Appendix for "The Largest Insurance Program in History: Saving One Million Lives Per Year in China"

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June 2023

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Appendix 1 Literature review of studies on major insurance expansion in developing nations

China

Audibert et al. (2013) find that the NCMS had, on average, a negative effect on the declining efficiency of Township hospitals.

Babiarz et al. (2010) find that participation in NCMS was associated with a 5% increase village clinic use, 19% decrease in out-of-pocket spending, 24-63% decrease in the two measures of exposure to financial risk, but no change in overall medical care use. In addition, NCMS was associated with a 26% increase in weekly patient flow and a 29% increase in monthly gross income, but no change in annual net revenue or the proportion of monthly income from drug revenue for rural primary healthcare.

Babiarz et al. (2012) find that, between 2005 and 2008, the NCMS provided some risk protection and increased the intensity of inpatient care but did not increase the overall number of patients or the likelihood that a sick person would seek care.

Bai and Wu (2014) finds that the NCMS increases nonmedical-related consumption by more than 5%.

Barber and Yao (2011) compare the three basic medical insurance schemes in China.

Brown and Theoharides (2009) find that NCMS participants in deteriorating health tend to forego healthcare in an NCMS-eligible facility. Conditional on seeking healthcare in an NCMS-eligible facility, patients generally choose lowest-level hospitals with lowest deductible and highest reimbursement rate.

Bogg et al. (2010) find unhealthy and dramatic increases in cesarean delivery under the NCMS, likely spurred on by misaligned financial incentives.

Cao et al. (2012) find early evidence of little OOP reduction, broad categories of necessary (and prevalent treatments) uncovered, and misaligned provider incentives.

Chen et al. (2019) find that the NCMS reduces out-of-pocket spending and the effect is more pronounced for the rich.

Chen and Jin (2012) find that the NCMS (as of 2006) has no effect on child or maternal mortality rate, it is associated with better school attendance for children.

Cheng et al. (2015) find that the NCMS (as of 2008) has improved the elderly's activities of daily living and cognitive function, but not mortality outcomes, and that the NCMS enrollees are more likely to get adequate medical service when sick, but there is no effect on medical spending and out-of-pocket spending.

Cheung and Padieu (2015) find that NCMS has a negative impact on middle-income savings but does not affect the poorest participants.

Donato and Rokicki (2016) find no evidence that the NCMS resulted in consistent improvements in objective measures of health.

Dou, Wang and Ying (2018) find inequities in medical burden with income regions, as well as insufficient subsidies in the NCMS.

Fang et al. (2019) find that the NCMS increased medical expenditure in the good-health and high-income group.

Guo et al. (2016) find that the impact of NCMS in alleviating the financial burden of rural residents was still limited, especially among the poor.

Hou et al. (2014) find the NCMS provides limited financial protection and may increase inpatient OOP and increases the use of both inpatient and outpatient care.

Hu et al. (2012) find that the NCMS has a significant efficiency-enhancing effect, particularly for non-coastal regions.

Huang and Liu (2023) find that exposure to NCMS in early life (ages 0-5) improve health, cognitive, and educational outcomes during adolescence in rural China.

Jiang et al. (2011) find that the NCMS increased medical utilization for girls under 5 but not women over 65, and the use of antibiotics and systemic steroids for patients above 5.

Jing et al. (2013) find that people covered by the NCMS were less likely to become impoverished, but no statically significant impact on CHE.

Lei and Lin (2009) find that participating in the NCMS decreases the use of traditional Chinese folk doctors and increases the utilization of preventive care. But it has no effect on the out-of-pocket spending and utilization of formal medical service.

Liang and Lu (2014) find that the NCMS participation can promote the self-rated quality and health of the elderly and alleviate anxiety and loneliness.

Liang et al. (2012) review the existing literature on the effect of NCMS and finds no clear

evidence that NCMS improves health outcomes.

Li (2019) finds that joining the NCMS does not affect household medical expenditure.

Li and Zhang (2013) find some, but limited increases in utilization by the elderly under the new insurance schemes.

Li et al. (2012) find that the insurance expansion in China does not provide adequate financial protection (rate of CHE was 13% and rate of impoverishment was 7.5%).

Li et al. (2014) find similar levels of impoverishment and CHE between those insured under the NCMS and the uninsured.

Li et al. (2015) find that the NCMS has reduced the rate of re-impoverishment from health hazard and the severity of impoverishment.

Li et al. (2019) find that the NCMS significantly increased the effective reimbursement rate by 12.4% and out-of-pocket medical expenditure/income by 7.5% between 2004 and 2015 but played an insignificant role in reducing out-of-pocket payments.

Liao, Gilmour, and Shibuya (2016) find that although probability of receiving treatment for hypertensives increases by 30% with insurance, the number of hypertensive patients increased by 35% from 1991-2009, but rates of care remained low.

Liu and Tsegai (2011) find adverse selection in the NCMS both medically and economically, although it has increased utilization by the poor.

Liu et al. (2012) compare Chinese and Vietnamese health care reforms, finding that China has achieved high coverage, but low utilization, whereas Vietnam has more limited coverage, but much higher utilization.

Liu et al. (2016) find that NCMS reimbursement is being outpaced by rising medical expenditure, leaving diabetic patients and patients suffering hypertension with high rates of CHE and impoverishment.

Liu et al. (2020) find that the did not improve the medical service utilization of rural elder with chronic disease.

Liu (2016) finds that access to health insurance helps households to maintain investment in children's human capital during negative health shocks.

Liu et al. (2011) find that adults are 2.1% more likely to purchase private health insurance when NCMS became available, especially among higher income groups. NCMS crowded out

child private health insurance, especially among lower income groups.

Long et al. (2012) find that the NCMS is associated with the use of non-emergency C-section.

Lu et al. (2012) find that the NCMS increased the probability of seeking medical care and the number of visits, but not reduced out-of-pocket health expenditure or catastrophic spending.

Ma and Cen (2017) find that the NCMS did not affect health service utilization.

Ma et al. (2016) find very high OOP and incidence of CHE even after reimbursement from the NCMS.

Ma and Oshio (2020) find that participation in NCMS is not associated with any health outcomes.

Pan et al. (2016) find that the NCMS increased access and utilization for the elderly.

Pan et al. (2017) find that the NCMS has had limited success in reducing inequities in the health care system.

Ren et al. (2019) compare three basic insurance schemes in China and finds that there are significant disparities in medical costs and health care service usage among the 3 insurance programs. Health insurance program is only associated with inpatient care.

Shi and Zhang (2013) find that the NCMS is negatively associated with outpatient care.

Shi et al. (2010) find that the coverage of NCMS among the rural population was high but not adequate to improve access to in-patient care and protect against financial catastrophe and household impoverishment due to health payment, especially for the poor and the chronically ill.

Strauss et al. (2012) find the NCMS is associated with inpatient usage for men.

Sun et al. (2009a) find that the NCMS only slightly reduces the incidence of catastrophic medical spending.

Sun et al. (2009b) find that patients with chronic diseases still face catastrophic health expenditures, especially amongst the poor, in spite of the NCMS.

Sun et al. (2010) find that health payment-induced poverty decreases but still high after the NCMS.

Sun and Lyu (2020) find that NCMS enrollment has a significantly positive effect on

self-assessed physical and mental health of rural adults.

Sun (2020) finds that the value of NCMS to recipients is slightly lower than the government's cost of implementation.

Wagstaff et al. (2009) finds that the NCMS enrollment has increased outpatient and inpatient utilization, reduced the cost of deliveries, but not reduced out-of-pocket expenses. This program has increased ownership of expensive equipment among central township health centers but has had no impact on cost per case.

Wang et al. (2005) find that income is an important factor influencing farmers' decision to join the NCMS and wealthy farmers benefit more.

Wang et al. (2008) find that gender, socioeconomic status, adequate knowledge about the policy, subjective premium contribution, subjective co-payment rates, and need are significantly associated with NCMS enrollment.

Wang et al. (2012) find that the NCMS outpatient coverage increased outpatient utilization, especially among the poor.

Wang et al. (2014) find that the NCMS has some impact on reducing catastrophic medical payments associated with hypertension, stroke, and CHD.

Wang et al. (2021) find that households participating in the NCMS increased the use of preventive services and western medicine, while lowering the use of traditional Chinese medicine. NCMS also reduced hospital use, out-of-pocket payment, travel time to healthcare facilities and waiting time to see a doctor.

Xiao et al. (2010) find that there is no evidence of overuse of delivery services, and moreover, total hospital costs and OOP for delivery services were greatly reduced by those covered under the NCMS.

Xie et al. (2018a) find that catastrophic health expenditures reduced in incidence and severity with the NCMS.

Xie et al. (2018b) find that the NCMS has encouraged farmers to get more healthcare and reduced the hospitalization expenses of the tertiary hospitals significantly.

Yang and Wu (2015) find that NCMS outpatient coverage increases outpatient cost but not OOP payment.

Yi et al. (2009) find that the NCMS is associated with an increase on healthcare

expenditure, and a decrease in the real reimbursement rate.

Yip and Hsiao (2009) compare NCMS (MSA/Catastrophic) to Rural Mutual Health Care and find that NCMS is not effective at reducing medical impoverishment because it does not address a major cause of medical impoverishment: expensive outpatient services for chronic conditions.

You and Kobayashi (2009) illustrate the NCMS on the aspects of revenue collection, risk pooling, reimbursement rules and provider payment. The existing literature show that the NCMS increased access and utilization but had no effect on OOP or CHE (from very initial data).

Yu (2015) explains that public support and wide, shallow coverage allowed China to achieve universal coverage before becoming a high-income country.

Yu et al. (2010) find an increase in inpatient utilization, but no increase in outpatient utilization under the NCMS.

Zeng et al. (2019) find that NCMS remarkably increased the rural elderly's reimbursement ratio but insignificantly decreased the rural elderly's OOP.

Zhang et al. (2010) find that the poor received more financial protection from CHE than the non-poor, yet CHE remains high across the board.

Zhang et al. (2016) find that the NCMS was significantly associated with lower odds of delaying or foregoing inpatient care.

Zhao et al. (2008) find that the NCMS participation leads to an elevated probability of general obesity and abdominal obesity.

Zhou et al. (2016) find that the NCMS reduces the incidence of CHE and impoverishment by 11.5% and 7.3% respectively, but after reimbursement, almost half of households still experience CHE.

Brazil

Elias and Cohn (2003) publish a qualitative report about decentralization of health care in Brazil and the role of government in universal coverage.

Macinko et al. (2010) find that the increase in primary care supply since the SUS rollout, hospitalizations for cerebral-cardiovascular diseases, stroke and asthma has all declined at

statistically significant rate, suggesting improvement to the quality of care.

Guanais (2010) finds declining, yet persistent inequities in the Brazilian health system.

Szwarcwald, Souza-Junior, and Damacena (2010) find socioeconomic disparities in outpatient utilization, but also narrowing inequities in the most serious situations.

Paim et al. (2011) provide an extensive overview of the history and details of the SUS – noting its decentralization and universal coverage of vaccination, but also the challenges it faces in financial structure, an emerging private market and the political landscape.

Macinko and Lima-Costa (2012) find large improvements in horizontal equity under the SUS, most substantially in dental visits.

Gragnolati, Lindelow and Couttolenc (2013) write a 131 page report on the health system reform in Brazil for the World Bank – given its length and breadth, it's hard to summarize the entire report here, but in broad strokes they find improvement in health outcomes and access, but room for improving cost efficiency and political structure.

Marten et al. (2014) review UHC progress in Brazil, Russia, India, China, and South Africa (BRICS) – in Brazil primary care has expanded significantly, yet OOP remain high. Private health insurance market undermines public insurance system. More qualitative findings from the rest.

Ceccon, Meneghel, and Viecili (2014) also find a reduction in hospitalization following the expansion of the FHP.

Silva et al. (2017) find larger barriers to mammographic screening for women using the SUS than private insurance.

Hone et al. (2017) find a reduction of mortality inequities between racial groups following expansion.

Andrade et al. (2018) find disparities in geographical regions in Brazil such as lower physician supply, low population density, etc. that undermines the sustainability of the health care in certain regions.

Massuda et al. (2018) find structural issues – low funding, suboptimal resource allocation, poor governance – that plague the SUS leading to large regional and socioeconomic inequities and threatening its sustainability.

Bhalotra, Rocha, and Soares (2019) find large reductions in maternal, fetal, neonatal,

post-neonatal mortality, and fertility, and an increase in hospital use following universalization.

Vietnam

Lofgren et al. (2008) find that the willingness to pay (WTP) is on average higher than costs for insurance premiums, indicating an ability to insure more people (coverage of the health insurance schemes was much less) in Vietnam.

Jowett (2010) finds that informal financial networks may have crowded out government insurance programs in Vietnam

Nguyen and Knowles (2010) find that demand for health insurance in Vietnam was greater with benefits and with a female head of household (although male children were prioritized).

Nguyen (2012) finds the voluntary health insurance market increased utilization by 45-70% but had no effect on OOP in Vietnam.

Somanathan, Dao, and Tien (2013) show that despite Vietnam's success in enrolling the poor into the existing insurance framework, they are not well integrated and lack effective coverage.

Somanathan et al. (2014) find that despite high coverage, there are huge inefficiencies in the insurance system in Vietnam: overly generous benefits, oversupply of services, high prices and overconsumption of pharmaceuticals, and poor incentive systems.

Guindon (2014) finds some increases in health care utilization (in-or-out patient depending on age group) but no evidence of increased health outcomes in Vietnam.

Wagstaff et al. (2016) find that information campaigns and subsidies had limited effect on voluntary health insurance enrollment and may have increased adverse selection in Vietnam.

Nguyen (2016) finds that in Vietnam health care utilization by children has increased over time and that the free health insurance (but not student health insurance) has strongly reduced OOP.

Nguyen et al. (2017) find that a high proportion of people living with HIV lack health insurance (as of 2013), but that the primary drivers were lack of information and difficulty understanding access, suggesting returns from a simple information campaign.

Nguyen and Wilson (2017) find that the subsidized but not free insurance premiums for the near-poor poses a significant barrier to enrollment.

Nguyen and Hoang (2017) find a WTP for social health insurance, but a lack of knowledge about the program indicating enrollment could be increased through enhanced awareness.

Colombia

Groote, Paepe, and Unger (2005) show that in spite of a massive increase in spending, inefficiency in the private/public model in Colombia has resulted in poor coverage, and deteriorating health indicators.

Trujillo, Portillo, and Vernon (2005) find that Colombia's health care subsidies greatly increased utilization among poor and uninsured.

Ruiz, Amaya and Venegas (2006) show service and medication usage is significantly related to socioeconomic, geographical and risk variables and argue this can be addressed through a two-stage income segmented insurance system.

Giedion et al. (2007) show that the insured are 38% more like to receive care when needed and other indications that the reform has lead to high take-up rates of necessary care.

Charry, Carrasquilla and Roca (2008) find inequities in breast cancer screening, particularly for the most vulnerable.

Giedion and Uribe (2009) find broad coverage, increased access/utilization, reduced catastrophic health spending, with larger impact on the most disadvantaged.

Trujillo et al. (2010) find that unlike in other countries, insurance does not influence diabetes patients to avoid preventative services.

Amaya Lara and Ruiz Gómez (2011) indicate that uninsured in Colombia have higher rates of catastrophic health expenditures.

Arroyave et al. (2013) find that the increase in insurance may have contributed to curbing growing disparities in mortality.

Torres and Acevedo (2013) examine the SR to find that supply-side constraints create inequities, barriers to access and regional discrepancies – legal, regulatory and political changes will need to be made to fix the issues.

Garcia-Subirats et al. (2014) find similar inequities by socioeconomic in Brazil and Colombia.

Rodriguez (2015) finds that insurers have market power in concentrated markets in

Colombia, potentially constraining access to health care.

Ettenger, Barnighausen and Castro (2014) find that enrollment in the SR may have reduced access to HIV screening.

Vries et al. (2015) show that despite high coverage, access to effective diagnostic and curative care for gastric cancer varies widely with income, leading to disparities in mortality.

Sanz (2017) argues that wait times and energy negotiating care negatively impacted cancer patients during the reform.

Houweling et al. (2017) find that the SR has reduced neonatal mortality, but may not be enough to achieve equity across socioeconomic status.

Cucunuba et al. (2017) find that lack of screening for Chagas disease leads to lack of care for said disease in Colombia, indicating health insurance is not covering sufficient treatments.

Cuadros-Menaca (2020) finds that remittances in Colombia increased health insurance (and pension) enrollment.

Philippines

Gertler and Solon (2002) find that hospitals extract 86% of social health insurance through price discrimination.

Obermann et al. (2006) determine that PhilHealth is a success story for its high enrollment, but lags behind in key areas such as quality and price.

Quimbo et al. (2008) find that although underutilization declined, from 2004-2007 it averaged 15% in the Philippines.

Kozhimannil et al. (2009) show that the national insurance program (PhilHealth) increased minimal standards of prenatal care, but a donor-funded program (Well Family Midwife Clinics) did not.

Quimbo et al. (2011) estimate a 9-12% reduction in wasting and a 4-9% reduction in having an infection from health insurance targeted at poor children.

Tobe et al. (2012) show that although the insurance program has mitigated some OOP, most services still involve OOP which can, in some cases, be extremely large, necessitating more funding for the insurance program.

Capuno et al. (2016) use a randomized trial to show enrollment increases through two

types of interventions: subsidies and information kits.

Gouda et al. (2016) find that insurance rates are associated with increased utilization of hospital deliveries. Bredenkamp et al. (2017) find that awareness of hospital care is around 75%, but less than half know about the free primary care consolation they are entitled to.

Obermann, Jowett and Kwon (2018) find major achievements in limiting co-pays and improving quality, but PhilHealth still only accounts for 14% of health expenditure (even though it covers 90+% of the country) revealing poor financial protection.

Rwanda

Schneider and Diop (2001) show up to 5x more utilization with insurance, more equity among the insured and lower OOP per illness under Rawanda's CBHI.

Schneider (2005) qualitatively examines trust-building in Rawanda's insurance scheme and offers policy recommendations to improve trust and consumer-insurance-provider relationship.

Schneider and Hanson (2006) find large horizontal inequities between the insured and uninsured in Rwanda in hospital utilization rates.

Schmidt et al. (2006) find that the CBHI schemes are prohibitively expensive for the poor and that subsidies must be considered to extend coverage.

Shimeles (2010) finds increased utilization and reduced incidence of catastrophic health expenditure, but also inequity in usage by income.

Saksena et al. (2011) find that Rwanda's mutual health insurance (MHI) doubles utilization and reduces incidence of catastrophic health expenditure by a factor of 4.

Bucagu et al. (2012) review the first decade of health insurance and finds a large uptake of health services.

Zeng et al. (2014) find that the CBHI has a significant, positive effect on the delivery HIV/AIDS services, by increasing utilization and making the population more sensitive to health care.

Strobl (2017) finds that health insurance reduced child labor and increased education of said children.

Woode (2017) finds statistically significant evidence that parental health insurance increases attendance in school (father for all children, mother only for daughters).

Chirwa, Suhrcke and Moreno-Serra (2020) evaluate the two concurrent CBHI schemes in Rwanda – one with flat premiums and the other with stratified premiums – they find the stratified premiums are less regressive.

Thailand

Pachanee and Wibulpolprasert (2006) discuss the competing interests of private and public health providers as well as the lack of physician supply and offer potential policy interventions.

Rojpibulstit, Kanjanakiritamrong, and Chongsuvivatwong (2006) find that health insurance was not associated with patient delays for TB, with the longest delays for people who first presented at a low-level public health facility.

Damrongplasit and Melnick (2009) discuss early returns to the Thai health care reforms, finding that Thailand added almost 14 million people without compromising access to those with existing insurance, and no informal market had emerged.

Li et al. (2011) provide policy prescriptions for China based on the success of health insurance reform in Thailand.

Hanvoravongchai (2013) writes an overview of the Thai health insurance system and finds an uptick in utilization, but also rising THE.

Gruber, Hendren and Townsend (2014) find that the health reforms in Thailand increased utilization and evaporated infant mortality disparities by income of provinces.

Limwattananon et al. (2015) finds 28% reduction in OOP, medical expenditure risk reduced by 3/5, welfare gain between 80-200%, and an increase in utilization.

Tangcharoensathien et al. (2019) finds path dependence and evidence based policy led to high returns from the Thai health insurance reforms.

Ghana

Agyepong and Adjei (2008) use Ghana as a case-study to show how a lack of information and understanding of the existing insurance system can hinder its success and how other countries can learn from Ghana.

Witter and Garshong (2009) show that high enrollment, large groups of payment-exempt people, broad benefits and no co-pays has lead to distressed schemes and failure to pay facility

claims.

Sarpong et al. (2010) find that 38% enrollment, which is encouraging, but a long way off from universal coverage (particularly in low socioeconomic status areas).

Jehu-Appiah et al. (2011) find broad inequities in enrollment by socioeconomic status, necessitating the need for policy intervention to reach as many possible.

Jehu-Appiah et al. (2012) find that scheme factors, such as benefits were most correlated with enrollment and retention. Perceptions were more positive for the insured, but not as important as scheme factors.

Gobah and Liang (2011) find that education and occupation are major determinants of membership. Moreover there are significant financial barriers to access and lack of insurance is a significant barrier to health care access. They do find that insurance has increased utilization, though.

Akazili, Gyapong, and McIntyre (2011) find health care financing in Ghana is generally progressive (since it is mostly funded by taxes), but informal contributions as well as OOP were both regressive.

Blanchet, Fink and Osei-Akoto (2012) show that insurance is highly correlated with obtaining prescriptions, visiting clinics and seeking formal care when sick.

Dalinjong and Laar (2012) find that the insured perceive long wait times, verbal abuse and discrimination, they believe because they are not making immediate payments.

Yilma, van Kempen and de Hoop (2012) find that ex-ante moral hazard is present in the NHIS, especially for costly activities.

Atinga (2012) finds that perception of health insurance in Ghana depends on in person interactions, not wait times.

Odeyemi and Nixon (2013) compares insurance schemes in Ghana and Nigeria, finding better health outcomes, equity and financing in Ghana.

Kanchebe Derbile and van der Geest (2013) show that the poor remain excluded from the health insurance market in Ghana and recommend policy interventions.

Fenny et al. (2014) find that a higher percentage of insured are satisfied with the quality of their care – the most important variables being wait time, friendliness and consultation process.

Brugiavini and Pace (2016) show that NHIS enrollment is positively associated with formal natal care, but has not had a significant effect on OOP.

Alhassan, Nketiah-Amponsah and Arhinful (2016) find that the NHIS' sustainability in Ghana is threatened by cost escalation, political interference, spatial distribution, among others – and lack of trust in the system hinders (re)enrollment.

Dalinjong et al. (2017) find being insured is associated with increased utilization of both inpatient and outpatient services.

Multinational studies

Escobar, Griffin and Shaw (2010) is a book on the impact of health insurance in LMIC, using a number of countries as case studies.

Comfort, Peterson, and Hatt (2013) provide a systematic review of health insurance in developing world on maternal health services.

Gottret, Schieber and Waters (2013) study Chile, Colombia, Costa Rica, Estonia, the Kyrgyz Republic, Sri Lanka, Thailand, Tunisia, and Vietnam to find common factors and determine good policies.

Wang, Temsah and Mallick (2016) use evidence from Ghana, Indonesia and Rwanda to show that health insurance in developing countries can increase the use of maternal care.

Appendix 2 County characteristics and the timing of NCMS implementation

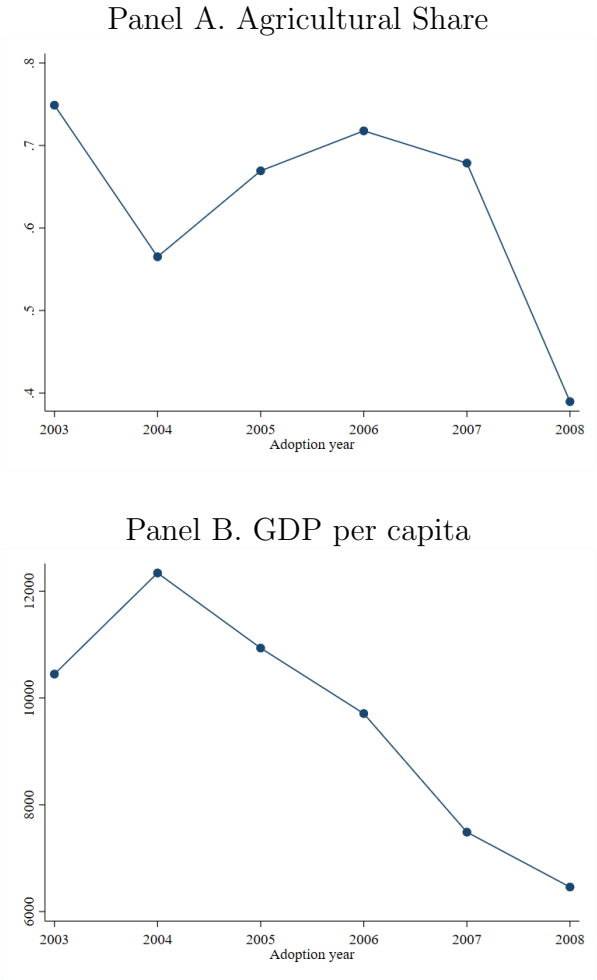


Figure A1: Average agricultural share and GDP per capita by the year of NCMS adoption

Notes: The figures plot the average agricultural share (Panel A) and GDP per capita (Panel B) by the year of NCMS adoption for counties in our sample. Data is from China's 2000 Population Census. The number of counties that adopted NCMS over the years is 15 in 2003, 11 in 2004, 17 in 2005, 23 in 2006, 49 in 2007, and 6 in 2008. Notably, the six counties in our sample that adopted NCMS in year 2008 are highly urbanized counties in poor inland provinces.

Appendix 3

We compare the characteristics of counties with information of NCMS adoption dates and those without such information in our DSP dataset. Table A1 shows no significant difference between the two groups. All the characteristics are obtained from China Population Census 2000.

Table A1: Comparison of in-sample and out-of-sample counties in DSP

	(1) In sample	(2) Out of sample	(3) Diff.
Population (thousand)	461.346	436.148	-25.198
	(307.997)	(272.872)	(54.672)
Share of agricultural population (%)[a]	67.502	60.701	-6.801
	(26.996)	(28.083)	(4.973)
Age 15 to 64 (%)	70.895	71.007	0.112
	(5.164)	(5.681)	(0.966)
Age above 65 (%)	6.985	6.816	-0.168
	(2.003)	(1.637)	(0.350)
Birth rate (%.)	11.228	12.033	0.805
	(3.785)	(4.249)	(0.712)
Death rate (%.)	5.822	5.648	-0.174
	(1.357)	(1.475)	(0.253)
Total fertility rate [b]	1.220	1.267	0.047
	(0.401)	(0.472)	(0.076)
Average years of schooling	7.851	7.852	0.001
	(1.320)	(1.747)	(0.262)
Unemployment rate (%)	7.223	8.026	0.803
	(6.539)	(5.560)	(1.151)
Labor share in the first industry (%)	55.742	47.807	-7.936
	(29.915)	(31.318)	(5.590)
Labor share in the second industry (%)	18.412	21.422	3.010
	(14.673)	(15.645)	(2.721)
Observations	121	40	161

Notes: The table compares key characteristics of the counties with information on the starting year of NCMS (in-sample) and those of the remaining counties (out-of-sample) using 2000 China Population Census. Standard errors are in the parentheses.
[a] Share of agricultural population is the share of population with an agricultural hukou.
[b] Total fertility is the number of births per women of child-bearing age.

Appendix 4 Summary Statistics

Table A2: Summary statistics of DSP data

	DSP sample			National
	Mean	S.D.	Obs	statistics
Age-adjusted mortality rate	546.23	132.79	847	568
Life expectancy at birth	75.35	3.79	847	74
Share of Agricultural population in 2000	0.704	0.258	121	0.7
# healthcare staff (per1,000)	5.625	2.764	847	5.3
# hospital beds (per1,000)	3.473	1.452	847	2.94
GDP per capita	20,489	14,633	847	20,686
Wage	23,776	11,534	847	25,340
# social aid centres (per 10,000)	0.38	0.27	847	0.31
Investment in fixed asset per capita	11,717	8,056	847	11,651

Notes:
a. DSP sample: Age-adjusted mortality rate is measured as the number of deaths per 100 thousand people. The age adjustment is based on the China's 2000 Population Census. Share of agricultural population in 2000 is obtained from China's 2000 Population Census. The rest are the average values over 2004 through 2010 from China Statistical Yearbooks (county level) 2005-2011. The statistics are weighted by the county population. The monetary values are in current prices.
b. National statistics: Mortality rate and life expectancy at birth are statistics in 2007, calculated using the China's 2000 and 2010 Population Census. Share of agricultural population in 2000 is obtained from China's 2000 Population Census. The rest statistics are national average over 2004 through 2010 from China Statistical Yearbook (2005-2011). The monetary values are in current prices.

Table A3: Summary statistics of the main variables from the CLHLS and the CHNS

	Mean	S.D.	Obs
Panel A: CLHLS sample			
Health outcomes			
Suffering from serious illness (past two years, Dummy)	0.183	0.387	53,224
Limited activities of daily living (ADL) (Dummy)	0.252	0.434	53,224
Mental health (Dummy)	0.228	0.419	53,224
Self-reported health (Dummy)	0.853	0.354	53,224
Interviewer-reported health (Dummy)	0.862	0.345	53,224
Healthcare utilization			
Adequate medical service (at present, Dummy)	0.92	0.271	58,565
Positive medical spending (the previous year, Dummy)	0.791	0.406	31,378
Total medical spending (the previous year, 1,000 RMB)	2.733	6.064	24,832
Financial difficulty in medical service (at present, Dummy)	0.059	0.236	52,046
Panel B: CHNS sample			
Health outcomes			
Cognitive deficit (Dummy)	0.509	0.5	5,942
Limited activities of daily living (ADL) (Dummy)	0.333	0.471	5,942
Healthcare utilization			
Healthcare use (past 4 weeks, Dummy)	0.109	0.311	46,519
Inpatient care use (past 4 weeks, Dummy)	0.009	0.096	46,519
Outpatient care use (past 4 weeks, Dummy)	0.095	0.293	46,519
Preventive care use (past 4 weeks, Dummy)	0.037	0.19	46,519
Total medical spending (past 4 weeks, 1,000 RMB)	1.537	6.546	4,005
Out-of-pocket spending (past 4 weeks, 1,000 RMB)	1.112	3.807	680
Out-of-pocket /Total spending (past 4 weeks)	0.952	0.168	680

Notes: The table reports the summary statistics of the main variables from the CLHLS (Panel A) and the CHNS (Panel B). The monetary values are CPI-adjusted to 2010 RMB.

Table A4: Summary statistics of 2000 agricultural share by the year of NCMS adoption

Cohort	Mean	SD	Min	Max
2003	0.749	0.214	0.103	0.961
2004	0.565	0.285	0.096	0.891
2005	0.669	0.289	0.062	0.899
2006	0.718	0.237	0.084	0.938
2007	0.679	0.264	0.051	0.939
2008	0.390	0.284	0.087	0.876

Notes: The table shows the summary statistics of 2000 agricultural share by the year of NCMS adoption.

Appendix 5

As noted in the literature review, we are not the first paper to use a quasi-experimental approach to studying the effects of the NCMS. Yet we find much larger impacts than previous studies. Partly this arises from better data, and the reinforcing results that we find across data sources. There are also two key sources of difference in statistical approach between our study and previous approaches that explain these findings. First, previous studies used only variation in NCMS timing but did not exploit the additional substantial variation in agricultural shares across counties. Second, the NCMS timing-by-year FE and county trends that we include in the model lead to both better identified, and much larger, impacts.

We revisit the DD estimates on our mortality data based on a standard framework below, and explore potential unobserved confounders.

$$\log(Y_{cpt}) = \alpha_0 + \alpha_1 Post_{ct} + \delta_c + \delta_t + \epsilon_{cpt},$$

where the notations are the same as those in equation (1) and the covariates are omitted for illustration purposes (hereafter, the same). The first two columns of Table A5 shows that the estimates of α_1 are small and imprecise.

However, the identification of α_1 relies on the random timing of NCMS adoption conditional on county and year FEs: $cov(Post_{ct}, \epsilon_{pct}|\delta_c, \delta_t) = 0$. If there exist unobserved confounders, C_{ct}, that correlates with Y_{cpt} and $Post_{ct}$ simultaneously, then this assumption is not satisfied, and the estimates of α_1 are biased. We illustrate this point in two ways.

First, we show that potentially omitted variables are strongly correlated with the DD estimation. Table A6 show the DD estimates for four local variables their lagged terms: county GDP, county average wage of urban employees, investment in fixed asset per capita, and the number of social aids centers per 10,000 people. In every case, we find a highly significant correlation with these variables their lags, suggesting that other factors may be correlated with the adoption of the reform.

Second, we examine the pre-trends in health outcomes using the first round of DSP data from 1991 to 2000. The parallel trend assumption states that the health outcomes would have evolved similarly regardless of the NCMS adoption time. We then classify counties

that adopted NCMS before 2006 as the early NCMS adopters, and other counties as the late NCMS adopters. We find unparallel pre-trends for early and late NCMS adopters in Figure A2, which violate the identification assumption.[1]

Combining the two pieces of evidence, we show that the DD method suffers from endogenous timing of NCMS implementation based on time-variant unobserved confounders C_{ct}. Our empirical strategy exploits the additional variation in agricultural shares across counties. By comparing counties that had different shares of the agricultural population but adopted NCMS at the same time, we are able to remove the influence of unobserved confounders, based on a different parallel assumption. For illustration purposes, we use a dummy variable that indicates a high or a low agricultural share rather than a continuous variable of agricultural share in the following equation:

$$\log(Y_{cpt}) = \gamma_0 + \gamma_1 HighAgri_{c,2000} \times Post_{ct} + \gamma_3 Post_{ct} + HighAgri_{c,2000} \times \delta_t + \delta_c + \nu_{cpt},$$

where $HighAgri_{c,2000}$ is a dummy variable that equals one if the agricultural share of county c is above the median. This is a completely saturated triple-difference model and is equivalent to that we estimate the following equation separately for high vs. low agricultural share counties:

$$\log(Y_{cpt}) = \beta_0^r + \beta_1^r Post_{ct} + \delta_c + \delta_t + \epsilon_{cpt},$$

where $r(= H, L)$ denotes the high or low agricultural share counties. As is noted earlier, both β_0^H and β_0^L are biased due to the unobserved confounders C_{ct}. The correct specification should be

$$\log(Y_{cpt}) = \rho_0^r + \rho_1^r Post_{ct} + \rho_2^r C_{ct} + \delta_c + \delta_t + \eta_{cpt}.$$

We then derive $\beta_1^r = \rho_1^r + \rho_2^r \frac{Cov(Post_{ct}, C_{ct})}{Var(Post_{ct})}$, if if we ignore δ_c and δ_t. Thus, the triple-difference estimate is

$$\gamma_1 = \beta_1^H - \beta_1^L = (\rho_1^H - \rho_1^L) - [\rho_2^H \frac{Cov(Post_{ct}, C_{ct})}{Var(Post_{ct})} - \rho_2^L \frac{Cov(Post_{ct}, C_{ct})}{Var(Post_{ct})}].$$

[1]We formally test for the parallel pre-trends in Figure A2 by regressing the outcomes on the full vector of relative time indicators, the indicator of the early cohort, and the set of their interactions, using the indicator of the -8 period as the default group. The estimated coefficients on some interactions in Table A8 are statistically significant, suggesting that the pre-trends are unparallel.

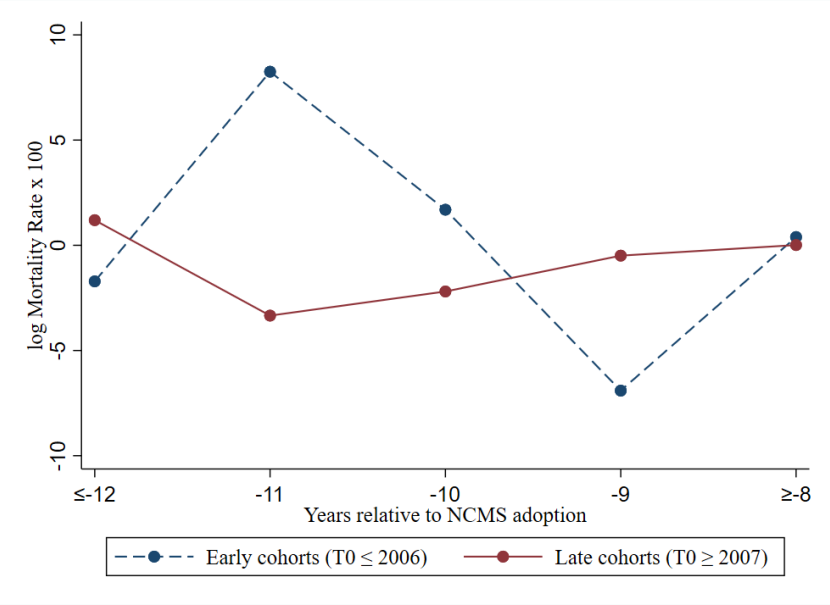
So, we derive the identification assumption in the triple-difference framework as

$$\rho_2^H \frac{Cov(Post_{ct}, C_{ct})}{Var(Post_{ct})} - \rho_2^L \frac{Cov(Post_{ct}, C_{ct})}{Var(Post_{ct})} = 0.$$

Notably, this assumption is not equivalent to that both DD estimates for high and low agricultural share counties should be consistent: $\beta_1^r = \rho_1^r$ for $r(= H, L)$. Instead, our triple-difference estimation does allow both DD estimates in high and low agricultural share counties to be biased. It only requires that the sizes of the biases in both groups are similar.

According to this assumption, the effect of NCMS can be identified if the gap of health outcomes between high and low agricultural share counties would have evolved similarly in the absence of reform, regardless of the time when NCMS was implemented. We verify this assumption by examining the pre-trends of this gap for early and late NCMS adopters, respectively, using DSP data from 1991 to 2000. Figure A3 shows that, without additional controls, this parallel trend assumption is not satisfied, perhaps due to time-varying factors such as existing and evolving rural-urban gaps in health outcomes and healthcare facilities and local government policies to mitigate the rural-urban gaps. They may differentially affect the decision of when to adopt NCMS in high or low agricultural share counties ($HighAgri_{c,2000} \times Post_{ct}$). We intend to dealing with these county-level time-varying by unobservables by controlling for county-specific linear trend, province-by-year fixed effects, and NCMS-timing-by-year fixed effects, admitting that whether it helps or not is a statistical question. But we find that, after doing so, this parallel trend assumption holds, as illustrated in Figure A4. Estimation results in Table A9 also support our argument.

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

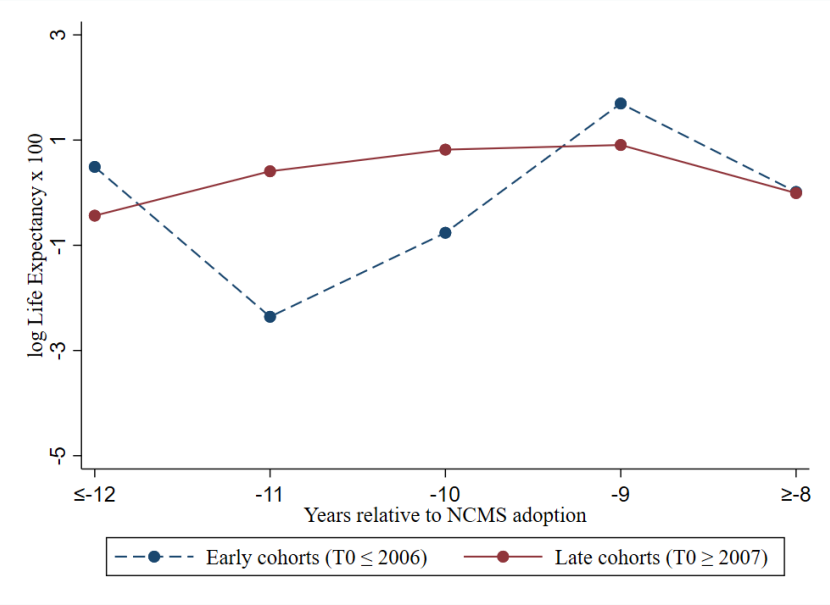
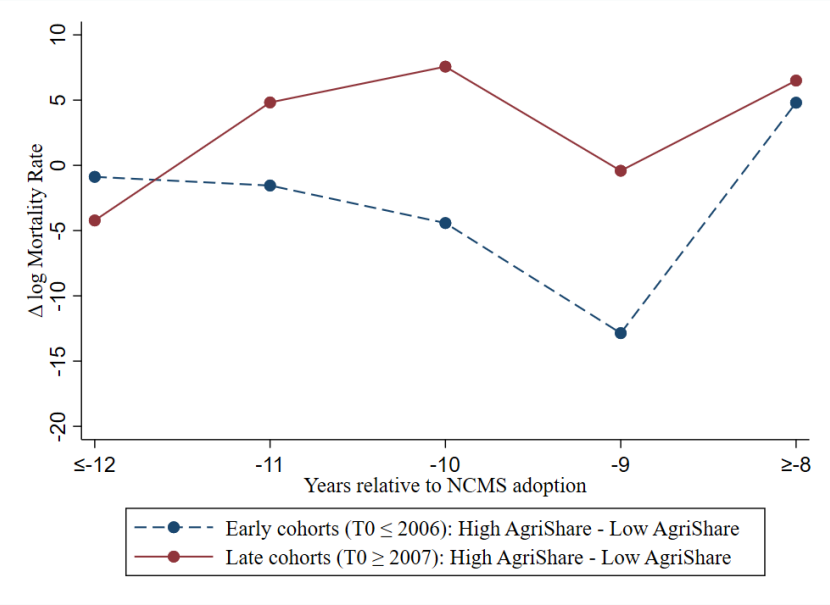


Figure A2: Pre-trends in DD estimation using DSP 1991-2000

Notes: The figures plot the average value of the residuals from regressing Mortality rate (Panel A) and Life expectancy (Panel B) on county FE and year FE. By year of adoption, counties are divided into early and late cohorts (adoption years before and after 2006). Observations more (less) than 12 years (8 years) before the NCMS are binned into groups. The sample period is from 1991 to 2000. The sample counties are those that were under surveillance in both rounds (round 1991-2000 as well as round 2004-2012).

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

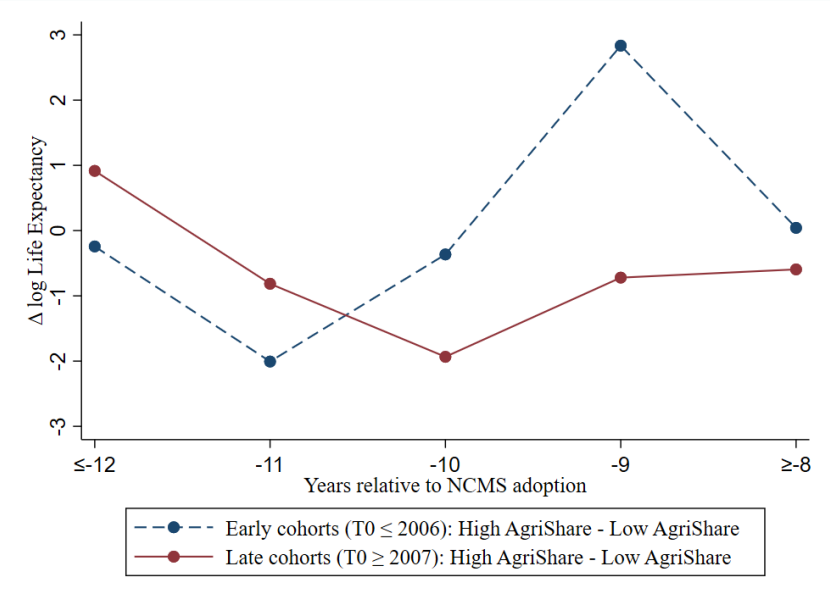
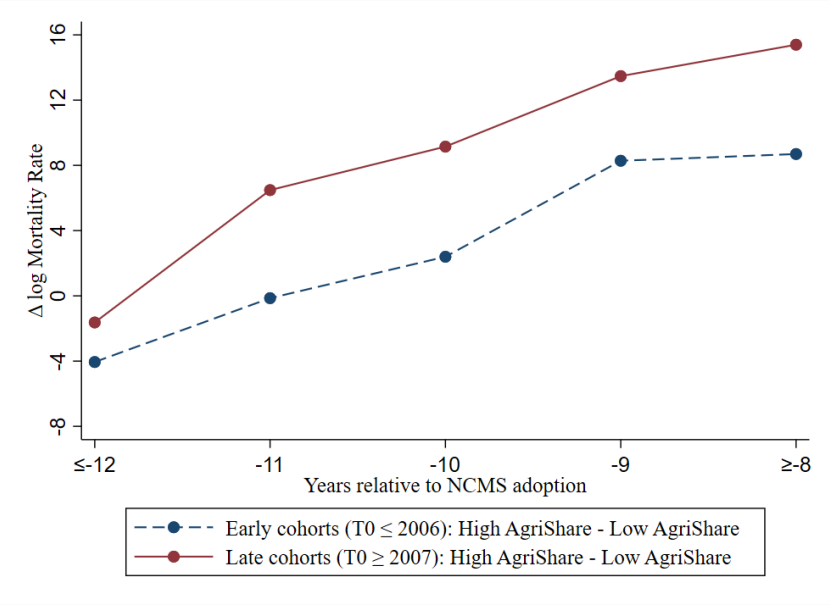


Figure A3: Pre-trends in DD estimation using DSP 1991-2000

Notes: The figures plot the outcome gap between high and low agricultural counties for early and late cohorts, respectively. Counties are split into high and low AgriShare groups by the median of agricultural share, and divided into early and late cohorts (adoption years before and after 2006) by the year of adoption. The outcomes are average residuals from regressing Mortality rate (Panel A) and Life expectancy (Panel B) on county FE and year FE. Those observations more (less) than 12 years (8 years) before the NCMS are binned into groups. The sample period is from 1991 to 2000. The sample counties are those that were under surveillance in both rounds (round 1991-2000 as well as round 2004-2012).

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

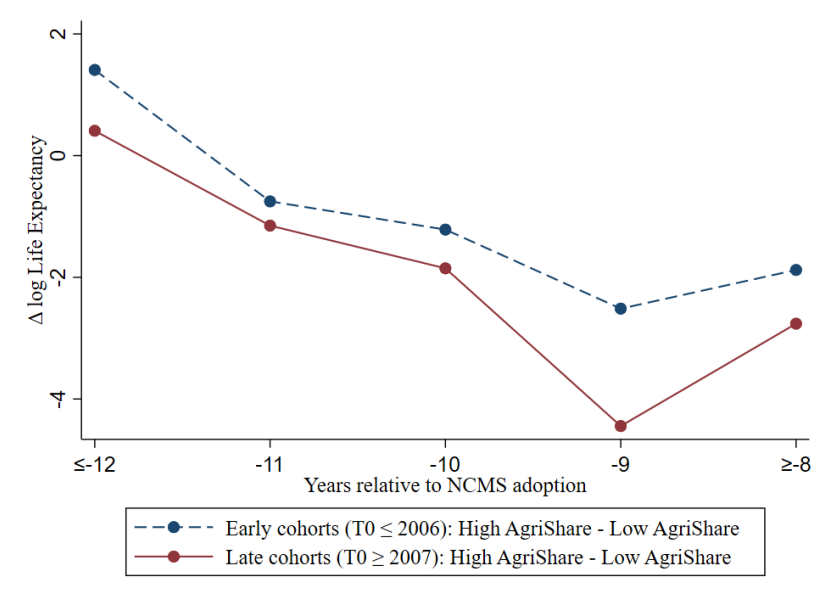


Figure A4: Pre-trends in triple-difference estimation using DSP 1991-2000, detrended

Notes: The figures plot the outcome gap between high and low agricultural counties for early and late cohorts, respectively. Counties are split into high and low AgriShare groups by the median of agricultural share, and divided into early and late cohorts (adoption years before and after 2006) by the year of adoption. The outcomes are average residuals from regressing Mortality rate (Panel A) and Life expectancy (Panel B) on NCMS-timing-by-year FE, county-specific linear trend and province-by-year FE. Observations more (less) than 12 years (8 years) before the NCMS are binned into groups. The sample period is from 1991 to 2000. The sample counties are those that were under surveillance in both rounds (round 1991-2000 as well as round 2004-2012).

Table A5: DD estimation: Mortality rate and life expectancy

	(1) Age-adjusted mortality rate	(2) Life expectancy at birth
Post NCMS	-0.006	0.004
	(0.027)	(0.005)
County FE	Yes	Yes
Year FE	Yes	Yes
Obs	847	847
Adjusted R^2	0.688	0.616
Mean	546.23	75.35

Notes: The table shows the estimated coefficients from a standard DD framework controlling for county and year fixed effects. Dependent variables are shown in the first row of each column. All variables are in logarithm. The sample period is between 2004 to 2010. Regression results are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A6: DD estimation: Other county-level variables

	(1) GDP	(2) Average wage	(3) Investment in fixed asset	(4) # social aids centers
Post NCMS	0.042**	0.075**	0.110***	0.041***
	(0.019)	(0.029)	(0.038)	(0.013)
Adjusted R^2	0.981	0.922	0.964	0.938
Mean	20489.92	23775.55	14223.58	17840.73
	(5) Lagged GDP	(6) Lagged Average wage	(7) Lagged Investment in fixed asset	(8) Lagged # social aids centers
Post NCMS	0.089**	0.200***	0.225***	0.337***
	(0.037)	(0.060)	(0.045)	(0.044)
Adjusted R^2	0.926	0.889	0.810	0.789
Mean	13780.64	6139.16	0.76	0.79
County FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	847	847	847	847

Notes: The table shows the estimated coefficients of Equation (1). Dependent variables are shown in the first row of each column. All variables are in logarithm except for the number of social aids centers in column (4). GDP (columns (1) and (5)), investment in fixed assets (columns (3) and (7)), and the number of social aids centers (columns (4) and (8)) are divided by the population. The sample period is between 2004 to 2010. Regression results are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A7: DDD estimation: Other county-level variables

	(1) GDP	(2) Average wage	(3) Investment in fixed asset	(4) # social aids centers
Post NCMS	0.006	0.022	-0.026	-0.248
x AgriShare2000	(0.040)	(0.044)	(0.061)	(0.158)
Adjusted R^2	0.997	0.943	0.994	0.907
Mean	20489.92	23775.55	14223.58	17840.73
	(5) Lagged GDP	(6) Lagged Average wage	(7) Lagged Investment in fixed asset	(8) Lagged # social aids centers
Post NCMS	-0.011	0.100	-0.041	-0.052
x AgriShare2000	(0.030)	(0.217)	(0.166)	(0.166)
Adjusted R^2	0.965	0.983	0.961	0.894
Mean	13780.64	6139.16	0.76	0.79
County FE	Yes	Yes	Yes	Yes
Province-by-year FE	Yes	Yes	Yes	Yes
NCMS-timing-by-year FE	Yes	Yes	Yes	Yes
County-specific linear trend	Yes	Yes	Yes	Yes
AgriShare2000 x year FE	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes
Obs	847	847	847	847

Notes: The table shows the estimated coefficients of Equation (1). Dependent variables are shown in the first row of each column. All variables are in logarithm except for the number of social aids centers in column (4). GDP (columns (1) and (5)), investment in fixed assets (columns (3) and (7)), and the number of social aids centers (columns (4) and (8)) are divided by the population. The sample period is between 2004 to 2010. Regression results are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A8: Testing for parallel pre-trends: DD estimation

	(1)	(2)
	Mortality rate	Life expectancy
Early cohort x (t=-12)	2.739	-0.681
	(6.007)	(1.195)
Early cohort x (t=-11)	8.406*	-2.163*
	(4.902)	(1.081)
Early cohort x (t=-10)	3.500	-1.256
	(5.395)	(1.310)
Early cohort x (t=-9)	-12.906	3.075
	(12.949)	(3.895)
Obs	505	505
Adjusted R^2	0.015	0.017

Notes: This table show the estimation results from regressing the outcomes on the full vector of relative time indicators, the indicator of the early cohort, and the set of their interactions, using the indicator of the -8 period as the default group. Outcome variables are residuals from regressing Mortality rate and Life expectancy on county FE and year FE. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A9: Testing for parallel pre-trends: Triple D estimation

	Mortality rate		Life expectancy	
	(1)	(2)	(3)	(4)
	No FEs&trends	With FEs&trends	No FEs&trends	With FEs&trends
High AgriShare	22.494**	7.086	-5.129***	-0.971
x Early cohort x (t=-12)	(9.111)	(9.121)	(1.716)	(1.472)
High AgriShare	-3.805	-8.005	-0.702	1.260
x Early cohort x (t=-11)	(10.383)	(8.781)	(2.017)	(1.547)
High AgriShare	5.951	1.610	-1.629	-0.337
x Early cohort x (t=-10)	(10.194)	(5.680)	(2.284)	(1.102)
High AgriShare	-5.587	1.286	3.670	1.426
x Early cohort x (t=-9)	(20.715)	(8.442)	(6.186)	(2.854)
Obs	505	505	505	505
Adjusted R^2	0.029	0.036	0.022	0.032

Notes: This table show the estimation results from regressing the residualized outcome variables on fully saturated interactions between relative time indicators, the indicator of the early cohort, and indicators of high AgriShare county, using the indicator of the -8 period as the default group. Outcome variables for columns (1) and (2) are residuals from regressing Mortality rate and Life expectancy on county FE and year FE. Outcome variables for columns (2) and (4) are residuals from regressing Mortality rate and Life expectancy on NCMS-timing-by-year FE, county-specific linear trend and province-by-year FE. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Appendix 6 Bootstrapping, permutation test, placebo test, and alternative estimators

Bootstrapping

We generate random samples from our DSP data with replacement for 1,000 times and estimate Equation (1) in each random sample. We then plot the distribution of the 1,000 coefficient estimates of $Post \times AgriShare2000$ in Figure A5. The means and standard errors are shown in the figures.

Permutation test

We randomly re-assign the adoption dates to counties and re-estimating equation (1) for 1,000 times. The distribution of estimated coefficients of $Post \times AgriShare2000$ are shown in Figure A6.

Placebo test

We take each implementation data for NCMS and shift it back by 10 years, so that the program is (counterfactually) phased in from 1994 to 1998. We then randomly re-assign the counterfactual dates and re-estimate the regression 1000 times. The distribution of estimated coefficients of $Post \times AgriShare2000$ is shown in Figure A7.

Estimator following De Chaisemartin and D'Haultfoeuille (2022)

We apply the estimator proposed by De Chaisemartin and D'Haultfoeuille (2022), and the estimation results are shown in Table A13. We first obtain the residuals from regressing the health outcome on covariates and fixed effects as stated, and then compute the difference between the average residualized outcomes of the high and the low agricultural counties that adopted the NCMS at the same time and use them as dependent variables in the estimation. The estimates are computed by the Stata did_multiplegt, weighted by the county population. Standard errors are estimated using 100 bootstrap replications clustered at the county level.

In Table A13, we show the placebo estimate of the common trend assumption (Placebo at $t = -1$), the estimate of instantaneous effect at the year of adoption (Effect at $t = 0$), and the estimate of effect in one year after adoption (Effect at $t = 1$).

Estimator following Sun and Abraham (2021)

We apply the interacted-weighted (IW) estimator based on Sun and Abraham (2021). In particular, we estimate the following equation

$$\begin{aligned}\log(Y_{cpt}) =&\beta_0 + \sum_{j=-3, j\neq -1}^{j=2} [\sum_e (\beta^1_{e,j} 1\{t^0_c = e\} \times 1\{t - t^0_c = j\} \times HighAgri_{c,2000} \\ &+ \beta^2_{e,j} 1\{t^0_c = e\} \times 1\{t - t^0_c = j\}) + \beta^3_j HighAgri_{c,2000} \times 1\{t - t^0_c = j\}] \\ &+ \delta_c + \delta_c t + \delta_{pt} + \epsilon_{cpt},\end{aligned}$$

where $1\{t^0_c = e\}$ is an indicator that county c adopted the NCMS in year e (cohort e), $HighAgri_{c,2000}$ is a dummy variable that equals 1 if the agricultural share of county c is above the median, and other variables are defined as in Equation (2) in the main text. According to Sun and Abraham (2020), we drop counties that adopted NCMS before 2005 because we do not observe their units when not treated; we also restrict the sample period from 2004 to 2007 because all counties are treated after that period. The IW estimator is the weighted average of $\beta^1_{e,j}$, where the weights are the sample share of each cohort e across all cohorts in the certain year j relative to the adoption year. The interacted-weighted estimator focuses on the event study design and does not specify the way to aggregate relative year fixed effects across years. The estimation results are shown in Figure A8.

Robustness analysis for county-specific linear trends

To check the robustness of our findings when controlling for county-specific time trends, we employ alternative methods described by Agha and Zeltzer (2022) and Goodman-Bacon (2021). Results are shown in Table A14.

(1) Agha and Zeltzer (2022):

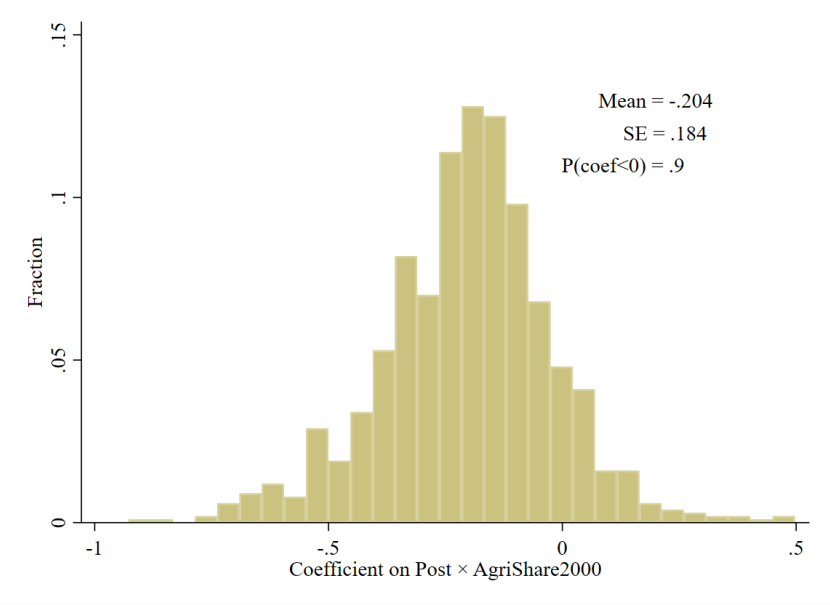
We first use data from 1991 to 2010 to estimate the pretends by regressing the outcome variables on NCMS-timing-specific linear pre-trends interacted with Agricultural share as well as the full vector of indicators for post-NCMS years interacted with Agricultural share. We then residualize the outcome variables by the estimated pre-trends. Finally, we run the baseline regression as in Equation (1) in our paper using data from 2004 to 2010, except that we no longer control for the county-specific linear trends. The results are in column (1) of

Table A14.

(2) Goodman-bacon (2021)

Using the DSP data from 1991 to 2000, we estimate the pretends by regressing the outcome variables on NCMS-timing-specific linear pre-trends interacted with Agricultural share. We then extrapolate the pre-trends forward and subtract the fitted trends from the observations between 2004 to 2010. Finally, we run the baseline regression as in Equation (1) in our paper using data from 2004 to 2010, except that we no longer control for the county-specific linear trends. Results are in column (2) of Table A14.

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

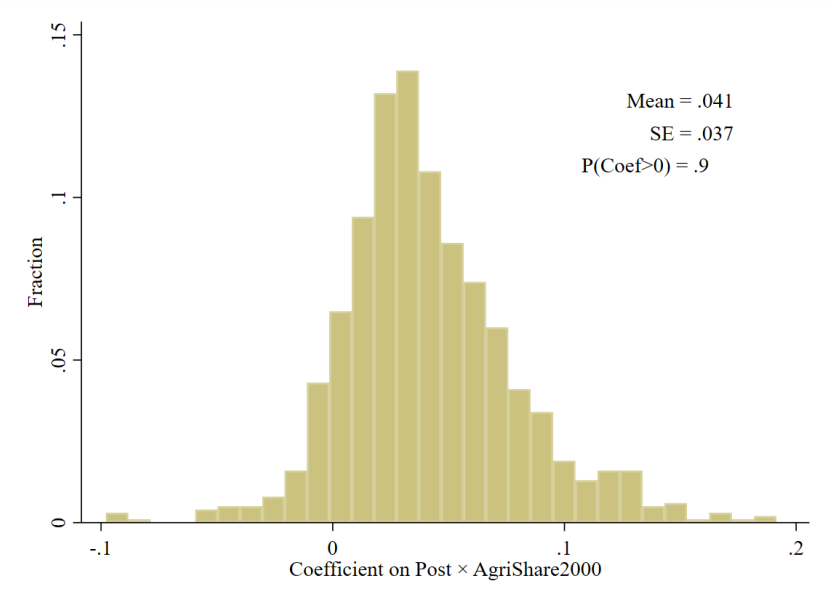
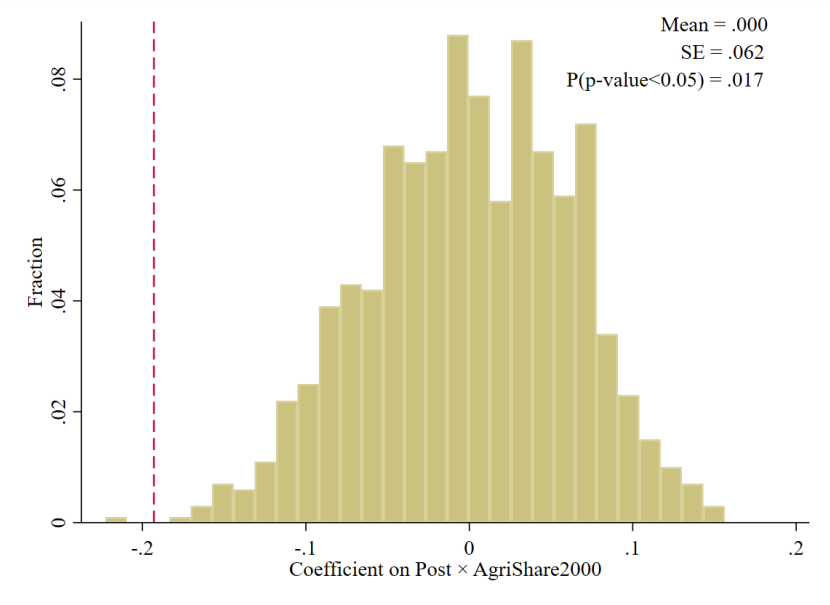


Figure A5: Bootstrapping

Notes: The figures plot the distribution of estimated coefficients on Post x AgriShare2000 in equation (1) using 1,000 random samples with replacement from our data. The mean, standard error, and proportion of negative/positive coefficients are shown in the figure. Results are weighted by county population. The sample period is from 2004 to 2010.

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

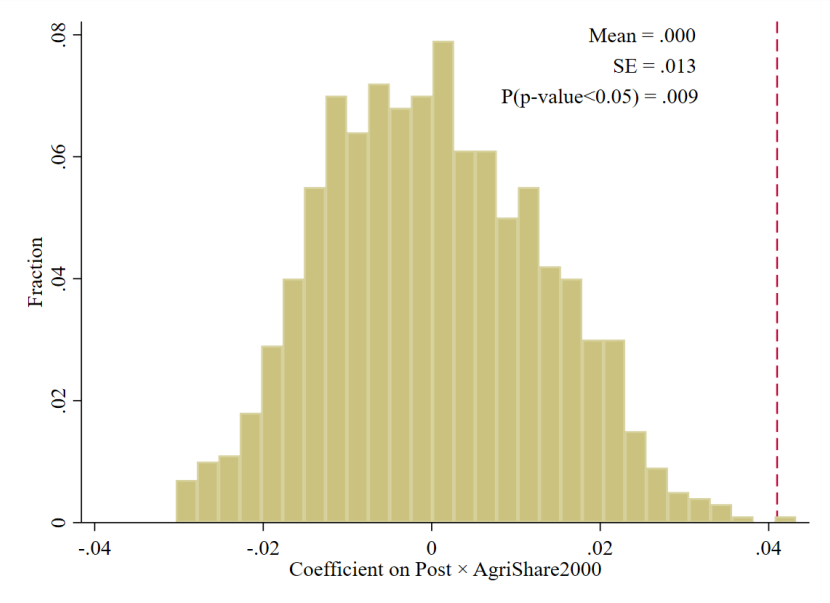
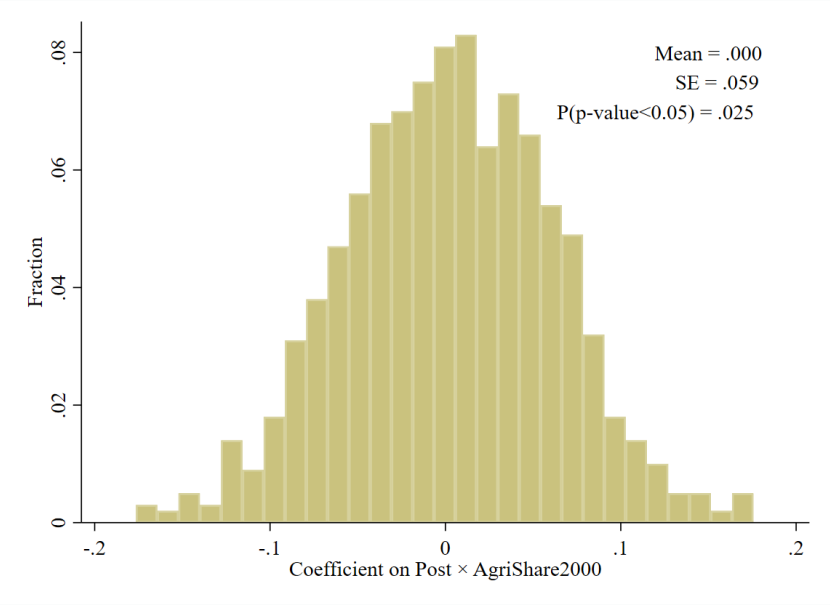


Figure A6: Permutation test

Notes: The figures plot the distribution of estimated coefficients on Post x AgriShare2000 in equation (1) by randomly assigning the NCMS adoption year among sample counties for 1,000 times. The mean and standard error of estimated coefficients, as well as the proportion of significant estimates (p-value¡0.05), are shown in the figure. The vertical dash line represents the baseline coefficient. Results are weighted by county population. The sample period is from 2004 to 2010.

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

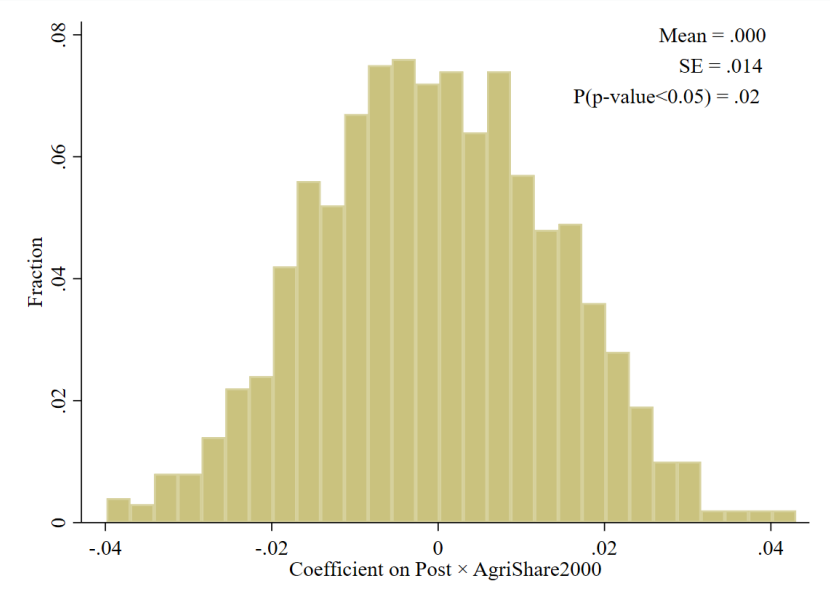
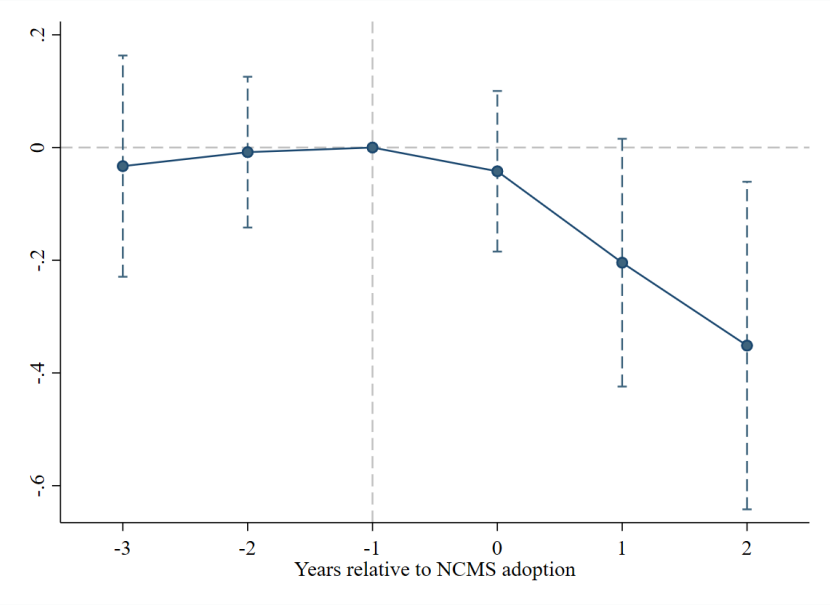


Figure A7: Placebo test

Notes: The figures plot the distribution of estimated coefficients on Post x AgriShare2000 in equation (1) by shifting the adoption date by 10 years and randomly assigning the NCMS adoption year among sample counties for 1,000 times. The mean and standard error of estimated coefficients, as well as the proportion of significant estimates ($P < 0.05$), are shown in the figure. Results are weighted by county population. The sample period is from 1994 to 2000.

Panel A. Age-adjusted mortality rate



Panel B. Life expectancy at birth

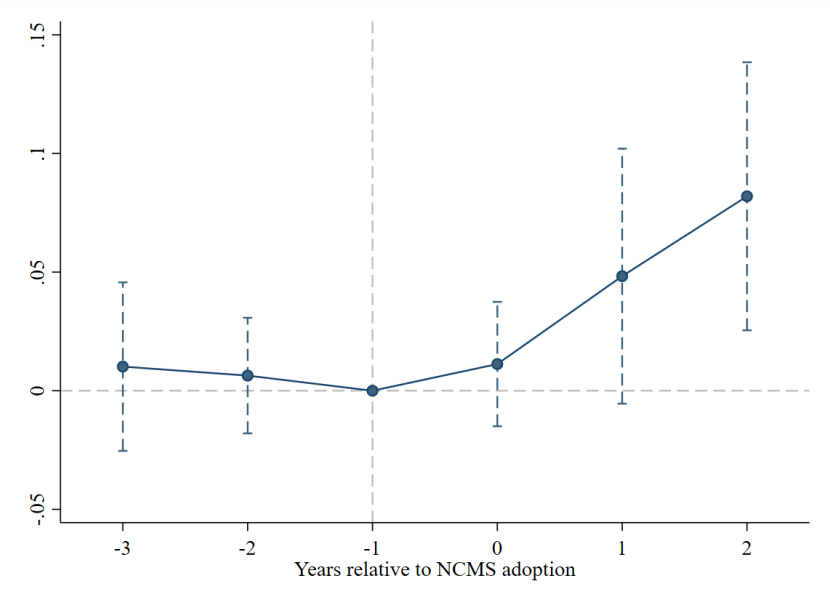


Figure A8: Interaction-weighted (IW) estimator

Notes: The figures plot the Interaction-weighted (IW) estimators following Sun and Abraham (2020). Counties that adopted NCMS before 2005 are excluded. The sample period is from 2004 to 2007. The year before NCMS adoption is omitted, so the estimates are normalized to zero in that year. Regressions are weighted by county population. Dashed lines represent the 95 percent confidence intervals based on standard errors clustered at the county level.

Table A10: Robustness analysis: Outcome variables in levels

	(1) Baseline	(2) Controlling for Government inputs	(3) Removing covariates	(4) Sample 04 to 07
Panel A: Age-adjusted Mortality rate				
Post NCMS x AgriShare2022	-60.815	-57.518	-61.195	-62.709
	(38.859)	(39.819)	(38.954)	(42.886)
Adjusted R2	0.812	0.803	0.803	0.803
Sample Mean	546.23	546.23	546.23	546.23
Panel A: Life expectancy at birth				
Post NCMS x AgriShare2022	0.021*	0.040**	0.038**	0.039**
	(0.012)	(0.018)	(0.018)	(0.019)
Adjusted R2	0.761	0.740	0.740	0.740
Sample Mean	75.35	75.35	75.35	75.35
County FE	Yes	Yes	Yes	Yes
Province-by-year FE	Yes	Yes	Yes	Yes
NCMS-timing-by-year FE	Yes	Yes	Yes	Yes
County-specific linear trend	Yes	Yes	Yes	Yes
AgriShare2000 x year FE	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	No	Yes
Government Covariates	No	Yes	No	No
Obs	847	847	847	484

Notes: The table shows the estimated coefficients from Equation (1) in various specifications. Panel A shows the results on age-adjusted mortality rates and Panel B shows those on life expectancy at birth. Column (1) reports the baseline results from Equation (1) using DSP sample from 2004 to 2010. Columns (2) includes variables of other local policies, such as the number of social aid centers and investment in fixed asset per capita. Column (3) reports results from specifications removing economic covariates. Columns (4) restricts the sample period to 2004 -2007. Age-adjusted mortality rate and life expectancy are in level. Results are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A11: Robustness analysis: Mortality rates by causes of death

	(1) Respiratory disease	(2) Cerebral-cardiovascular diseases
Post NCMS x AgriShare2022	-0.222**	-0.237**
	(0.107)	(0.108)
County FE	Yes	Yes
Province-by-year FE	Yes	Yes
NCMS-timing-by-year FE	Yes	Yes
County-specific linear trend	Yes	Yes
AgriShare2000 x year FE	Yes	Yes
Covariates	Yes	Yes
Adjusted R^2	0.859	0.857
Sample Mean	108.09	218.02
Obs	847	847

Notes: The table shows the estimated coefficients from Equation (1). The dependent variable is age-adjusted mortality rates due to respiratory disease in Column (1) age-adjusted mortality rates due to cerebral-cardiovascular diseases in Column (2). Age-adjusted mortality rate are in logarithms. Results are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A12: Estimation results including additional county variables

	(1) Including GDP*Post	(2) Including Wage*Post	(3) Including Fixed asset investment*Post	(4) Including Social aids centers*Post	(5) Including local fiscal income	(6) Including prefecture tariff gap
Panel A: Age-adjusted mortality rate						
Post NCMS x AgriShare2000	-0.189**	-0.188*	-0.174**	-0.206**	-0.201**	-0.186**
	(0.088)	(0.099)	(0.085)	-0.094	-0.088	-0.088
Adjusted R-squared	0.803	0.803	0.805	0.803	0.803	0.813
Mean	546.23	546.23	546.23	546.23	546.23	558.38
Panel B: Life expectancy at birth						
Post NCMS x AgriShare2000	0.037**	0.037*	0.035**	0.041**	0.040**	0.032**
	(0.018)	(0.019)	(0.017)	(0.019)	-0.018	-0.014
Adjusted R-squared	0.740	0.740	0.743	0.740	0.741	0.82
Mean	75.35	75.35	75.35	75.35	75.35	74.99
County FE	Yes	Yes	Yes	Yes	Yes	Yes
Province-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
Agricultural share x year FE	Yes	Yes	Yes	Yes	Yes	Yes
NCMS-timing-by-year FE	Yes	Yes	Yes	Yes	Yes	Yes
County-specific linear trend	Yes	Yes	Yes	Yes	Yes	Yes
Covariates	Yes	Yes	Yes	Yes	Yes	Yes
Obs	847	847	847	847	847	637

Notes: The table shows the estimated coefficients from equation (1), additionally controlling for the interactions of Post NCMS with county variables measured in the year 2000 (columns (1)-(4)), local fiscal income per capital in column (5), and prefecture tariff gap (Leight and Bilge, 2019) interacted with year dummies in column (6), respectively. The additional controls are shown in the first row of each column. All variables are in logarithm except for the number of social aids centers in column (4) and prefecture tariff gap in column (6). The sample period is between 2004 to 2010. There are fewer observations in column (6) than the baseline because tariff data is not available for some prefectures. Regression results are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A13: Estimation results based on de Chaisemartin and d'Haultfoeuille (2021)

	Age-adjusted mortality rate		Life expectancy at birth	
	(1)	(2)	(3)	(4)
Placebo at t=-1	0.137	-0.005	-0.016**	0.002
	(0.084)	(0.036)	(0.008)	(0.004)
Effect at t=0	0.021	-0.099	-0.003	0.016
	(0.049)	(0.088)	(0.009)	(0.015)
Effect at t=1	-0.168	-0.123***	0.032	0.025***
	(0.138)	(0.039)	(0.028)	(0.005)
Control variables	Yes	Yes	Yes	Yes
County-specific linear trend	No	Yes	No	Yes
Province-by-year FE	No	Yes	No	Yes
NCMS-timing-by-year FE	No	Yes	No	Yes

Notes: This table shows the estimation results based on de Chaisemartin and d'Haultfoeuille (2021). We define the dependent variable as residuals from regressing the difference between the average outcomes of the high-AgriShare counties and the low-AgriShare counties in the same cohort on covariates and fixed effects as stated. Placebo at t=-1: the placebo estimate of the common trend assumption. Effect at t=0: estimate of instantaneous effect at the year of adoption. Effect at t=1: estimate of effect in one year after adoption. The estimates are computed by the Stata did_multiplegt, weighted by the county population. Standard errors are estimated using 100 bootstrap replications clustered at the county level. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A14: Robustness analysis for county-specific linear trends

	(1) Agha and Zeltzer (2022)	(2) Goodman-bacon (2021)
Panel A: Age-adjusted Mortality rate		
Post NCMS x AgriShare2022	-0.156**	-0.129**
	(0.060)	(0.060)
Adjusted R2	0.815	0.826
Sample Mean	546.23	546.23
Panel B: Life expectancy at birth		
Post NCMS x AgriShare2022	0.035***	0.033***
	(0.012)	(0.012)
Adjusted R2	0.731	0.788
Sample Mean	75.35	75.35
County FE	Yes	Yes
Province-by-year FE	Yes	Yes
NCMS-timing-by-year FE	Yes	Yes
AgriShare2000 x year FE	Yes	Yes
Covariates	Yes	Yes
Obs	847	847

Notes: This table shows the estimation results controlling for trends using methods in Agha and Zeltzer (2022) and Goodman-Bacon (2021). Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Appendix 7 Supplementary analysis using micro datasets

First-stage results

Table A15: First-stage results: NCMS enrollment

	NCMS Enrollment	
	(1)	(2)
NCMS county × Agricultural Hukou	0.763***	0.673***
	(0.014)	(0.042)
NCMS county	-0.001	-
	(0.001)	-
Agricultural Hukou	-0.013	-
	(0.008)	-
Covariates	Yes	Yes
County FE	Yes	No
Year FE	Yes	No
County-by-wave FE	No	Yes
Hukou-by-wave FE	No	Yes
Hukou-by-County FE	No	Yes
Individual FE	No	No
Obs	78,446	58,565

Notes: The table shows the association between one's Agricultural Hukou and NCMS enrollment after NCMS adoption. Column (1) reports the results of equation (4), and the sample is restricted to those used in the mortality analysis in equation (3). Column (2) reports the results of equation (6), and the sample is restricted to those survivors used in the analysis of health outcomes and healthcare utilization in equation (5). Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Exploring baseline health status by NCMS enrollment

Table A16: NCMS enrollment and baseline health status

	(1) CLHLS sample Dep: baseline health in 2002	(2) CHNS sample Dep: baseline health in 2000
Early NCMS enrollment	0.291***	0.084***
	(0.083)	(0.017)
Obs	2,549	11,208
R^2	0.063	0.063
Sample Mean	0.740	0.433

Notes: The table shows an individual-level analysis by regressing one's baseline health status on whether one enrolls in NCMS at the earlier stage using CLHLS in Column (1) and CHNS in Column (2), respectively. We define baseline health status as an indicator for "Very good" or "Good" health self-reported in wave 2002 in CLHLS and wave 2000 in CHNS, respectively; we define early NCMS enrollment as an indicator for enrolling in NCMS before 2005 in CLHLS and before wave 2006 in CHNS, respectively. We also control for county fixed effects. Standard errors clustered at the county in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Testing for research design using micro data

We demonstrate that the interaction between NCMS adoption and the baseline agricultural share is uncorrelated with the previous county variables or their involvement in recent years, as shown in Table A17 and A18.

In particular, Table A17 conducts a county-level analysis by regressing the change in outcome variables from 1990 to 2000 on the indicator of the early cohort, the agricultural share in 2000, and their interactions, with province fixed effects added. The early cohort indicates that the county adopted the NCMS in 2005 or earlier. The outcome variables include mortality rates (number of deaths per 1000), GDP per capita (in thousands), number of hospital beds (per 10,000 people), and the average amount of subsidies provided to those aged above 70 per year (in thousands). The data is from the CLHLS community data for the period 1998-2005.

Table A18 reports the estimation results of a community-level panel analysis by regressing the lagged values of the outcome variables on the interaction of having adopted NCMS and the agricultural share in the 2000 wave. We also control for community fixed effects, province-by-wave fixed effects, NCMS-timing-wave fixed effects, AgriShare2000 x Wave fixed effects, and county-specific time trends. The outcome variables are various types of scores based on a scale of 1 to 10 and provided by the CHNS as a comprehensive evaluation of community development in various aspects.

Table A17: Testing for research design using CLHLS

	(1) Change in mortality rate	(2) Change in GDP per capita	(3) Change in beds per 10,000 people	(4) Change in elderly subsidies
Early cohort	-0.391	5.144	9.557	0.275
x AgriShare2000	(2.211)	(11.382)	(58.002)	(0.637)
Early cohort	-0.024	-3.025	-14.810	-0.160
	(1.510)	(7.036)	(41.354)	(0.484)
AgriShare2000	0.917	-11.694***	-10.747	-0.035
	(0.655)	(3.807)	(21.500)	(0.145)
Province fixed effect	Yes	Yes	Yes	Yes
Obs	351	449	281	152
R^2	0.120	0.166	0.197	0.095
Mean	-0.205	8.792	19.086	0.204

Notes: The table reports the estimation results of a county-level analysis by regressing the change in outcome variables from 1990 to 2000 on the indicator of early cohort, the agricultural share in 2000, and their interactions. The early cohort indicates that the county adopts the NCMS in 2005 or earlier. Dependent variables shown in the first row refer to the change from 1990 to 2000 (log difference). GDP per capita is in 1000s. Province fixed effects are included and the regression are weighted by county population. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A18: Testing for research design using CHNS

	(1) Social service score	(2) Economic component score	(3) Community health score	(4) Community population density score
NCMS x AgriShare2000	0.206	-0.109	-0.031	0.001
	(0.136)	(0.120)	(0.030)	(0.019)
Community FE	Yes	Yes	Yes	Yes
Province-by-Wave FE	Yes	Yes	Yes	Yes
NCMS-timing-Wave FE	Yes	Yes	Yes	Yes
AgriShare2000 x Wave FE	Yes	Yes	Yes	Yes
County-specific time trends	Yes	Yes	Yes	Yes
Obs	801	801	801	801
R^2	0.823	0.805	0.961	0.965
Mean	2.301	5.300	3.294	5.843

Notes: The table reports the estimation results of a community-level analysis by regressing the lagged values of the variables shown in the first row the interaction of having adopted NCMS and the agricultural share in 2000 wave. The various types of scores are based on a scale of 1 to 10 and provided by the CHNS as a comprehensive evaluation the community development on various aspects. We also control for the communit FE, province-by-wave FE, NCMS-timing-Wave FE, AgriShare2000 x Wave FE, county-specific time trends. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A19: NCMS enrollment and perceived well-being

	(1) CLHLS sample	(2) CHNS sample
NCMS enrollment	0.047	0.077
	(0.068)	(0.178)
Covariates	Yes	Yes
County-by-wave FE	Yes	Yes
Hukou-by-wave FE	Yes	Yes
Hukou-by-County FE	Yes	Yes
Obs	53419	17263
Mean	0.634	0.510

Notes: The table shows the impacts of the NCMS on one's perceived well-being based on Equations (5) and (6). We measure perceived well-being using an individual's rating of the quality of their current life, and define the dependent variable as an indicator that equals 1 if one rates their life as good or very good, and 0 if one rates their life as so-so, bad, or very bad. Results in columns (1) and (2) rely on the CLHLS, and results in columns (3) - (6) rely on the CHNS. Standard errors clustered at the county in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A20: NCMS and the health of the nonelderly: CHNS data

	(1)	(2)	(3)	(4)
	Sick or hurt	Fever/Cough	Headache	Joint and muscle pain
NCMS enrollment	-0.010	-0.011	-0.016	-0.012
	(0.049)	(0.038)	(0.026)	(0.019)
Covariates	Yes	Yes	Yes	Yes
County-by-wave FE	Yes	Yes	Yes	Yes
Hukou-by-wave FE	Yes	Yes	Yes	Yes
Hukou-by-County FE	Yes	Yes	Yes	Yes
Obs	27621	27621	27621	27621
Mean	0.151	0.075	0.033	0.028

Notes: The table shows the results from Equations (5) and (6) about health outcomes other nonelderly (age below 60) using CHNS. Each cell presents the IV coefficients on NCMS enrollment based on Equations (5) and (6). Dependent variables in these regressions are shown in the first column. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Including individual fixed effects

We include individual fixed effects in equations (4) and (5), re-estimate the model with health outcomes and healthcare utilization, and show the results using CLHLS in Table A21 and results using CHNS in Table A22. Results for outcomes of financial protection using both datasets are in Table A23.

Table A21: Impacts of NCMS enrollment on health outcomes and healthcare utilization using CLHLS (controlling for individual fixed effects)

	(1) Other health outcomes	(2) Healthcare Utilization
Suffering from serious illness	-0.122**	
	(0.062)	
Obs	53,224	
Mean	0.183	
Limited ADL	-0.085*	
	(0.048)	
Obs	53,224	
Mean	0.252	
Mental health	0.120*	
	(0.069)	
Obs	53,224	
Mean	0.228	
Self-reported health	0.122**	
	(0.053)	
Obs	53,224	
Mean	0.853	
Interviewer-reported health	0.122***	
	(0.046)	
Obs	53,224	
Mean	0.862	
Adequate medical service		0.077**
		(0.038)
Obs		58,565
Mean		0.920

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Positive medical spending		0.129**
		(0.062)
Obs		31,378
Mean		0.791
Total medical cost (log)		0.472**
		(0.218)
Obs		24,832
Mean		2.733
Baseline covariates	Yes	Yes
County-by-wave FE	Yes	Yes
Hukou-by-wave FE	Yes	Yes
Individual FE	Yes	Yes

Notes: The table reports the estimation results from equations (5) and (6) using the CLHLS, additionally controlling for individual fixed effects. Dependent variables in these regressions are shown in the first column. Each cell presents the 2SLS estimated coefficient on NCMS enrollment. Information on medical spending is available after 2005. Total medical spending are in 1,000, 2010 RMB. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A22: Impacts of NCMS enrollment on health outcomes and healthcare utilization using CNHS (controlling for individual fixed effects)

	(1) Health outcomes	(2) Healthcare utilization	(3) Medical spending
Cognitive Deficit	-0.301**		
	(0.135)		
Obs	5,942		
Mean	0.509		
Limited ADL	-0.215*		
	(0.128)		
Obs	5,942		
Mean	0.333		
Healthcare use		0.106**	
		(0.047)	
Obs		46,519	
Mean		0.109	
Inpatient care		0.022**	
		(0.011)	
Obs		46,519	
Mean		0.009	
Outpatient care		0.087**	
		(0.042)	
Obs		46,519	
Mean		0.095	
Preventive care		0.055*	
		(0.033)	
Obs		46,519	
Mean		0.037	
Total medical spending (log)			0.449
			(1.575)
Obs			4,005
Mean			1.537
Covariates	Yes	Yes	Yes

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County-by-wave FE	Yes	Yes	Yes
Hukou-by-wave FE	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes

Notes: The table shows the results about health outcomes, healthcare utilization and medical spending from CHNS. Each cell presents the 2SLS estimated coefficient on NCMS enrollment based on equations (5) and (6), additionally controlling for individual fixed effects. Dependent variables in these regressions are shown in the first column. Limited ADL and Cognitive deficit are measured for those age 55+ only and the information is available in waves 2000-2006. Sample in Column (3) is restricted to those with positive medical spending. Total medical spending are in 1,000, 2010 RMB. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table A23: Potential mechanisms: financial protection

	(1) Financial difficulty	(4) ln(OOP spending)	(5) OOP/total spending
NCMS enrollment	-0.050**	-0.323	-0.278**
	(0.026)	(2.808)	(0.118)
Covariates	Yes	Yes	Yes
County-by-wave FE	Yes	Yes	Yes
Hukou-by-wave FE	Yes	Yes	Yes
Individual FE	Yes	Yes	Yes
Obs	52,046	680	680
Mean	0.059	1.112	0.952

Notes: The table reports the estimation results from equations (5) and (6), additionally controlling for individual fixed effects. Dependent variables are shown in the first row. Column (1) uses the CLHLS sample and Financial difficulty is an indicator for not seeking any medical service due to lack of money. This information is available after 2000. Columns (2) and (3) use the CHNS sample and the sample is restricted to those with positive OOP spending both before and after the NCMS initiation in their counties. OOP spending are in 1,000, 2010 RMB. Standard errors clustered at the county level are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

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