survey of Chinese communities, families, and individuals. It is designed to gather comprehensive data at the individual, family, and community levels to capture contemporary trends in China. The survey examines both economic and non-economic aspects of well-being, covering topics such as economic activities, educational outcomes, family dynamics, migration, and health.

The CFPS collects data every two years from participants who took part in the initial 2010 wave, while also recruiting new respondents in later waves. To date, the study has completed seven waves from 2010 to 2022. Figure 2 illustrates the CFPS timeline, and Table 1 details the retention of participants over time.

In order to answer our research questions, the key variables preserved are as follows, and Table 2 is the summary statistics.:



Figure 2: CFPS Time Line Graph

- Demographics: ID, gender, birth year/month;
- Education: Subjects education level, parents education level
- Mental Health: Confidence about the future, depression level
- Income: Income in each CFPS Year

Table 1: Retention Matrix by CFPS Year

First Year	CFPS Year							Total
	2010 No.	2012 No.	2014 No.	2016 No.	2018 No.	2020 No.	2022 No.	
2010	42,590	33,955	32,706	30,475	28,421	20,944	18,947	208,038
2012	0	10,385	7,619	7,157	6,297	4,831	4,410	40,699
2014	0	0	5,439	3,670	3,271	2,404	2,139	16,923
2016	0	0	0	4,017	2,553	1,904	1,732	10,206
2018	0	0	0	0	3,074	1,576	1,369	6,019
2020	0	0	0	0	0	1,886	1,019	2,905
2022	0	0	0	0	0	0	1,613	1,613
Total	42,590	44,340	45,764	45,319	43,616	33,545	31,229	286,403

3.2 Chinese Education Policy

In China, students typically begin primary school at age 6, progress to junior high school at age 12, and then enter senior high school at age 15. At 18, they decide whether to take the college entrance exam, after which they may enroll in college. Figure 3 is a simple illustration.

Apart from that, there are two education policies in China that happened in the last century, which will change people's schooling years:

Figure 3: Typical Education Trajectory in China

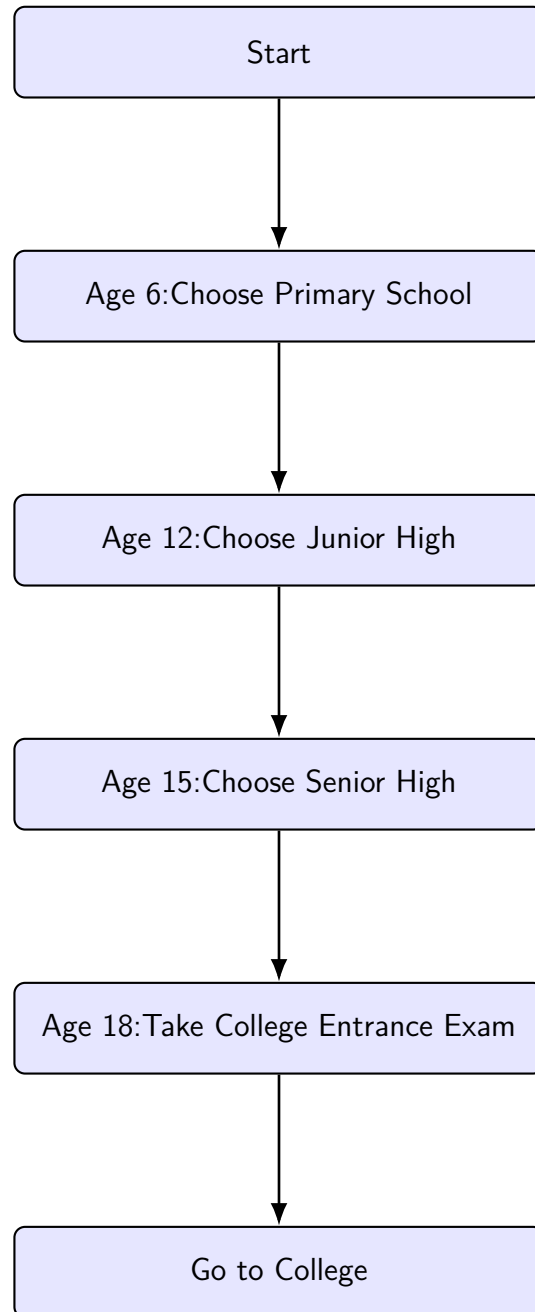


Table 2: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Gender	284,424	0.503	0.500	0	1
Father Education Level	207,668	2.098	1.146	1	8
Mother Education Level	214,805	1.688	1.009	1	8
Birth Year	280,913	1976.813	21.904	1900	2022
Birth Month	233,023	6.637	3.48	1	12
Education Year	264,173	6.525	5.101	0	24
Education Level	281,288	2.416	1.401	1	8
Type of Residence	276,725	0.468	0.449	0	1
Yearly Income ¹	115,552	23183.953	37859.107	0	3,036,046
Happiness Level	209,074	3.781	2.018	0	10
Frequency of Feeling Depression	210,526	2.438	1.455	1	5
Confidence about Future	204183	3.923	1.05	1	5

¹ Income is measured in Chinese currency (RMB).

- 1986 policy: In 1986, the government implemented a new policy which waive the the tuition fee for the junior high school. Therefore, the incentive for going to junior high school will be higher.
- 1999 policy: In 1999, the government implement the "college entrance examination expansion", which leads to more people admitted in the college.

3.3 Econometric Model

Based on the data set and the policy content, this study will employ a regression discontinuity design (RDD) model to address our research questions. We focus on two key groups of cohorts: individuals born before and after 1974, which can be applied to estimate the effect of the junior high school degree (1986 policy); and those born before and after 1981, which can be applied to estimate the effect of the college degree. By **assuming** that people's birth near these thresholds occur randomly, we use birth year as the running variable in our RDD analysis. Ideally, we should observe a jump in terms of the education years around 1974 and 1981. Figure 4 is a simple illustration about the time line of the policy and birth cohorts that been affected by policies.

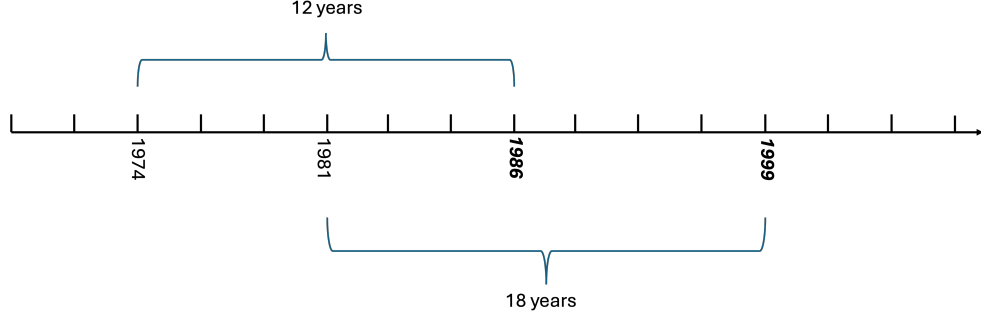


Figure 4: Education Policy Time line

Even though we have a panel dataset, we begin by constructing our regression model separately for each year. Let t denote the year, where

$$t \in \{2010, 2012, \dots, 2022\}. \quad (1)$$

In each t we present the following regression model:

$$Educy_i = \tau_0 + \tau_1 D74_i + \tau_2 (birth_i - 1974) \cdot D74_i + \tau_3 (birth_i - 1974) + \epsilon_i, \quad (2)$$

$$y_i = \rho_0 + \rho_1 D74_i + \rho_2 (birth_i - 1974) \cdot D74_i + \rho_3 (birth_i - 1974) + \mu_i, \quad (3)$$

$$Educy_i = \gamma_0 + \gamma_1 D81_i + \gamma_2 (birth_i - 1981) \cdot D81_i + \gamma_3 (birth_i - 1981) + \nu_i, \quad (4)$$

$$y_i = \delta_0 + \delta_1 D81_i + \delta_2 (birth_i - 1981) \cdot D81_i + \delta_3 (birth_i - 1981) + \eta_i. \quad (5)$$

Where:

- $Educy_i$ denotes the educational attainment (years of education) of individual i .
- y_i represents the mental health outcome or the yearly income of individual i .
- $D74_i$ is a binary indicator equal to 1 if individual i was affected by the 1986 policy reform, and 0 otherwise.
- $D81_i$ is a binary indicator equal to 1 if individual i was affected by the 1999 policy reform, and 0 otherwise.

- $birth_i$ is the birth year of individual i .
- $\tau_0, \tau_1, \tau_2, \tau_3$ are parameters capturing the intercept, the baseline effect of the 1986 reform, the interaction effect between birth year and the reform, and the linear trend in birth year on education, respectively.
- $\rho_0, \rho_1, \rho_2, \rho_3$ are the corresponding parameters for the outcome variables related to the 1986 reform.
- $\gamma_0, \gamma_1, \gamma_2, \gamma_3$ are the parameters for education corresponding to the 1999 reform.
- $\delta_0, \delta_1, \delta_2, \delta_3$ are the parameters for outcome variables related to the 1999 reform.
- $\epsilon_i, \mu_i, \nu_i, \eta_i$ are individual-specific error terms.

Now, define the treatment effect of junior high school on the outcome as β then

$$\begin{aligned}
\beta &= \frac{\lim_{x \rightarrow 1974^+} \mathbb{E}[Y \mid D74_i = 1] - \lim_{x \rightarrow 1974^-} \mathbb{E}[Y \mid D74_i = 0]}{\lim_{x \rightarrow 1974^+} \mathbb{E}[Educy_i \mid D74_i = 1] - \lim_{x \rightarrow 1974^-} \mathbb{E}[Educy_i \mid D74_i = 0]} \\
&= \frac{(\rho_0 + \rho_1 + \rho_2(birth_i - 1974) + \rho_3(birth_i - 1974)) - (\rho_0 + \rho_3(birth_i - 1974))}{(\tau_0 + \tau_1 + \tau_2(birth_i - 1974) + \tau_3(birth_i - 1974)) - (\tau_0 + \tau_3(birth_i - 1974))} \\
&= \frac{\rho_1 + \rho_2(birth_i - 1974)}{\tau_1 + \tau_2(birth_i - 1974)} \xrightarrow{x \rightarrow 1974} \frac{\rho_1}{\tau_1}.
\end{aligned}$$

Similarly, we define the treatment effect of college education on the outcome as θ , then

$$\begin{aligned}
\theta &= \frac{\lim_{x \rightarrow 1981^+} \mathbb{E}[Y \mid D81_i = 1] - \lim_{x \rightarrow 1981^-} \mathbb{E}[Y \mid D81_i = 0]}{\lim_{x \rightarrow 1981^+} \mathbb{E}[Educy_i \mid D81_i = 1] - \lim_{x \rightarrow 1981^-} \mathbb{E}[Educy_i \mid D81_i = 0]} \\
&= \frac{(\delta_0 + \delta_1 + \delta_2(birth_i - 1981) + \delta_3(birth_i - 1981)) - (\delta_0 + \delta_3(birth_i - 1981))}{(\gamma_0 + \gamma_1 + \gamma_2(birth_i - 1981) + \gamma_3(birth_i - 1981)) - (\gamma_0 + \gamma_3(birth_i - 1981))} \\
&= \frac{\delta_1 + \delta_2(birth_i - 1981)}{\gamma_1 + \gamma_2(birth_i - 1981)} \xrightarrow{x \rightarrow 1981} \frac{\delta_1}{\gamma_1}.
\end{aligned}$$

Therefore, by examining $\frac{\rho_1}{\tau_1}$ and $\frac{\delta_1}{\gamma_1}$ in each year t , we can plot the treatment effect of attaining junior high school education and the treatment effect of obtaining a college degree over time, and investigate their respective time trends.

4 Preliminary Results

Due to time limitations, we only present the regression results for the 1986 policy using data from the 2022 survey year. Figure 5 displays the first-stage results for education level. The x-axis shows the standardized birth year, centered at 1974, the first cohort affected by the 1986 policy. To demonstrate the robustness of our results, we use two variables to measure education level. The y-axis in the left panel represents the probability of completing junior high school,¹ while the y-axis in the right panel indicates total years of schooling. In both measures, we observe a significant positive jump, suggesting that the 1986 policy had a meaningful impact on individuals' educational attainment.

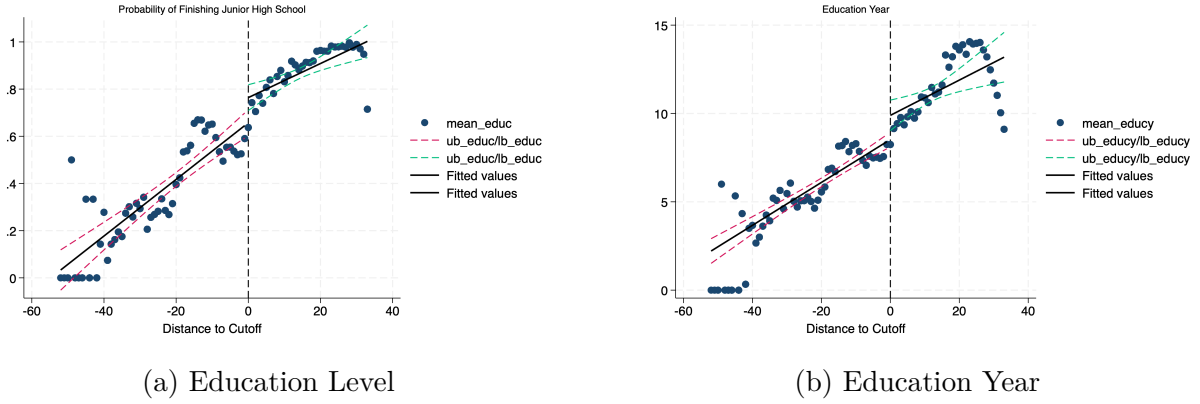


Figure 5: First Stage Results for Education

Figure 8 presents the second-stage results. The x-axis is the same as in Figure 5. In the left panel, the outcome variable is income, while in the right panel, it is individuals' confidence about the future. We observe a noticeable positive jump around the cutoff in both panels.

By examining both figures together, we can draw the following conclusion: the impact of completing junior high school (induced by the 1986 policy) continues to positively influence individuals' earnings and their outlook on the future, even as of the 2022 survey year.

Table 3 below presents the regression results. The estimates suggest that each additional year of schooling increases an individual's annual income by approximately 8,048 RMB,² and improves their confidence about the future by 0.08 points. Although the absolute change

¹This variable is a binary indicator equal to 1 if the individual has nine or more years of schooling.

²RMB is the Chinese currency. The current exchange rate is approximately 7.26 RMB per US dollar.

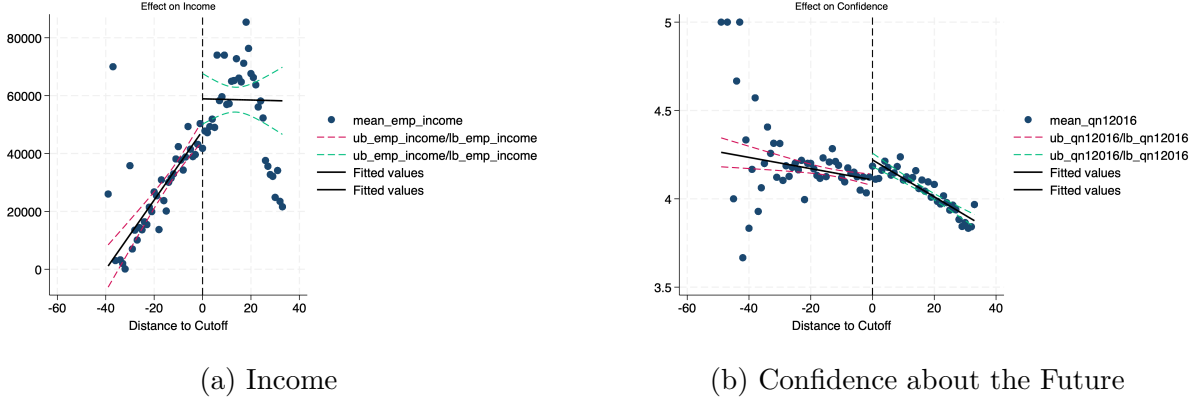


Figure 6: Second Stage Results

may appear small, it represents 2% of the full 15 scale and roughly 0.07 standard deviations a modest but meaningful effect.

Furthermore, completing junior high school is associated with a substantial income increase of roughly 102,972 RMB and a 1.06-point rise in future confidence, amounting to more than 25% of the scale and nearly 0.9 standard deviations.

Table 3: Effect of Education on Income and Mental Health

	(1) Probability	(2) Education Years	(3) Income	(4) Confidence
<i>D74</i>	0.107** (0.0397)	1.369** (0.489)	11018.9* (4,836.9)	0.113*** (0.0257)
Birth Year	0.0120*** (0.00125)	0.121*** (0.00975)	1198.8*** (132.3)	-0.00318** (0.00111)
Interaction ¹	-0.00478* (0.00218)	-0.0215 (0.0340)	-1219.3*** (314.1)	-0.00725*** (0.00150)
Constant	0.657*** (0.0283)	8.525*** (0.211)	47877.1*** (1,854.2)	4.107*** (0.0169)
Observations	15,761	15,761	6,864 ²	16,192

Standard errors in parentheses.

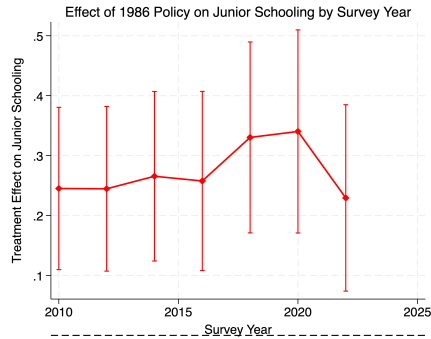
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

¹ Interaction between birth year and dummy variable indicator.

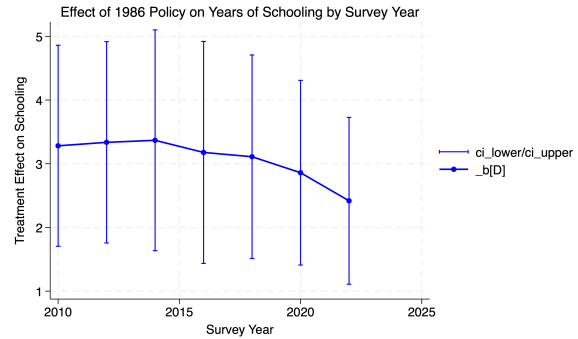
² Fewer observations due to missing income data.

We also plot the estimated discontinuities (τ_1 , ρ_1) for each survey year in Figure 7 and Figure 8. Detailed results are presented in Table 4. Although the current findings are primarily based on reduced-form estimates, four **cautious** conclusions can be drawn:

- The 1986 policy contributed to an increase in individuals' educational attainment.
- The income gains associated with the policy are only significant in the first two years, suggesting that signaling theory may be a plausible mechanism. The value of a diploma may primarily manifest during the early stages of one's career.
- The impact of education on mental health appears to be more persistent, potentially exhibiting long-term effects. However, this influence may diminish as individuals grow older.
- There may exist alternative channels through which education affects mental health, beyond income as a mediating factor.

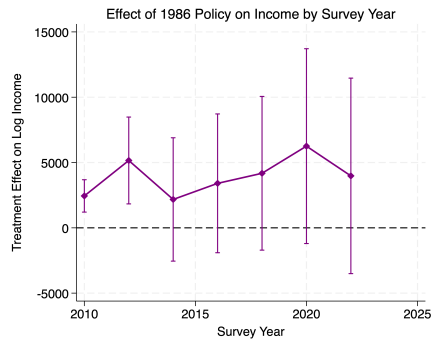


(a) Education Level

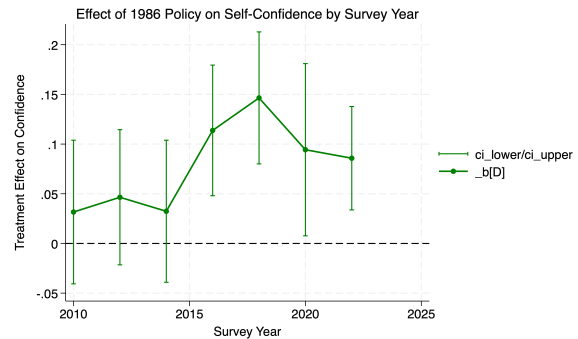


(b) Education Year

Figure 7: First Stage Results Across Years



(a) Income



(b) Confidence about the Future

Figure 8: Second Stage Results Across Years

Table 4: Effect of the 1986 Policy by Year and Outcome (with no bandwidth)

	2010	2012	2014	2016	2018	2020	2022
Panel A: Schooling Years							
Treatment Effect	3.2817*** (0.8051)	3.3362*** (0.8062)	3.3681*** (0.8844)	3.1779*** (0.8889)	3.1105*** (0.8147)	2.8593*** (0.7397)	2.4184*** (0.6680)
Observations	11,296	11,244	10,760	10,642	10,894	10,870	10,421
R-squared	0.291	0.250	0.193	0.152	0.156	0.190	0.241
Panel B: Complete Junior High School							
Treatment Effect	0.2451*** (0.0691)	0.2446*** (0.0701)	0.2655*** (0.0722)	0.2576*** (0.0762)	0.3303*** (0.0813)	0.3403*** (0.0864)	0.2293*** (0.0793)
Observations	11,296	11,296	11,296	11,296	11,293	11,293	11,255
R-squared	0.189	0.160	0.133	0.114	0.127	0.134	0.121
Panel C: Total Income (in RMB)							
Treatment Effect	2,442.72*** (632.18)	5,156.01*** (1,695.94)	2,173.02 (2,409.05)	3,406.18 (2,710.28)	4,175.98 (3,001.97)	6,254.39 (3,805.27)	3,977.60 (3,818.33)
Observations	8,540	9,068	2,335	1,028	3,318	3,531	3,761
R-squared	0.017	0.008	0.019	0.033	0.025	0.041	0.039
Panel D: Self-Confidence							
Treatment Effect	0.0316 (0.0369)	0.0465 (0.0347)	0.0324 (0.0365)	0.1137*** (0.0335)	0.1465*** (0.0339)	0.0943** (0.0442)	0.0858*** (0.0266)
Observations	8,506	8,706	8,830	9,345	9,434	9,471	10,138
R-squared	0.040	0.031	0.012	0.009	0.003	0.005	0.009
Panel E: Feeling Depressed							
Treatment Effect	0.0971*** (0.0323)	-0.0430 (0.0289)	-0.0051 (0.0387)	-0.0309 (0.0262)	0.0354 (0.0279)	-0.0260 (0.0269)	0.0014 (0.0302)
Observations	8,826	8,742	8,842	9,357	10,401	10,443	10,139
R-squared	0.002	0.002	0.001	0.001	0.009	0.002	0.001

Standard errors in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

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