

Education for All and Sustainable Development: An Empirical Study on Family Cognition and Household Resource Using in China

Edukacja dla wszystkich i zrównoważony rozwój: badania empiryczne nad rodziną i wykorzystaniem zasobów w gospodarstwach domowych w Chinach

Shuxing Chen, Yuxiang Gao

*School of Economics, Southwestern University of Finance and Economics,
Chengdu 611130, China*

Abstract

Education for sustainable development has achieved a lot in the past decade. However, the extent to which sustainable development education can achieve sustainability is still unclear. This article uses the survey data of Chinese families and establishes an empirical analysis model. By using the transition of China's sustainable development education mode as a recognition strategy and using DID method to analyze this issue, we found out that the sustainable education in schools can only help families correctly understand the status quo of sustainable development, but it cannot improve the household sustainability. After implementing the education for sustainable development for all (ESDFA), the average monthly electricity use of the affected Chinese households has decreased by 79.6124 kWh, which is a drop of 41.56%; household carbon dioxide emissions has decreased by 123.8958 kg, which is a drop of 49.16%. Among them, households with their heads aged 40-55 were the most significant. The mechanism analysis shows that the greater the scope of the population covered by ESDFA, the more obvious the effect of reducing family resource use, and there may be a mechanism similar to the herding effect.

Key words: Education for all, sustainable development, Chinese family cognition, family resource use

Streszczenie

W ramach edukacji dla zrównoważonego rozwoju udało się osiągnąć już wiele. Zarazem pytanie o to, w jakim zakresie ta edukacja wspomaga rzeczywiste osiągnięcie zrównoważoności pozostaje bez odpowiedzi. W artykule wykorzystano wyniki badań odnoszących się do chińskich rodzin, opracowując empiryczny model analizy. Odnosząc się do obserwowanej zmiany w chińskim systemie edukacji dla zrównoważonego rozwoju, ponadto wspierając się metodą DID, ustaliliśmy, że edukacja w szkołach może tylko pomóc rodzinom w zrozumieniu koncepcji zrównoważonego rozwoju, ale jest niewystarczająca dla poprawy poziomu zrównoważoności na poziomie gospodarstw domowych. Natomiast po wprowadzeniu programu *Edukacja dla zrównoważonego rozwoju dla wszystkich* (ESDFA) okazało się, że w chińskich gospodarstwach domowych średnie miesięczne zużycie energii elektrycznej zmniejszyło się o 79.6124 kWh, co stanowi spadek o 41.56%, a emisja ditlenku węgla obniżyła się o 123.8958 kg, co stanowi spadek o 49.16%. Najbardziej znaczące wyniki osiągały gospodarstwa, w których głowy rodzin stanowiły osoby w wieku 40-55 lat. Szczegółowa analiza wykazała ponadto, że im większa część populacji poddana zostaje programowi ESDFA, tym większy efekt redukcji zużycia zasobów w gospodarstwie domowym, co prawdopodobnie uwarunkowane jest działaniem mechanizmu podobnego do tzw. efektu stada.

Słowa kluczowe: Edukacja dla wszystkich, rozwój zrównoważony, chińskie rodziny, zużywanie zasobów w gospodarstwach domowych

1. Background and literature

The issue of sustainable development has become the greatest human challenge in this century (UNESCO, 2005), and every phase of our education system is being asked to declare its support for education for sustainable development (ESD) (Vare, 2007). Education can foster public awareness and ideas of sustainability, which is the basic requirement for sustainable development. After people realize the importance of sustainable development, many countries have successively introduced many education policies for sustainable development. Among them, the most significant is the *UN Decade of Education for Sustainable Development* (DESD) that was implemented during the 10-year period from 2005 to 2014. A series of literatures show that these sustainable development education projects have achieved great success globally, and the level of the awareness of sustainable development has been greatly enhanced in the educated population (De Haan, 2006; Lozano, 2013; Huckle, 2015; Wals, 2012), but a fundamental question that is still crucial has not been answered yet: the extent to which sustainable development education can improve the sustainability of development.

Education for sustainable development (ESD) comes from the early environment education for sustainable development (EEFSD) (Sauvé, 1996). Hopkins proposed in 2002 that ESD should include four dimensions: social and economic dimensions, conservation & management of resources, strengthening the Role of major groups, means of implementation (Hopkins, 2002), UNESCO has added humane concepts such as anti-poverty, human rights, equality, etc. (UNESCO, 2005) and gradually formed today's concept of sustainable development education. However, some scholars oppose adding social issues to the content of sustainable development education. For example, Kopnina (2014) believes that ESD masks its anthropocentric agenda and may in fact be counterproductive to the efficacy of environmental education in fostering a citizenry that is prepared to address the anthropogenic causes of environmental problems, for discourse on sustainable development singles out economic development, which we may have created the current ecological problems in the first place, as part of the solution. We deeply agree with this, because although the education for sustainable development covers a wide range of topics, its core content should still be environmental protection and sustainable use of resources. Therefore, the next part of this article will only discuss the issue of education for sustainable development on environmental and resource issues.

From the perspective of sustainable use of resources, sustainable development requires less resource use and higher efficiency in the use of resources. The

former leads to a reduction in certain marginal utility of economic participants, while the latter means higher technical costs. Therefore, according to the basic principles of economics, rational people pursuing utility maximization lack sufficient incentives to choose sustainable economic participation modes unless they can obtain additional utility from resource-saving behaviour.

In fact, education for sustainable development in China illustrates this issue. In 2003, the central government formally put forward the theory of the scientific development concept and emphasized the sustainability of economic development. As it was listed as a political task, the government introduced a series of policy measures such as energy saving and consumption reduction subsidies. Since 2005, China's unit GDP resource consumption has been decreasing year by year. For example, energy consumption per 10,000 yuan of GDP has decreased from 1.40 tce in 2005 to 1.13 tce in 2010 and 0.71 tce in 2015. But at the same time, as there is no household-oriented resource policy, the resource consumption of Chinese households has been increasing rapidly in the past 10 years. By 2014, the energy consumption of Chinese households was 472 million tce, which is 71.6% higher compared to 275 tce in 2005¹.

From 2005 to 2014, it was the time of the *UN Decade of Education for Sustainable Development*. In China, the DESD project was undertaken by the Ministry of Education. The targeted education population were mainly all levels of school students. If the education for sustainable development has induced some effects then such effects can be reflected first in students' family rather than in the production enterprises. Therefore, the fact that the consumption of household resources in China has risen significantly indicates that the DESD project in China may only increase the awareness of sustainable development of the educated population. Due to the lack of an effective incentive mechanism, this policy does not really bring about improvement of sustainability on the household level.

After 2014, China changed its previous *government-school-student-family* education model for sustainable development. In 2014, the *Environmental Protection Law of China* passed a major revision and was implemented on January 1, 2015. The new Environmental Protection Law added to the original version that citizens should adopt low-carbon lifestyle, comply with environmental protection laws and regulations, and sort living garbage according to the waste classification regulation, so as to reduce the damage caused by daily life to the environment. At the same time, the governments at all levels should strengthen publicity and popularization of environmental protection, encourage grassroots self-government organizations, social organizations, and

¹ The above data comes from: *China Statistical Yearbook*.

environmental protection volunteers to carry out propaganda on environmental protection laws and regulations and environmental protection knowledge, and create a good atmosphere to protect the environment. Educational administrative departments and schools should incorporate environmental protection knowledge into school education content and cultivate teenagers' awareness of environmental protection.

The new environmental protection law has actually changed from the single mode that education for sustainable development was only carried out in schools, to a new *government-family* education of sustainable development for all (ESDFA). On one hand, this mode has expanded the scope of the subjects of receiving education for sustainable development, making the concept of sustainable development a common knowledge in the entire society. Citizens can obtain some kind of utility from the *herd behaviour* of saving resources. On the other hand, as the law clearly give citizens the right to protect the environment, citizens now have the incentive to report violations of sustainable development and increase the opportunity cost of wasting resources. Therefore, compared with before, the new mode for all people can carry out education for sustainable development more extensively, and better encourage citizens to save resources, which will help reducing the damage to the environment caused by the household use of resources.

In terms of these changes, compared to the above intuitive analysis, we are more interested in the impact of different education modes on household sustainability, and whether the empirical data analysis supports the above argument. Generally, empirical studies are rarely used for such issues. One major reason is that the results of education for sustainable development are difficult to quantify. The method used by Kopnina (2013) provides a viable idea for this purpose. He used the Ecocentric and Anthropocentric Attitudes toward the Sustainable Development (EAATSD) scale as a variable to measure the outcome of education for sustainable development, and conducted an empirical study. This article refers to this idea and use similar scales to measure the achievements of China's sustainable development education, and conducts empirical study on the changes in China's sustainable development education mode, hoping to find the reasons for the changes in the sustainability of China's household use of resources, as well as the role of education for sustainable development in this process, and the effectiveness and mechanism of the for-all education mode for the sustainable development.

2. Data management

This article uses China Family Panel Study (CFPS) data for research. This data was started in 2010 and is released every two years. Since 2012, it has added in the survey data of the family subjective scale.

Therefore, we adopt the micro family data for three years of 2012, 2014, and 2016 to study the issues we concern.

An important goal of education for sustainable development is to enable educators to objectively understand the status quo of sustainable development issues. Because China has a large population and low per capita resources, China's sustainable development situation is relatively severe. Therefore, in China, Education for sustainable development means recognizing the seriousness of environmental problems. Similar to the study by Kopnina (2013), we use the cognitive scale of the family on environmental issues as a variable to measure the outcome of education for sustainable development. CFPS survey results show that the average ratings of environmental problems in Chinese households in 2012, 2014, and 2016 were 5.42, 6.56, and 5.87 (particularly severe = 10, particularly insignificant = 0), showing a trend of first increase and then decline.

If families recognize the seriousness of environmental issues through education for sustainable development and decide to contribute to sustainable development, then the most possible response of families is to reduce the use of various resources in daily life. Resource usage can be used as a variable that reflects the level of sustainability at the household level. As can be seen from Table 1, from 2012 to 2014, the use of various household resources has increased significantly, and from 2014 to 2016, only the use of electricity has increased significantly, with the increase rate decreasing significantly. Even the use of fuel has decreased. The families' awareness of the severity of environmental problems also shares the similar trend of change, which shows an increase in 2014 and a decrease in 2016. Therefore, we can make a preliminary judgment, that in the period around 2014, the impact of the education for sustainable development on Chinese families' use of resources had changed.

In Table 1, *water*, *electric*, and *fuel* are respectively the household's monthly water consumption, electricity consumption, and fuel consumption in the unit of natural gas usage, deducted from the monthly resource use cost dividing the local living resource price. *CO₂* indicates the carbon dioxide emissions from domestic consumption of resources calculated based on China's current production levels. *Evaluation* is the cognitive scale of the surveyed households on the severity of environmental problems in China. Since the scales are large, they can be considered as continuous variables for econometrical analysis. Table 1 also gives the descriptive statistics for other major family characteristics and household head personal characteristics variables, where *health* is the self-assessment of their own health by household heads, and *view1* is the assessment of the government's integrity by household heads (particularly uncorrupted = 10, particularly corrupted = 0), *view2* is the degree of trust in the local government (particularly trust = 5, particularly distrust = 0), control

Table 1. Statistics Description of Variables

Variables	Year 2012	Year 2014	Year 2016	Year 2014 - 2012	Year 2016 - 2014
Water (ton)	3.3258 (5.2086)	4.6654 (8.6867)	4.7544 (8.1729)	1.3396*** (0.2369)	0.0889 (0.2870)
Electric (kw·h)	149.6630 (234.3885)	191.5469 (259.5056)	206.4719 (239.3240)	41.8840*** (8.4808)	14.9249* (8.4776)
Fuel (L)	18.9210 (34.3078)	29.9033 (82.4464)	25.7718 (36.4213)	10.9823*** (2.0378)	-4.1315** (2.0213)
CO ₂ (kg)	206.8421 (292.4752)	252.0340 (326.2513)	259.1454 (265.2255)	45.1919*** (10.6189)	7.1113 (9.9619)
ESD	5.4191 (2.9057)	6.5563 (2.8781)	5.8729 (2.8436)	1.1372*** (0.0999)	-0.6833*** (0.0961)
Infinc (RMB)	9.1871 (1.5552)	9.6388 (2.0358)	9.8207 (2.0003)	0.4517*** (0.0642)	0.1820*** (0.0691)
Infinc ² (RMB)	86.8196 (26.9781)	97.0476 (29.9518)	100.4462 (30.1284)	10.2279*** (1.0178)	3.3986*** (1.0310)
Infasset (RMB)	7.5565 (4.9984)	8.2331 (5.0362)	8.8403 (4.8570)	0.6766** (0.1403)	0.6072*** (0.1713)
Infexp (RMB)	9.9005 (1.0319)	9.4385 (1.6730)	9.6633 (1.4700)	-0.4620*** (0.0497)	0.2248*** (0.0539)
Inhouse (RMB)	2.4127 (1.4107)	2.7126 (1.5184)	2.6860 (1.4216)	0.2999*** (0.0599)	-0.0266 (0.0593)
Height (cm)	155.9137 (34.5342)	157.9880 (29.6206)	159.6011 (45.2466)	2.0743* (1.0986)	1.6131 (1.3524)
Weight (0.5kg)	117.2600 (27.8350)	118.9206 (26.0963)	120.0638 (25.1459)	1.6607 (0.9144)	-1.1431 (0.8451)
Health	3.4626 (1.1780)	3.2754 (1.2743)	3.3113 (1.2489)	-0.1872*** (0.0406)	-0.0359 (0.0414)
Gender (male=1)	0.4828 (0.4992)	0.4915 (0.5001)	0.5260 (0.4994)	-0.1087*** (0.0303)	0.0344** (0.0164)
Age	55.5733 (18.0015)	55.0547 (17.3704)	55.0442 (17.0236)	-0.5214 (0.5917)	-0.0105 (0.5641)
Education (college=1)	0.0747 (0.2630)	0.0970 (0.2961)	0.0794 (0.2705)	-0.0222** (0.0092)	-0.0176* (0.0092)
View1	5.3237 (3.5669)	6.7440 (3.2317)	5.9201 (3.1618)	-1.4203*** (0.1185)	-0.8239*** (0.1073)
View2	2.3193 (1.2435)	2.3418 (1.2783)	2.4027 (1.0758)	-0.0225 (0.0434)	0.0609 (0.0389)
N	983	858	1485	1841	2343

Table 2 OLS regression results (γ_1)

Resource	Water	Electric	Fuel	CO ₂
2012	0.0625* (0.0344)	2.8103* (1.5487)	0.3456 (0.2920)	3.8655** (1.9795)
2014	0.1701*** (0.0721)	2.6155 (2.1688)	1.0891 (1.0437)	4.8318* (3.0070)
2016	0.0271 (0.0573)	0.3228 (1.8567)	-0.3110 (0.3358)	-0.2443 (2.0703)

of these two variables can eliminate the subjective evaluation bias caused by personal optimism or pessimism.

3. Empirical analysis

The basic idea of the empirical analysis of this paper is to examine whether the results of sustainable de-

velopment education can bring about the improvement of the sustainability at the family level, that is, whether the family conserves resources and reduces carbon emissions. Therefore, the basic model can be set as:

$$Resource_i = \gamma_0 + \gamma_1 ESD_i + X\beta + u_i$$

To examine the differences among different years, the model can be further set as:

Table 3 OLS regression after adding cross items

	2012&2014				2014&2016			
	Water	Electric	Fuel	CO ₂	Water	Electric	Fuel	CO ₂
ESD	0.0693 (0.0731)	2.7328 (2.7012)	0.0714 (0.6323)	3.9334 (3.4118)	0.0836 (0.0755)	1.8400 (2.3544)	1.2420 (1.3472)	4.2705 (3.5127)
year	0.2580 (0.3197)	17.1622* (10.2564)	2.9503 (4.1038)	15.5044 (13.9804)	0.4463 (0.4424)	22.3152 (15.3094)	3.0159 (3.9190)	28.3847 (18.3067)
ESD*year	0.0214 (0.0945)	-2.3095 (3.6429)	1.3072 (1.3713)	-1.0473 (4.8117)	-0.0700 (0.0919)	-2.8099 (2.8185)	-1.8510 (1.2312)	-6.3822* (3.7691)
lnfinc	-0.8614** (0.3627)	-60.1101*** (19.6531)	-13.1651 (12.6074)	-87.0673*** (30.4815)	-1.6802*** (0.3072)	-52.5412*** (9.9817)	-5.1459 (4.8738)	-63.6899*** (14.1155)
lnfinc^2	0.0855** (0.0347)	4.3899*** (1.1769)	0.7027 (0.5927)	5.9144*** (1.7260)	0.1544*** (0.0275)	4.4912** (0.7517)	0.3054 (0.2294)	5.1985*** (0.9656)
Regional characteristics	yes	yes	yes	yes	yes	yes	yes	yes
Family variables	yes	yes	yes	yes	yes	yes	yes	yes
Head of household characteristics	yes	yes	yes	yes	yes	yes	yes	yes
N	1841				2343			

Table 4. Results of Regression of Households of Different Ages

	2014&2016							
	Age<40				Age≥40			
	Water	Electric	Fuel	CO ₂	Water	Electric	Fuel	CO ₂
ESD	0.1521 (0.1873)	-8.6842 (11.0609)	-3.5646 (4.3825)	-15.2923 (14.1741)	0.0934 (0.0852)	3.3441 (2.3614)	2.0187 (1.5479)	7.0110* (3.7626)
year	0.0637 (1.1812)	-19.2314 (41.5328)	-27.3036 (22.5604)	-70.9925 (62.5149)	0.7854 (0.5661)	32.4037** (14.6131)	8.2909* (4.8871)	50.1777*** (17.9806)
ESD*year	-0.1157 (0.2832)	12.4560 (11.4344)	4.2313 (4.4372)	20.3529 (14.7764)	-0.0776 (0.1023)	-4.6662* (2.7763)	-2.8949** (1.4376)	-10.1491*** (3.9060)
lnfinc	-1.7672** (0.7660)	-116.2122** (55.3855)	8.4053 (6.9854)	-101.5017* (60.8305)	-1.4932*** (0.3362)	-39.4597*** (8.4851)	-6.9935 (5.5326)	-56.2508*** (13.8768)
lnfinc^2	0.1782** (0.0709)	8.2974** (3.8466)	-0.6701 (0.6326)	7.1615 (1.7260)	0.1361*** (0.0304)	3.6352*** (0.6938)	0.4297* (0.2478)	4.7836*** (0.9119)
Regional characteristics	yes	yes	yes	yes	yes	yes	yes	yes
Family variables	yes	yes	yes	yes	yes	yes	yes	yes
Head of household characteristics	yes	yes	yes	yes	yes	yes	yes	yes
N	405				1938			

$$Resource_{it} = \gamma_0 + \gamma_1 ESD_{it} + \gamma_2 year_{it} + \gamma_3 ESD_{it} * year_{it} + X\beta + u_{it}$$

Table 2 shows the main results of the basic OLS regression for different household resource usage in different years.

It is clear to see from the table that in 2012 and 2014, the family's awareness of environmental sustainability is positively related to the increased use of household resources. This shows that the sustainability education achievements of 2014 and before had not turned into sustainable increase in household resource use. Instead, households that recognize the seriousness of sustainable development issues tend to use more resources. In 2016, the situation

changed, the coefficient of OLS regression was no longer significant, and the coefficient of the influence of household cognition on fuel and carbon dioxide emissions also became negative. Although the coefficient is not significant, based on such changes, we still have reasons to believe that between 2014 and 2016, the use of family resources may have undergone some changes due to family cognition. For this reason, we continue to investigate the OLS regressions with cross terms. The results are shown in Table 3.

It can be seen that for the samples of 2012 and 2014, the cross-term coefficients are not significant, indi-

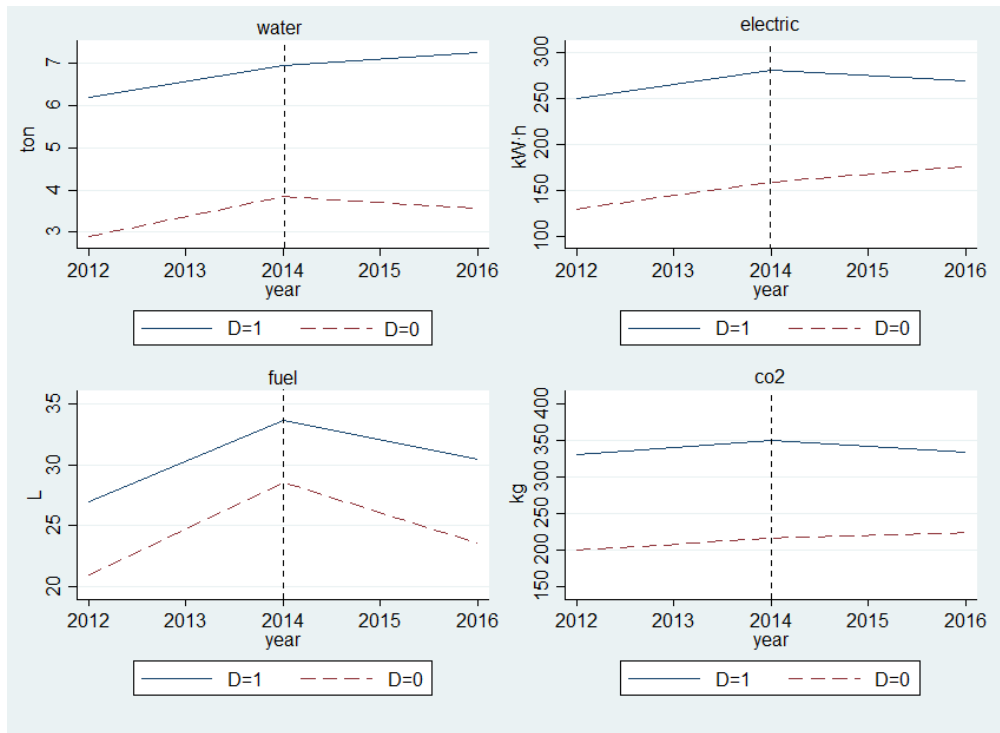


Figure 1. Consumption of household resources in different processing states

cating that the impact of family cognition on resource consumption did not change significantly from 2012 to 2014. The cross-term coefficients are significantly negative between 2014 and 2016, which means that during this period of time, families' perception of sustainable development had brought about a reduction in the consumption of household resources.

Before 2014, because the DESD project was mainly aimed at students at school, the younger family members had a higher probability of receiving education for sustainable development at school, while the older family members were less likely to be affected. After 2014, the for-all sustainable development education is mainly carried out through community residents' committees. Since the current young Chinese labors usually choose to migrate to employment in large cities, the possibility of education for sustainable education among younger family members is low. The older family members are more likely to receive education for sustainable development. Therefore, families whose households are in different age groups may have different effects. If grouped according to the age of the household head, the results of OLS regression are as that in Table 4. From 2014 to 2016, most of the reduction in resource consumption brought about by changes in the cognitive level of household heads over the age of 40 is significant. As the family recognizes the need to protect the environment, the monthly electricity use was reduced by 4.6662 kilowatts, which is a decrease of 2.45%; fuel use reduced 2.8949 liters of natural gas, which is a drop of 9.68%; and carbon dioxide emissions decreased 10.1491 kg, which is a decrease of 4.03%. At the same time, although household heads

under the age of 40 had experienced changes in their awareness of sustainability, their household resource consumption had not been significantly reduced. Since the student population targeted by the DESD project were no more than 22 years old (22 years old is the average graduation age of Chinese college students), they will not be more than 40 years old by 2016. Therefore, the results of Table 4 illustrate once again the sustainable development education on students is ineffective for improving sustainability.

In summary, although the concept of sustainable development has been enhanced, the sustainability on the family level has not been improved under the *government-school-student-family* model of sustainable development. Instead, after implementing the *government-family* for-all sustainable development education, families' resource consumption has been effectively reduced, and sustainability has been improved. In the following sections, we will identify the effectiveness of education for sustainable development that began in 2014.

In China, the ways of education for all include face-to-face education, television, radio, newspapers, text messaging, and the Internet. Since media organizations are all state-owned and promoted by national policies, this kind of sustainable education for the entire nation is comprehensive. In terms of effective scope, the Internet may have become the most important education for all, followed by television, radio, and face-to-face education, and traditional methods such as newspapers and text messaging are the least efficient. Therefore, families who use the Internet, television, etc. as the main information channel have greater possibilities to recognize the importance of sustainable development issues and

Table 5. Double Difference Regression Results

	Water	Electric	Fuel	CO ₂
<i>D</i>	1.1972 (0.8348)	61.9886*** (24.1719)	5.1534 (11.3719)	72.6835** (34.6026)
<i>year</i>	0.2290 (0.7419)	42.2511 (28.1593)	-5.1922 (6.4019)	32.4676 (32.7374)
<i>D x year</i>	-0.1194 (0.9604)	-60.6773** (28.8710)	-3.5188 (11.9872)	-67.2896* (39.3535)
ESD	0.0244 (0.0505)	-0.2912 (1.4323)	0.2468 (0.6473)	-0.2212 (1.9496)
Infinc	-1.7657*** (0.5912)	-58.2597*** (16.5588)	-4.319*** (2.4971)	-67.8986*** (19.2827)
Infinc ²	0.1808*** (0.0615)	6.0273*** (1.6854)	0.5137** (0.2455)	7.1498*** (1.9598)
Regional characteristics	yes	yes	yes	yes
Family variables	yes	yes	yes	yes
Head of household characteristics	yes	yes	yes	yes
N	2343	2343	2343	2343

Table 6. Double Difference Regression Results for Non-processed Years

	Water	Electric	Fuel	CO ₂
<i>D</i>	1.0247 (0.9252)	54.5372 (23.7472)	4.2408 (13.1289)	61.1654 (36.7190)
<i>year</i>	1.3232 (0.9049)	56.4270 (24.4339)	16.6106 (10.2019)	65.1278 (33.6314)
<i>D x year</i>	0.0203 (0.9870)	20.8921 (17.3923)	1.2939 (3.9586)	10.3922 (20.2320)
ESD	0.0771 (0.0605)	0.9386 (1.9052)	0.8843 (1.0918)	2.9094 (2.8973)
Infinc	-0.8129 (0.3876)	-57.4509 (19.4039)	-12.9931 (12.1653)	-84.1211 (29.5281)
Infinc ²	0.0818 (0.0366)	4.1865 (1.1601)	0.6887 (0.5634)	5.6882 (1.6811)
Regional characteristics	yes	yes	yes	Yes
Family variables	yes	yes	yes	Yes
Head of household characteristics	yes	yes	yes	Yes
N	1841	1841	1841	1841

Table 7. DID regression results for households with different ages

	Electric				CO ₂			
	<25%	25%~50%	50%~75%	≥75%	≥25%	25%~50%	50%~75%	≥75%
Age	<40	40~55	55~68	≥68	≥40	40~55	55~68	≥68
<i>D x year</i>	-65.3902 (66.4934)	-79.6124* (45.0628)	-8.4129 (49.9361)	4.8017 (50.9178)	-33.5692 (85.4424)	-123.8958** (64.7572)	34.8001 (63.3916)	-24.4606 (59.4498)
Regional characteristics	yes	yes	yes	yes	yes	yes	yes	yes
Family variables	yes	yes	yes	yes	yes	yes	yes	yes
Head of household characteristics	yes	yes	yes	yes	yes	yes	yes	yes
N	405	673	664	558	405	673	664	558

choose more resource-efficient lifestyles. Relatively, households that use newspapers, text messages, etc., as the main information channel lack the awareness of the importance of sustainable development may not necessarily save resources. Therefore, we use the

whether use the network as the main information channel as a processing state variable for the recognition of the education policy of the nation, using the method of double difference (DID).

The DID method requires that the data meet the common trend assumption that the two types of households with different processing states have the same change trend before 2014. Figure 1 shows the household resource consumption of two types of households from 2012 to 2016. It is easy to see that the common trend assumptions are satisfied here, that the two types of families have the same trends from 2012 to 2014, and the trends from 2014 to 2016 have changed. Therefore, the DID method is feasible for the analysis.

The empirical model for DID analysis can be set as:

$$Resource = \gamma_0 + \gamma_1 D_i + \gamma_2 year_i + \delta D_i \times year_i + X\beta + u_i$$

D_i is the state variables, and the coefficient δ of double difference terms $D_i \times year$ reflect the impact of the changes in the education mode of sustainable development. Table 5 shows the results of DID regression. From the table, we can see that the coefficient of the double difference term is significant for household electricity use and CO₂ emissions. ESDFA has brought household electricity use down by 60.6773 kWh, which is a decrease of 31.68%, and household CO₂ emissions down by 67.2896 kg, which is a decrease of 26.70%.

In comparison, the same DID analysis process was performed for non-processed years. The results are shown in Table 6.

Obviously, all the coefficients in Table 6 are insignificant, which shows that the impact on families' perception of sustainable development in the non-processed years on family resource use has not changed. Therefore, by combining Tables 5 and 6, it can be concluded that China's ESDFA has achieved remarkable success since 2015, and households that have received education for sustainable development have reduced their electricity use and CO₂ emissions significantly, and also water and fuel use to some extent.

Given the age characteristics of the ESDFA target, Table 7 shows the differences in families with household heads at different ages.

It can be seen that families with household heads aged between 40 and 55 are more affected by ESDFA, whose monthly electricity use and CO₂ emissions are reduced by 79.6124 kWh (41.56%) and 123.8958 kg (49.16%) respectively. While there is no significant effect in families with the household heads in other age groups.

Education for sustainable development from other sources, apart from internet, may also have an impact on households. For this reason, we also provide DID regression results with different processing state in terms of other information channels

such as television, radio, etc., as shown in Table 8.

It can be seen that when households that use SMS as the main information channel experience changes in family cognition, a reduction in the use of family resources will take place. While the families that use other channels are just in the opposite situation, that

their resource use increases. The reason for the former may be that mobile phones have become very popular and mobile phone text messages can be quickly read by the owner. Similar to the internet, a wide range of sustainable education audience groups can be reached through short message channels so that each family can gain some additional benefits from the actions to increase sustainability. The latter indicates that families who rely on delivered information from other people cannot receive ESDFA. Therefore, the DID analysis conducted by selecting different channels as processing state variables shows that only when sustainable development education is accepted by the general public through influential channels, can the results lead to a reduction in the use of family resources. This also confirms the argument at the beginning of this article that when all relatives and friends around think that it is necessary to reduce the use of resources, the family's behavior of saving resources can bring additional benefits, so that ESDFA can reduce the use of family resources while school education cannot.

4. Endogenous issues

There are three main sources of endogenous problems, missing variables, reverse causality, and sample selection biases. In the article, we have controlled regional characteristics, family characteristics, and household head characteristics as much as possible. Therefore, the bias of missing variables is not serious. The family's perception of sustainability is mainly based on ESDFA. As sustainable development is a global macro problem, subject to the constraints of its own conditions, it is impossible for a typical family to have knowledge of sustainable development issues on its own, so the reverse causation problem does not exist. Sample selection bias is not serious, CFPS survey on families choice is random, so there is no sample selection bias at the survey level, the use of resources such as water and electricity is essential for family life, the key variables are not obviously missing, so there are no survivor biases. Therefore, in general, there is basically no endogenousness to be solved in the impact of family cognition on sustainability. The results of the paper are reliable.

5. Conclusion and policy implications

Through the empirical analysis method of DID, this paper studies the impact of China's family-level sustainable development education on the level of sustainable development. It was found that before 2014, education for sustainable development was only targeted at students at school and there was no incentive to save resources. The mechanism, therefore, has no obvious impact on the use of family resources; education for sustainable development from 2015 onwards is conducted through various channels for

Table 8. DID regression results for different processing status variables

	TV				Broadcast				Newspaper	
	Water	Electric	Fuel	CO ₂	Water	Electric	Fuel	CO ₂	Water	Electric
<i>D</i>	0.3693 (0.5200)	-4.6845 (19.5421)	2.5203 (7.2069)	0.4542 (24.6525)	0.8847 (0.7762)	16.4483 (18.7689)	17.1242 (11.1922)	49.7399 (30.2027)	-0.5439 (0.5400)	-0.5439 (14.7568)
<i>year</i>	0.7808 (0.8771)	26.0770 (32.0604)	-4.0445 (8.5029)	19.0249 (37.8984)	0.5729 (0.7491)	29.1410 (26.9774)	-5.2812 (6.9663)	19.5407 (32.1037)	0.4544 (0.7415)	0.4544 (26.9072)
<i>D x year</i>	-0.4426 (0.6877)	0.7174 (23.2661)	-2.2014 (7.6379)	-3.8702 (28.6332)	-0.8731 (0.9108)	-16.3499 (22.7348)	-10.2456 (11.7073)	-36.5620 (33.7050)	0.1712 (0.6680)	0.1712 (18.1480)
ESD	0.0391 (0.0500)	0.0700 (1.4135)	0.0622 (0.6777)	0.2236 (1.9659)	0.0359 (0.0498)	-0.0058 (1.4212)	-0.0212 (0.6505)	-0.0133 (1.9299)	0.0429 (0.0507)	0.0429 (1.4125)
lnfinc	-1.6851*** (0.3078)	-52.4695*** (9.9309)	-5.2284 (4.9529)	-63.7795*** (14.2062)	-1.6750*** (0.3058)	-52.4814*** (10.0045)	-4.9933 (4.8026)	-63.3355*** (14.0454)	-1.6780*** (0.3071)	-1.6780 (9.9859)
lnfinc ²	0.1548*** (0.0276)	4.4879*** (0.7490)	0.3118 (0.2339)	5.2076*** (0.9691)	0.1537*** (0.0273)	4.4813*** (0.7502)	0.2863 (0.2236)	5.1516*** (0.9589)	0.1543*** (0.0275)	0.1543 (0.7512)
Regional	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Family variables	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Head of household	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
N	2343	2343	2343	2343	2343	2343	2343	2343	2343	2343

	Newspaper		SMS				Tell the others			
	Fuel	CO ₂	Water	Electric	Fuel	CO ₂	Water	Electric	Fuel	CO ₂
<i>D</i>	15.1743 (10.4197)	21.2708 (24.8095)	1.1957 (0.6963)	57.8992*** (20.0105)	-6.3432 (6.2841)	46.7616* (25.5243)	-0.3557 (0.5342)	-3.4154 (14.2258)	-12.5112*** (3.8858)	-26.7218 (17.4621)
<i>Year</i>	-4.4348 (6.6200)	19.9390 (31.8078)	0.3931 (0.7373)	39.9335 (26.9137)	-7.2699 (7.6744)	26.3587 (32.3275)	0.4274 (0.8378)	23.5328 (29.1074)	-18.7411*** (8.5077)	-83.8112** (35.6607)
<i>D x year</i>	-10.9007 (10.7549)	-23.1438 (27.6224)	-0.1157 (0.8248)	-46.1807** (23.2186)	5.3168 (6.1226)	-36.0455 (28.3578)	-0.0049 (0.6622)	5.6854 (17.6670)	19.4647*** (7.4380)	114.5189*** (33.4208)
ESD	-0.0212 (0.6416)	0.1169 (1.9266)	0.0347 (0.0505)	-0.1435 (1.4231)	0.0865 (0.6891)	0.0529 (1.9932)	0.0436 (0.0508)	0.0429 (1.4154)	0.1054 (0.6938)	0.2826 (1.9834)
lnfinc	-5.2254 (4.8698)	-63.7981*** (14.1469)	-1.6762*** (0.3051)	-52.7421*** (9.8757)	-5.1726 (4.8992)	-63.9371*** (14.1265)	-1.6755*** (0.3070)	-52.6037*** (9.9875)	-5.0978 (4.8591)	-63.6563*** (14.1149)
lnfinc ²	0.3139 (0.2321)	5.2137*** (0.9688)	0.1535*** (0.0273)	4.4987*** (0.7459)	0.3089 (0.2315)	5.2118*** (0.9638)	0.1541*** (0.0275)	4.4982*** (0.7530)	0.3037 (0.2290)	5.2020*** (0.9664)
Regional	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
Family	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes
Head of household	yes	yes	yes	yes	Yes	yes	yes	yes	yes	yes
N	2343	2343	2343	2343	2343	2343	2343	2343	2343	2343

propaganda and education, establishing the idea of saving glory and wasting shameful and constraining from the legal level, not only Residents can correctly recognize the status quo of sustainable development, and can also make residents save resources to obtain a certain effect, thereby reducing the amount of household resources used and improving the level of sustainability. In particular, although the conclusions of this paper show that the improvement of the level of sustainability depends on the incentive mechanism in the education model rather than the educational achievement itself, this does not mean that the role of education for sustainable development in the previous decade is denied. As Huckle (2015) put it,

the rationale for the Decade was idealistic and that global education for sustainability citizenship a more realistic focus for such an initiative. The conclusion of this paper may suggest that based on previous school education, now It may be time to turn education for ESDFA.

Subject to the level and objective conditions, this article will inevitably have some deficiencies, mainly the following two points:

First, the results and methods of this study are severely limited by the data. Among the available Chinese micro-survey databases, only the CFPS conducted household cognition surveys. The CFPS began in 2010 and family cognition issues were only

added in 2012, resulting in the investigation of this article. With only 3 years of data, the verification of common trend hypotheses may be less persuasive when performing DID analysis.

Second, the OLS analysis of this paper is based on the assumption that the use of household resources is technically neutral, that is, with the development of technological level, there is no obvious time trend in the use of family resources. But in fact, because China is a rapidly developing country, with the development of economy and the advancement of science and technology, the development of new types of Internet industry and automobile industry will inevitably bring about the increase in the use of resources such as electricity and fuel. This stage of the family resources There should be an ever-increasing trend in the use of time, so the OLS estimate should be higher than the true value, which is probably the reason why the OLS estimation coefficient is positive. Of course, we have not taken more measures on this issue. This is because trends that are limited by data are difficult to measure. On the other hand, we use the DID method to estimate the value of the processing and control groups. The differential process eliminates this type of time trend, and the results of the DID estimation are not biased.

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