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Health Inequality and Health Insurance Coverage: The United States and China Compared

Abstract

We study inequality in the distribution of self-assessed health (SAH) in the United States and China, two large countries that have expanded their insurance provisions in recent decades, but that lack universal coverage and differ in other social determinants of health. Using comparable health survey data from China and the United States, we compare health inequality trends throughout the period covering the public health insurance coverage expansions in the two countries. We find that whether SAH inequality is greater in the US or in China depends on the concept of status and the inequality-sensitivity parameter used; however, the regional pattern of SAH inequality is clearly associated with health-insurance coverage expansions in the US but not significant in China.

JEL-Codes: D630, I180, I300.

Keywords: health inequality, self-assessed health, health insurance coverage, social determinants of health.

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1 Introduction

The reduction of health inequality is specified as a core objective of health-system performance and is explicitly embedded in the national constitutions of many countries (European Parliamentary Research Service 2000). However, how do countries compare in terms of moving towards this objective? Answering this question requires a comparison of evidence from countries that have sufficiently similar institutions for financing health care but that may differ in other social determinants of health, including formal institutions, such as the type of state and government organisation, and informal determinants, such as cultural norms. Does the adoption of common health care financing institutions, such as public health insurance coverage, deliver compatible health-inequality outcomes? Or should health-inequality reduction focus instead on other wider social determinants of health?

This paper examines the comparative health-inequality performance of the United States and China, two countries that are characterised by substantial regional and social inequalities (Braveman et al. 2010, Yang and Kanavos 2012), that both rely on insurance-based health-delivery systems, and that have expanded their health-insurance scheme to cover lower-income populations. We study the three decades from the 1990s, during which, in both countries, there was a progressive increase in public health-insurance coverage for the partially uninsured and lower-income population. In the US, this covers health-insurance reform from the early years of Medicaid up to the Obamacare era; in China, during this period, there were two major health-insurance and health care reforms; all reforms increase health insurance coverage in these two countries. The long data series for the two countries allow one to examine the possible association between health-inequality outcomes and health-insurance coverage.

We find that the comparison of the US and China depends crucially on whether the inequality index used as a performance measure is sensitive to the lower tail of the health status distribution. This affects the analysis in two ways. First, it affects the judgement of whether the US or China is more unequal in terms of health. Second, it affects whether an increment in health insurance (HI) coverage is associated with lower health-inequality outcomes or whether other wider social determinants of health are more important in driving inequalities. Finally, these results help ascertain how much health inequality we can reduce through insurance coverage expansions.

The structure of the paper is as follows. In section 2, we provide the institutional background about health insurance and the corresponding reforms that expand health insurance coverage in the US and China, together with a brief introduction on the indices measuring health inequality. Section 3 contains a discussion of the data and the methods used. Section 4 provides the results and relevant extensions. Section 5 concludes.

2 Background

2.1 Health inequality: reduction mechanisms

The reduction of health inequality is typically one of the intended goals of policies designed to improve access to health care by neglected groups. The mechanism to achieve this policy outcome could be straightforward and direct in the form of additional investment to improve access to health care resources (European Commission 2009). One potential mechanism to reduce such barrier is to expand health-insurance (HI) coverage (Costa-Font and Cowell 2022, World Health Organization 2000). But there may be additional indirect mechanisms associated with HI as described below:

Direct effects:

Health inequality may decline if HI improves access to high-value health care affecting the health of those whose health status is at the bottom of the health distribution.[1] If HI expansions mainly increase coverage for individuals with poor health and financial conditions, then one would see a negative association between health inequalities and HI expansions. In contrast, if insurance expands coverage among individuals who otherwise would be in good health, such as the young, one would expect it to give rise to an insignificant correlation with health inequality.[2]

Indirect effects:

Insurance coverage also affects financial security, which reduces the financial risk of variable medical costs and produces income or financial effects on health (Nyman 1999). If insurance costs are too high, people may decide to go without needed health care, which can have undesirable health effects on their physical well-being (Baicker et al. 2015). Hence, in examining the distributional outcomes of HI reforms and coverage expansions, one needs to distinguish the health and financial effects of such reforms.

2.2 Health care reform and inequality in the US

The US is a particularly interesting setting to study the impact of HI on inequality. Before 2010, the US was the only industrialised nation without universal HI (Vladeck 2003). Health care reform in the US has been incremental and partial, which helps to explain why a substantial proportion of the American population remains uninsured.

[1] Health insurance can affect health care quality as well as access to primary care (Finkelstein et al. 2012) and preventive visits (Baicker et al. 2013); inadequate access to HI can worsen health status (Sommers et al. 2013). Goodman-Bacon (2018) found that utilisation of health care increased after the introduction of Medicaid and, as a result, child and infant mortality declined – a reduction of 20% in non-white mortality. The Oregon Health Insurance Experiment, which expanded insurance (Medicaid) for a random sample of individuals that initially did not qualify for Medicaid, found a 25% increase in the likelihood of individuals reporting good or very good health after qualifying (Baicker et al. 2013).

[2] Schoen et al. (2013) suggest that there is no evidence of a beneficial effect of private HI on health. Kino and Kawachi (2018) finds that Medicaid reforms in the United States after introducing the ACA (that involved expansion of insurance) mitigate income-based inequality related to the financial barrier to health care.

Since the introduction of the Medicaid and Medicare programmes in the 1960s (before the period covered here), there have been several insurance extensions such as the Health Insurance Portability and Accountability Act (HIPPA, 1996), the State Children's Health-Insurance Program (SCHIP, 1997)[3] and, of special importance here, the Patient Protection and Affordable Care Act (ACA, 2010).

The design of ACA suggested that it should mitigate health inequality in the US.[4] The ACA provided a comprehensive system of mandated HI (Medicare) extensions to low-income individuals and households up to four times the poverty line; it also provided web-based HI marketplaces where consumers can compare prices and purchase plans alongside federal subsidies to make insurance more affordable by reducing patient cost-sharing (Hofer et al. 2011). In addition, insurers were banned from discriminating against insurance applications based on health status and allowed children up to age 26 to stay on their parents' insurance. In 2008, the US health care system left 1 in 7 Americans without HI coverage. As a result of the implementation of ACA in 2010, the uninsured rate declined from 16.0% in 2010 to 9.1% in 2015; the number of uninsured people fell by about 20 million. Medicaid is a public insurance programme for low-income individuals, but the eligibility thresholds were extended after the ACA expansion (in 2014) depending on the state, as Medicaid is a co-funded program. Hence, there are even larger reductions in the uninsured rates in those states that have extended Medicaid eligibility (Martinez et al. 2018, Obama 2016). The Medicare program, which already provides universal insurance to people once they turn 65, was not directly altered after the introduction of ACA.

2.3 Health insurance in China

Expanding public health insurance coverage has been a recurrent policy question at the annual meeting of the National People's Congress of China. According to the Chinese government's plan, one of the 2009 reform goals was to reduce health inequalities, improve access to health care across different regions, and also further increase health insurance coverage (Information Office of the State Council 2009). After the introduction of market liberalisation in 1978, the government dismantled its communal insurance schemes and, as a result, out-of-pocket expenditures rose significantly. In addition, a two-tier HI scheme emerged, which depended on whether individuals have urban or rural household registration, and coverage by these schemes is not transferable

[3]HIPPA extended insurance protection for employees and their families when they change or lose their jobs for one year. SCHIP was established to provide HI to children in families at or below 200 per cent of the federal poverty level. These measures would have been expected to affect the probability of insurance uptake.

[4]Studies of health inequalities by social class ("bivariate" health inequality) in the US have shown that inequality increased over recent decades, with health improving incrementally with higher income or educational levels (Braveman et al. 2010, Minkler et al. 2006). O'Neill and O'Neill (2007) find that the health-income gradient is slightly steeper in Canada than it is in the US. However, we know little about variation in univariate health inequality. The issues underlying this are discussed in Section 3.2.

across provinces, or sometimes even across counties before 2017 (Yip et al. 2012).

China designed several different insurance schemes to tackle these problems. First, the mainstream type of insurance is the Urban Employee Basic Medical Insurance (UEBMI), launched in 1998 across the country, covering employees in urban areas and including contributions from employees and employers (Information Office of the State Council 2012). It is also the first public insurance scheme established after the abolition of the old communal insurance scheme. Second, the Urban Resident Basic Medical Insurance (UREMI), launched in 2007, provides coverage for urban residents who are unemployed or not working for an employer that provides appropriate HI coverage (Lin et al. 2009). Finally, the New Cooperative Medical System (NCMS) was introduced in 2002 and implemented in 2003 (National Development and Reform Commission 2002), providing HI for rural residents, typically not covered by the other two schemes.[5] The NCMS is a voluntary scheme with income-related premiums and government funds to subsidise the premiums to low-income beneficiaries (Wen 2009), which is comparable to Medicaid in the US. In addition, the government provides additional subsidies for provinces that are on the list of national-level poor counties; in 2011, nearly 100% of rural area residents participated in the NCMS (People's Republic of China 2011).

As a result of these reforms, the gap in the distribution of health resources between urban and rural areas has narrowed. The new investment in primary and secondary health facilities in rural areas has improved access to basic medical care (Eggleston et al. 2008). As the proportion of the Chinese population living in urban areas has grown with the urbanisation movements in China, attention has been paid to the association between urban/rural household registration and the health of the population. However, the evidence so far does not provide an account of the relations between different types of insurance reforms and the distribution of health status, which is one of the purposes of this paper.

3 Data and Methods

3.1 Data

The focus of this paper is on self-assessed health (SAH), a widely used concept that provides a comprehensive measure of people's health (Doiron et al. 2015). SAH is a categorical variable that is recognised as being correlated with health needs giving rise to health care use (Institute of Medicine (US) Committee on the Future Health Care Workforce for Older Americans 2008).[6] For the United States, the SAH data come from the National Health Interview Survey (NHIS) 1972-2018, a dataset that has monitored

[5]The NCMS and the UREMIC were integrated into the Urban and Rural Resident Medical Insurance Scheme in 2017. The dataset used in this paper is only up to 2015. So we will not discuss the integration in the paper.

[6]IMCFHCWOA stands for Institute of Medicine (US) Committee on the Future Workforce for Older Americans.

the health of the US since 1957. The NHIS is a cross-sectional household interview survey conducted through personal household interviews; it covers a broad range of health, demographic and socioeconomic indicators. The sampling and interviewing are continuous throughout each year, and the sampling process follows a multistage area probability design of households and non-institutional groups. Although the questionnaire was revised in 1982 and 1997, the core questionnaire framing has remained mostly unchanged and allows for trend analysis and for pooling of data from more than one year to increase the sample size for analytical purposes. The key question regarding people's SAH in the NHIS survey is given on the left-hand side of Table 1. However, the NHIS only provides geographical information at the regional level. So the latter analyses for the US are all based on the regional level.

For China, the SAH data come from the China Health and Nutrition Survey (CHNS), 1991-2015. The CHNS is designed to examine the effects of the health, nutrition, and family planning policies and programmes implemented by national and local governments. In addition, it is aimed at examining how the social and economic transformation of Chinese society affected the health and nutritional status of its population. This includes information on income, health care, medical expenditure and HI. Data are at the individual level using questionnaires on a sample of households. This unbalanced longitudinal data set contains comprehensive information for households from nine different provinces for ten waves over the period 1989-2015.[7] Self-assessed health data are only available in 1991, 1993, 1997, 2000, 2004, 2006, and 2015, so we only use these seven waves in the analysis of inequality analysis. The survey samples 7,200 households with over 30,000 individuals in 15 provinces and municipal cities that differ substantially in geography, economic development, public resources, and health indicators.

By contrast to the NHIS, the CHNS only covers certain provinces. We use the CHNS in our paper to analyze health inequality because it is one of the few datasets that provide information prior to the implementation of the NCMS. The provinces covered by the CHNS do not include China's poorest (mainly western provinces, such as Gansu and Ningxia). This may result in less health inequality estimated in this paper than in the real scenario in China; thus, we must keep this in mind when comparing Chinese results to those in the United States. The sampling method in the CHNS is a multi-stage, random-cluster process to draw the sample surveyed in each province, which at least free from selection problems within a province.

The key question on a person's SAH in the CHNS is similar to the one in the NHIS (see the right-hand side of Table 1), and the categories are consistent with the NHIS before 1982. Rather than asking for the health status directly in the NHIS, the CHNS asks for the health status compared to that of other people the same age. A summary of the self-assessed health questions in the NHIS and CHNS is in Table 1. For the analysis,

[7]The provinces are: Liaoning, Heilongjiang, Jiangsu, Shandong, Henan, Hubei, Hunan, Guangxi, and Guizhou; the waves are 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009, 2011 and 2015.

except for Table 7, we use four categories (poor, fair, good, excellent) for both the US and China, merging (3) and (4) categrories in the NHIS, and (1) and (2) categories in the CHNS shown in Table 1. The age-group weighting adjusted samples for different waves of the NHIS and CHNS can help to alleviate some of the interpretation issues caused by this inconsistency. It also alleviates some of the concern about inconsistent health status distributions across the panel and cross-sectional datasets.

3.2 Inequality measurement

Since the focus of this paper focuses on comparing SAH-inequality trends, how to measure health inequality is of prime importance. There are two methodological issues:

1. Previous evidence about the effect on the inequality of insurance reforms principally uses a bivariate approach covering health and income (Van Doorslaer and Ourti 2011). However, in the present context, bivariate measures present challenges of interpretation because HI changes can affect both health and income, and then income changes can further affect health. It would also be interesting to use the univariate measurement of health inequality, since pure health inequality is one component of social inequalities that the policy-makers care about (European Parliamentary Research Service 2000). So, a univariate health-inequality approach should be adopted here.

2. Both the NHIS and CHNS provide information on self-assessed health (SAH). Because SAH is a categorical variable, standard inequality measures,[8] which were designed for cardinal data such as income, are inappropriate (Costa-Font and Cowell 2022). Accordingly, we use measures of inequality devised by Cowell and Flachaire (2017) that are suitable for the SAH-inequality problem. These measures are robust under changes in the fineness of classification by category and the interpretation of categories across samples.

The categorical data approach uses a concept of "status", taken as an individual's position in the distribution of health outcomes. Suppose there are n_k persons in category $k = 1, 2, 3, ...K$, the status of person i who is currently in category $k(i)$ can be a function of either $\sum_{\ell=1}^{k(i)} n_\ell$ or $\sum_{\ell=k(i)}^{K} n_\ell$. The first of these is a peer-inclusive "downward-looking" concept, and the second is the "upward-looking" counterpart. If we normalise by the size of the total population $n := \sum_1^K n_k$, person i's status is given by either the "downward-looking" version

$$s_i = \frac{1}{n} \sum_{\ell=1}^{k(i)} n_\ell, \tag{1}$$

or by the "downward-looking" counterpart of (1):

[8]Examples include the Gini index, Atkinson indices, and Generalised Entropy indices.

Table 1: Questions on SAH used in the NHIS and CHNS

	NHIS					CHNS				
Question	*Would you say your health, in general, is...?*					*Right now, how would you describe your health compared to that of other people your age?*				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
early categories	poor	fair	good	—	excellent	—	poor	fair	good	excellent
late categories	poor	fair	good	very good	excellent	very poor	poor	fair	good	excellent

Note: "early categories" refers to "pre-1982" in the case of NHIS and "pre-2006" in the case of CHNS.

$$s'_i = \frac{1}{n} \sum_{\ell=k(i)}^{K} n_\ell; \tag{2}$$

In either definition, status must lie between zero and one. If there were perfect equality (everyone in the same category), then both (1) and (2) take the value 1 (maximum status): this value is the reference point.

The inequality-measurement problem then amounts to aggregating the information in the vector $\mathbf{s} := (s_1, s_2, ..., s_n)$ in relation to the equality vector $(1, 1, ..., 1)$. On the basis of a small number of elementary axioms Cowell and Flachaire (2017) show that inequality must take the form of an index in the following family, indexed by α:

$$I_\alpha(\mathbf{s}) = \begin{cases} \frac{1}{\alpha(\alpha-1)} \left[\frac{1}{n}\sum_{i=1}^{n} s_i^\alpha - 1\right], & \text{if } \alpha \neq 0, \\ \\ -\frac{1}{n}\sum_{i=1}^{n} \log s_i, & \text{if } \alpha = 0. \end{cases} \tag{3}$$

where $\alpha < 1$ is a parameter indicating the sensitivity of the index to a particular part of the distribution of health status s_i: for low values of α the index $I_\alpha(\mathbf{s})$ is particularly sensitive to values of s_i close to zero; for values of α close to 1 the index $I_\alpha(\mathbf{s})$ is particularly sensitive to values of s_i close to 1. If $\mathbf{s}$ is given by (1) then we have an index of inequality based on downward-looking status; if we replace $\mathbf{s}$ with $\mathbf{s}'$ in (2) then we have ordinal inequality defined on the corresponding upward-looking status concept.[9]

Equation (3) gives a family of indices that is suitable for making comparisons of inequality where data are categorical. Individual members of the family are characterised by specific values of the sensitivity parameter α. This form is also convenient for examining the breakdown of inequality by population groups (for example, gender, region, and age groups): this is because the additivity of the class of inequality measures in (3) permits one to carry out the analysis on whatever partition of the population is appropriate.

Lorenz curves with ordinal data (Jenkins 2021):

A final way to graphically represent the distributional changes in health outcomes is to develop Generalised Lorenz curves based on Jenkins (2021). Jenkins (2021) provides the construction of Generalised Lorenz (GL) curves based on the work of Cowell and Flachaire (2017) and uses the GL curves to construct a new area-based inequality index, J. Using this newly developed method, we construct the GL curves for the US and China in 1991 and 2015 in order to undertake comparative dominance studies of SAH inequality. According to Jenkins (2021), "the GL curve is drawn using straight

[9]Cowell and Flachaire (2017) provide proofs of the properties of the indices, discuss other attempts to measure inequality with ordinal data, and show the implications of downward-looking versus upward-looking status concepts in the case of skewed data. For a full discussion of how changes in the distribution among categories affect extreme values of inequality in the cases of downward-looking and upward-looking status, see Cowell and Flachaire (2021).

lines to connect adjacent points of" $\{0,0\}$ and $\{\frac{n_k}{n}, \frac{1}{n}\sum_{i=1}^{k(i)} s_i\}$, which corresponds to the inequality index with $\alpha = 0$ and downward-looking status in Cowell and Flachaire (2017). The corresponding index formula provided by Jenkins (2021) is

$$J = 1 - \frac{1}{n}\sum_{j=0}^{K-1}(n_{j+1} - n_j)\,(GL_j + GL_{j+1}); \tag{4}$$

while $GL(s, \frac{n_k}{n}) = \frac{1}{n}\sum_{i=1}^{k(i)} s_i$, $i = 1, \ldots, N$ and $GL(s, 0) = 0$.

3.3 Region-based regression approach

To check whether there is a negative relation between HI coverage and health inequalities, we compute a measure of inequality at the regional level. We draw on regression analysis rather than bivariate or decomposition measures as it allows us to control for different covariates (e.g., changes in age composition of the population). This is important when analysing changes like insurance reforms. Our unit of observation is the region within each country, appropriately defined. The precise definition of the word "regions" is different for the two datasets: when using the NHIS data, we refer to four standard regions, as classified by the US Census Bureau; but when using the CHNS, the term "regions" refers to provinces in China.[10] The index $I_\alpha(\mathbf{s})$ is estimated using SAH in each region of the two countries and the regression model uses the regional estimates of control variables commonly included in empirical inequality analysis. We estimate a model of the following sort:

$$y_{gt} = \gamma_0 + \gamma_1 H_{gt} + \mathbf{X}_{gt}^{'}\boldsymbol{\gamma}_2 + \eta_t + \vartheta_g + \varepsilon_{gt}, \tag{5}$$

where, for each region g and year t, y_{gt} is the SAH-inequality outcome, H_{gt} is HI coverage, $\mathbf{X}_{gt}$ refers to a vector of controls, η_t indicates a year-specific effect, ϑ_g is a region-specific fixed effect and ε_{gt} is the robust standard errors.[11] The specific terms in (5) allow for variants on the basic inequality model:

The inequality outcome y_{gt}: For either of the two concepts of status given in (1) and (2), let $\mathbf{s}_{gt}$ denote the vector of status for individuals in region g during year t. Then, for a given value of the distributional parameter α, the basic model takes y_{gt} as given by $I_\alpha(\mathbf{s}_{gt})$ where $I_\alpha(\mathbf{s})$ is defined in (3) – see section 4.3 for the implementation. As additional checks and extensions, we estimate other versions of the model with different specifications of the outcome variable y_{gt} – see section 4.4.

[10] A definition like this is because using provinces rather than regions in China because using provinces as the regional unit gives us more observations in regressions. See also subsection 4.3 below.

[11] The cluster level is not at the regional level because there are too few regions in the NHIS. The information available in the NHIS only allows us to run the regression at the regional level.

The HI coverage H_{gt}: In any year t, this is given by the proportion of the population covered by HI in a given region g.

The controls $\mathbf{X}_{gt}$: The most important controls are average household income and income inequalities at the regional level. Deaton (2003) and Wildman (2003) discuss the correlations between income and/or income inequality and health inequality. We also control the age and sex composition at the regional level, which are common factors associated with health and health inequalities (Dorling et al. 2007, Read and Gorman 2010).

4 Results

First, let us look at the distribution of SAH in the years 1991 and 2015 in the US and China: these are the start and the end years for the CHNS dataset. Figure 1 shows the distribution for the years 1991 and 2015 in the NHIS and the CHNS using the categories described in Table 1. For the US, it is markedly left-skewed in both years: more than 35% of the whole sample rates themselves as having "Excellent" health status. Furthermore, there are also more people in the "Excellent" category in 1991 and more people in the "Very Good", "Good", and "Fair" categories in 2015.[12] The SAH distribution for the CHNS is approximately normal. More than 60% of the sample rated themselves as "Good" health in 1991, while more people classified themselves as "Poor" and "Fair" categories in 2015 in the CHNS.

Comparing the NHIS and CHNS distributions, we can confirm the findings of Xu et al. (2019), that people in China are more likely to under report their health status than in the US. Xu et al. (2019) suggest that one of the possible explanations of for the different distribution of SAH in China is that sociocultural context in China influencing SAH. That is, some cultural traits tend to be praised such as being humble and modest. This is consistent with Dowd and Todd (2011) who also find that minorities in the US are also likely to report lower health than Whites. Health inequalities estimated using SAH should be interpreted as represent an upper-bound. Given the issue of SAH misreporting, estimating inequality using objective measures of health would be an important robustness check to use. We discuss objective health measurements in Section 4.4 rather than in other sections.

4.1 Trends

As a summary view of the period, Table [tab:5-year-average] provides five-year average estimates of SAH-inequality for the US and China, illustrating how inequality estimates vary according to the definition of status and the value of the sensitivity parameter α. The choice of the sensitivity parameter α follows the application in Cowell and

[12] Note that the NHIS does not change their questions regarding SAH from 1991 to 2015.

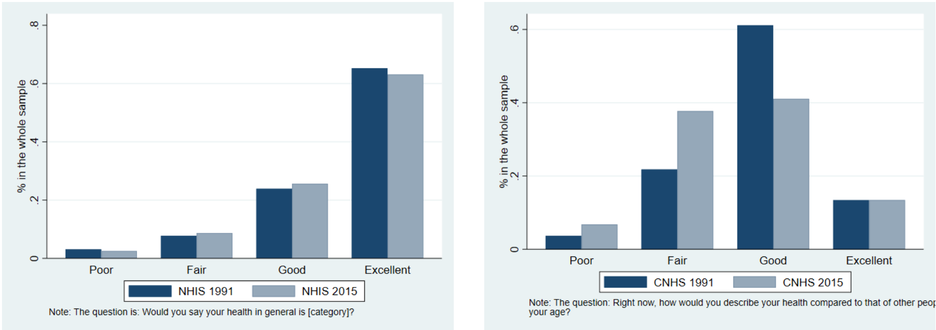


Figure 1: Distribution of SAH in the US (NHIS) and China (CHNS)

Flachaire (2017), and we show the results for two extremes $\alpha = 0.99$ and $\alpha = -2$.[13] The columns for $\alpha = 0.99$ reveal that when inequality measures are sensitive to the upper tail of the status distribution, for both status concepts, SAH inequality is higher in China than in the US soon after 2000. But this picture is almost exactly reversed if we check the columns for $\alpha = -2$, where the inequality measure is sensitive to the lower tail of the status distribution. With just a few exceptions, inequality increases in the US and decreases in China up to 2005-2009, irrespective of the status concept. All the indices are adjusted for age-group weighting through different waves, with the first wave used as the baseline wave.

Table 2: 5-year average SAH inequality indices in the US and China

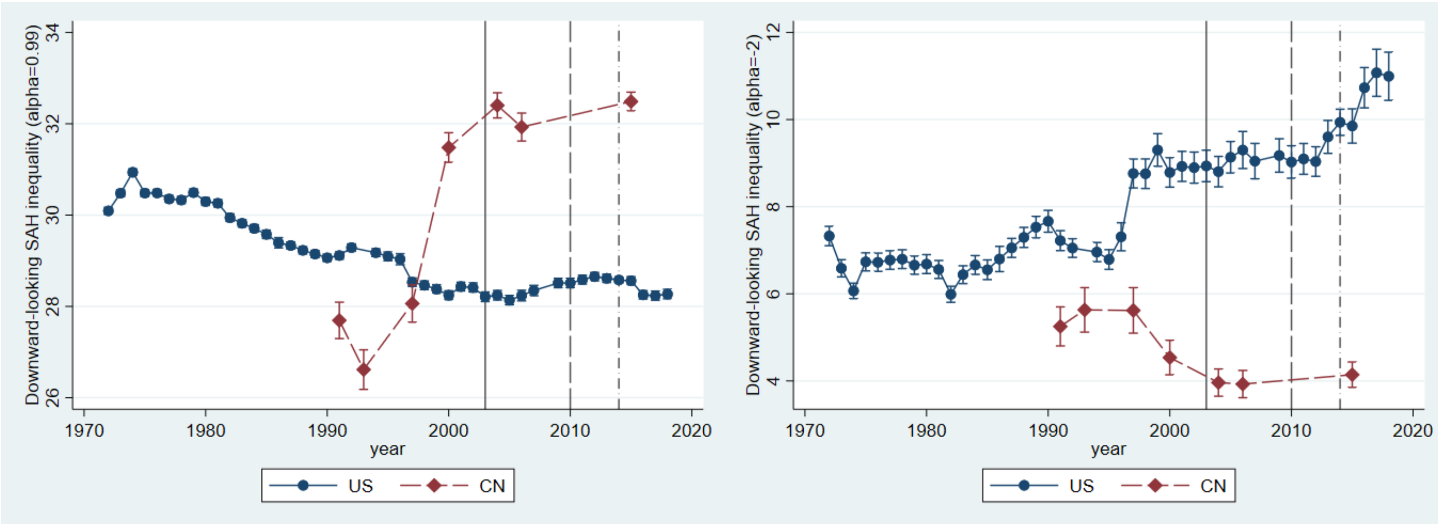
	$\alpha = -2$				$\alpha = 0.99$			
	US		**China**		**US**		**China**	
	down	*up*	*down*	*up*	*down*	*up*	*down*	*up*
1972-1974	6.659	0.2879	-	-	30.50	30.44	-	-
1975-1979	6.737	0.2874	-	-	30.43	30.37	-	-
1980-1984	6.466	0.3414	-	-	30.01	29.97	-	-
1985-1989	7.046	0.3884	-	-	29.34	29.32	-	-
1990-1994	7.223	0.3968	5.441	1.3095	29.16	29.14	27.15	27.13
1995-1999	8.183	0.4170	5.618	1.1755	28.70	28.69	28.06	28.05
2000-2004	8.869	0.4284	4.249	0.9545	28.31	28.30	31.94	31.93
2005-2009	9.164	0.4341	3.927	0.9881	28.31	28.30	31.93	31.91
2010-2014	9.339	0.4203	-	-	28.59	28.58	-	-
2015-2018	10.66	0.3977	4.144	1.1465	28.33	28.31	32.49	32.49

Note: The table shows the 5-year average SAH inequality indices in the US and China. For the US, the number showed in the table is usually the average. The numbers for China are sometimes the single-year SAH inequality indices due to data limitation. For example, from 1995-1999, the CHNS only provides one data point in 1999, so the corresponding number showed in the table is the 1999 SAH inequality index.

The detail behind this sketch is in Figures 2 and 3, which depict the yearly trends in SAH inequality (3) for the NHIS over 1972-2018 and the CHNS over 1991-2015. The two figures include the period where the HI reforms came into effect, indicated by

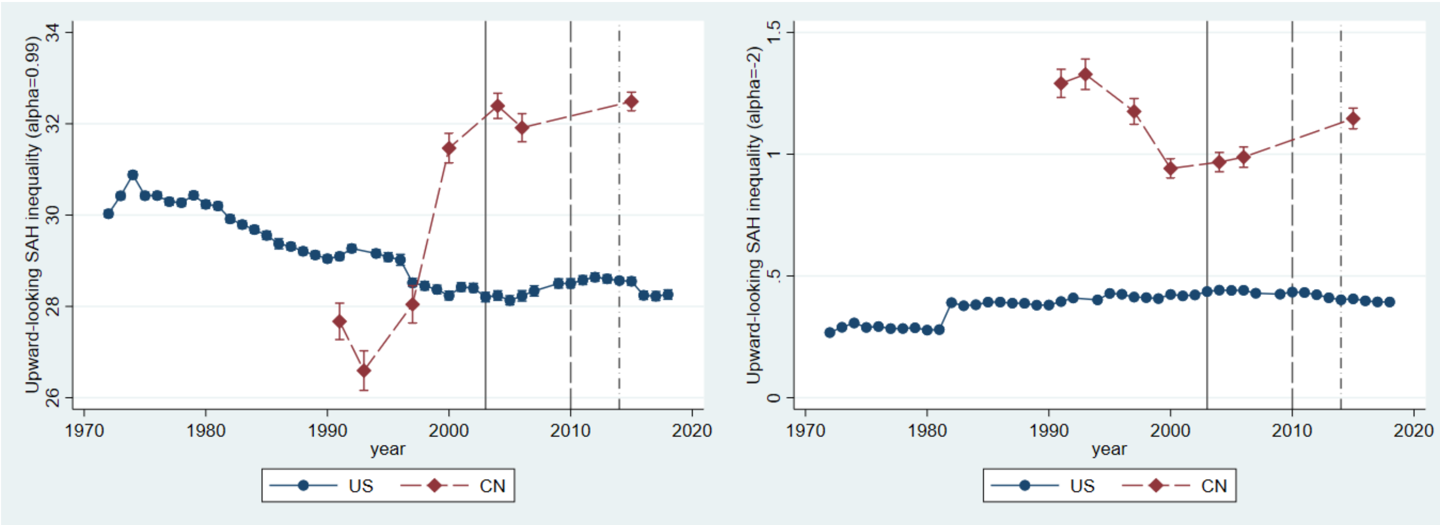
[13] Although the periods differ (NHIS data run from 1972 to 2018, CHNS data from 1991 to 2015), we have data to compare the two countries' inequalities over two decades. The results for indices with $\alpha = 0$ and $\alpha = -1$ are given in Table A.1.

Figure 2: SAH-Inequality, the US and China. $\alpha = 0.99, -2$; *downward*-looking status.



Vertical lines mark reform dates: NCMS reform in China (2003), start of ACA in US (2010), Medicaid expansion in US (2014).

Figure 3: SAH-Inequality, the US and China. $\alpha = 0.99, -2$; *upward*-looking status.



Vertical lines mark reform dates: NCMS reform in China (2003), start of ACA in US (2010), Medicaid expansion in US (2014).

the full-length vertical lines shown in 2003 (red, the NCMS reform in China) and in 2010 and 2014 (navy and grey, reforms in the US).[14] Figure 2 shows the trends in SAH inequality for two extreme values of the sensitivity parameter α and the downward-looking status concept (equation 1). For the case $\alpha = 0.99$ (left-hand panel), SAH inequality in China was below that of the US before 1997 and then rose in the following decade; for the case $\alpha = -2$ (right-hand panel) in Figure 2, it is clear that inequality in China remained significantly below that in the US during the entire period.[15] When we examine inequality using the upward-looking status concept (Figure 3, equation 2), we find similar results to those of Figure 2 for the case $\alpha = 0.99$, but for the case $\alpha = -2$, inequality is higher in China than in the US. When $\alpha = -2$, the US exhibits increasing trends in inequalities focusing on the poor-health population for downward-looking status, even after the health care reforms in the US.

Figures 2 and 3 show the trends in SAH inequality in the US and China for two values of the sensitivity parameters α and both upward- and downward-looking status concepts. If inequality is sensitive to high SAH status ($\alpha = 0.99$), then we estimate little difference in trends between upward- and downward-looking status. However, if inequality is sensitive to low status ($\alpha = -2$), then there is a sharp contrast between the US and China, depending on whether one focuses on upward- or downward-looking status. The right-hand side graphs in Figures 2 and 3 show that the downward-looking indices have higher values than the upward-looking indices. The skewness of the SAH distribution explains the higher inequalities in China than in the US in the upward-looking status and $\alpha = -2$ scenario, given that the distribution of SAH in China is more skewed towards low categories of SAH and upward-looking indices are higher if the corresponding distribution is skewed towards left (Cowell and Flachaire 2021). The pattern of inequality estimates over time does not differ significantly by gender nor by region.[16]

The GL curves generated using the method by Jenkins (2021) are presented in Figure 4. The GL curves in these two graphs implies the SAH inequality is not necessarily lower in the US than China for all individuals; hence the ranking between the US and China is incomplete. The GL curves corresponds to the downward-looking case with $\alpha = 0$ in Figure A.1 in the Appendix. We also present the inequality indices developed by Jenkins (2021) for the US and China in all years in Appendix A.2, Table A.2.[17]

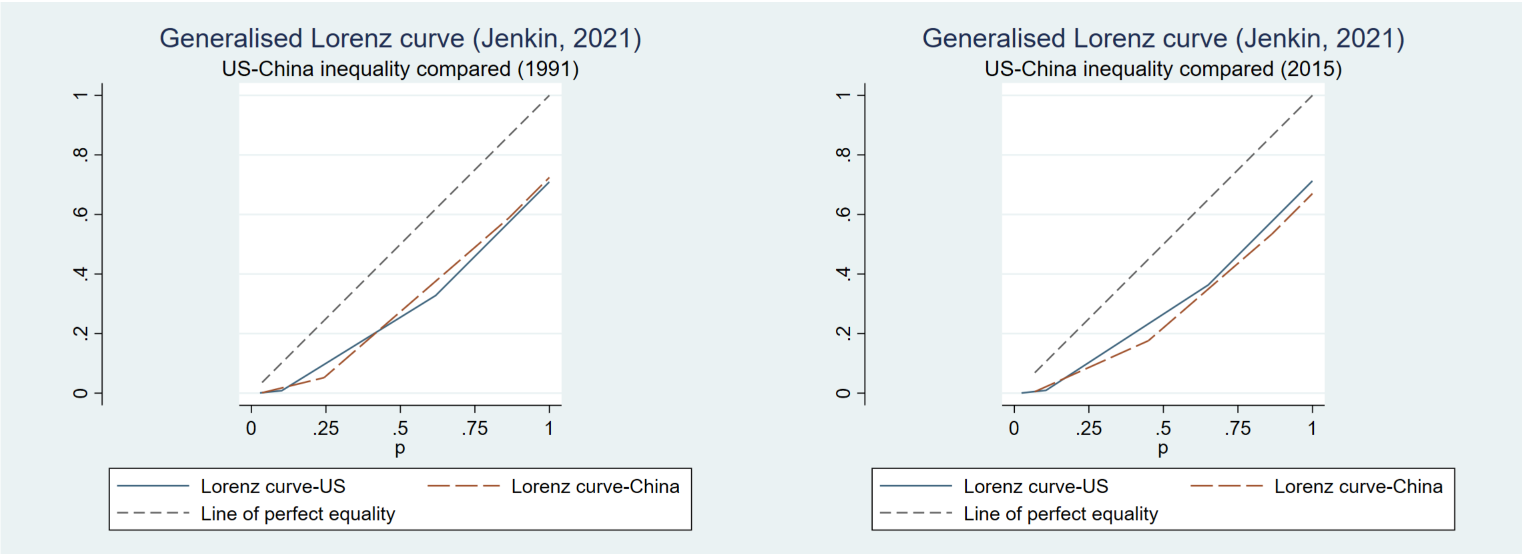
[14] The 2009 reform in China can also be represented by the 2010 vertical line.

[15] The "significant" when analysing the inequality trends means the following: Inequality estimate I^A is significantly greater than estimate I^B if $I^A > I^B$ and the 95% confidence intervals for $I^A and I^B$ do not intersect. In the figures representing inequality trends (Figures 2, 3, and Figures A.5-A.11), the small vertical bars represent the 95% confidence interval.

[16] See the Appendix A.4, Figures A.5 onwards for details.

[17] We use the STATA code *ineqord* written by Jenkins (2019) to calculate the SAH inequality for the US and China.

Figure 4: The GL Curve Comparisons of SAH, the US and China. Year 1999 and 2015



Note: The GL curves generated using the method by Jenkins (2021). We apply equation (4) to the SAH in the NHIS and CHNS in 1991 and 2015. The blue lines represent the GL curves for the US and the red dashed lines are the GL curves for China.

4.2 Maps

It is instructive to map inequality estimates by region in both countries. In the US, we identify four regions using the NHIS data: West, Midwest, Northeast and South. The states included in these regions are defined by the US census.[18] In China, we can also identify four regions for the CHNS data: Heilongjiang and Liaoning in the Northeast; Shandong and Jiangsu in the East; Henan, Hubei, and Hunan in the Central region; Guizhou and Yunnan in the Southwest. Figures 5 to 8 report visual evidence of the spatial distribution of SAH inequality in China and the US for 1991 and 2015, for two values of α used in Table 2 – high-status and low-status sensitive cases respectively. The regions in each figure are shaded so that the higher is SAH inequality, the darker the shading of the region.

High-status sensitive case ($\alpha = 0.99$): Figures 5 and 6 show that, from 1991 to 2015, the US's SAH-inequality increased more in the Northeast than in the Midwest; in China, the same happened for the Southwest compared to the Central region. The rankings for the other two regions in the US and China remain constant. These results hold for both downward and upward concepts of status.

Low-status sensitive case ($\alpha = -2$): Figure 7 shows a decrease in SAH inequality in the Northeast compared to the Midwest in the US. The same pattern for China is shown when comparing the Southwest to the Central region, which is consistent with Figures 5 and 6. However, for the upward-looking inequality index, the regional rankings for China in Figure 8 are consistent for 1991 and 2015, with a small change in the Northeast and the East; in the US, the regional rankings experience a significant change, although the SAH-inequality converged from 1991 to 2015.

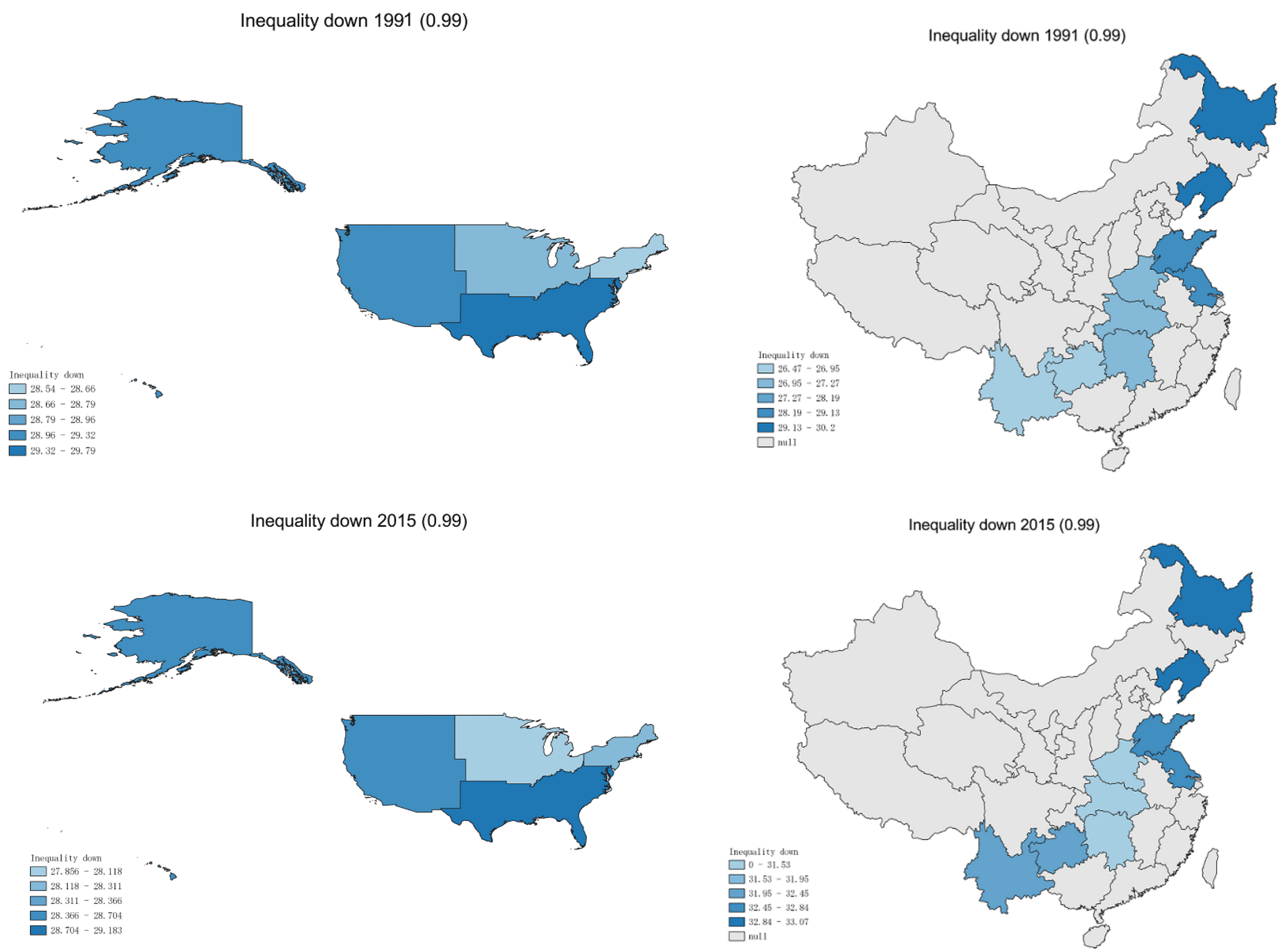
From Figures 5 to 8, we find that if the inequality index is sensitive to low status, changes in regional patterns of SAH inequality differ as between downward and upward-looking status. From the regional plots in SAH inequalities from 1991 to 2005, we cannot confirm whether HI coverage expansion in China reached its goal of easing inter-regional health disparities. This could be attributable to the uneven geographical distribution of health care resources in China (Qin and Hsieh 2014).

4.3 Regression Results: basic model

SAH inequality varies across regions and over time. To examine the factors correlated with SAH inequality, we use the basic version of the regression specification (5) outlined in section 3.3, which models inequality outcomes by region g and time t. Region

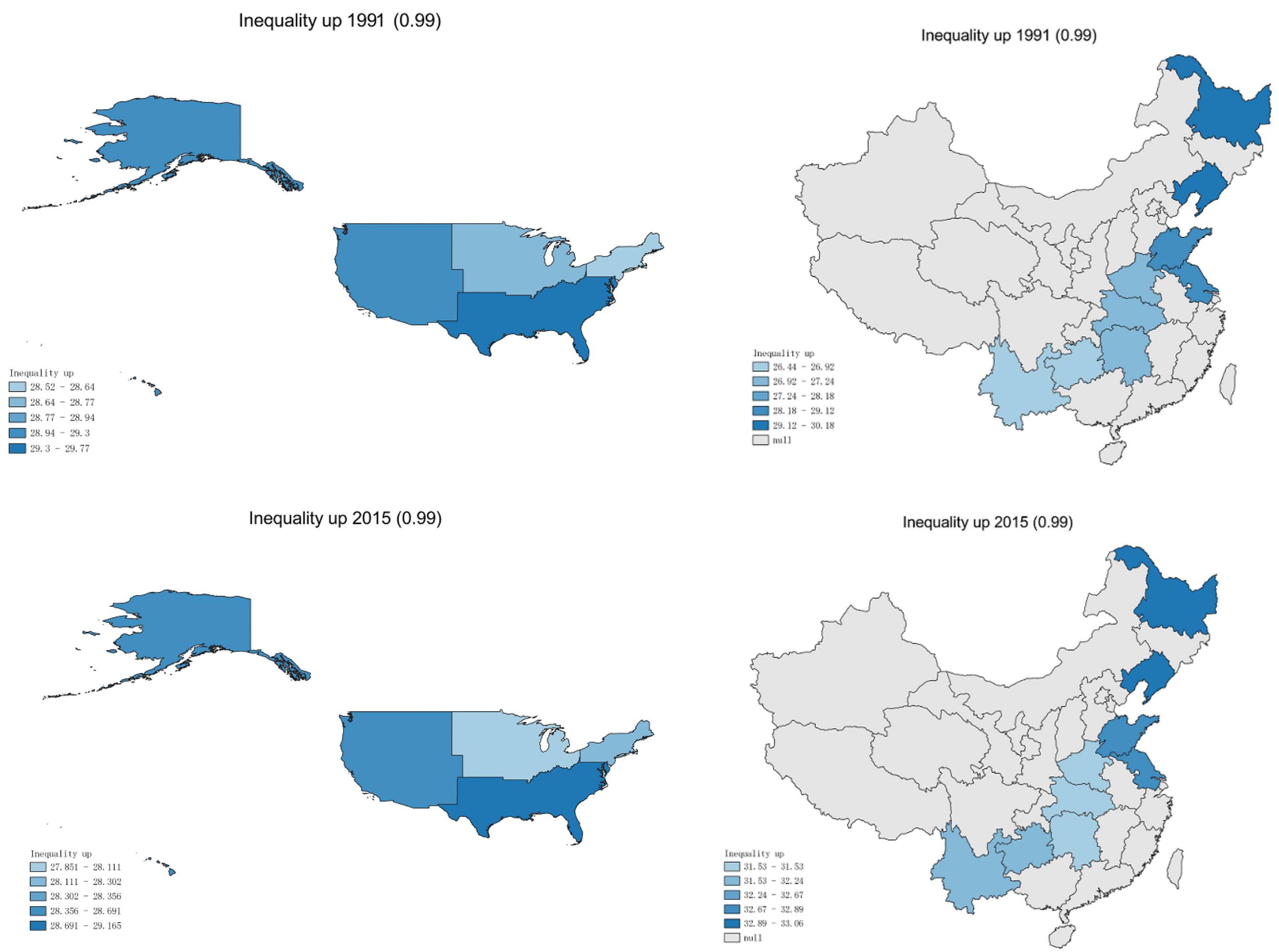
[18] While the NHIS is organised on a regional level, the CHNS is organised by provinces; for the map presentation, we have aggregated provinces to make the CHNS structure comparable to the NHIS structure. For the US definition of the region, see https://www2.census.gov/geo/pdfs/maps-data/maps/reference/us_regdiv.pdf.

Figure 5: The US and China, 1991 and 2015: $\alpha = 0.99$ downward



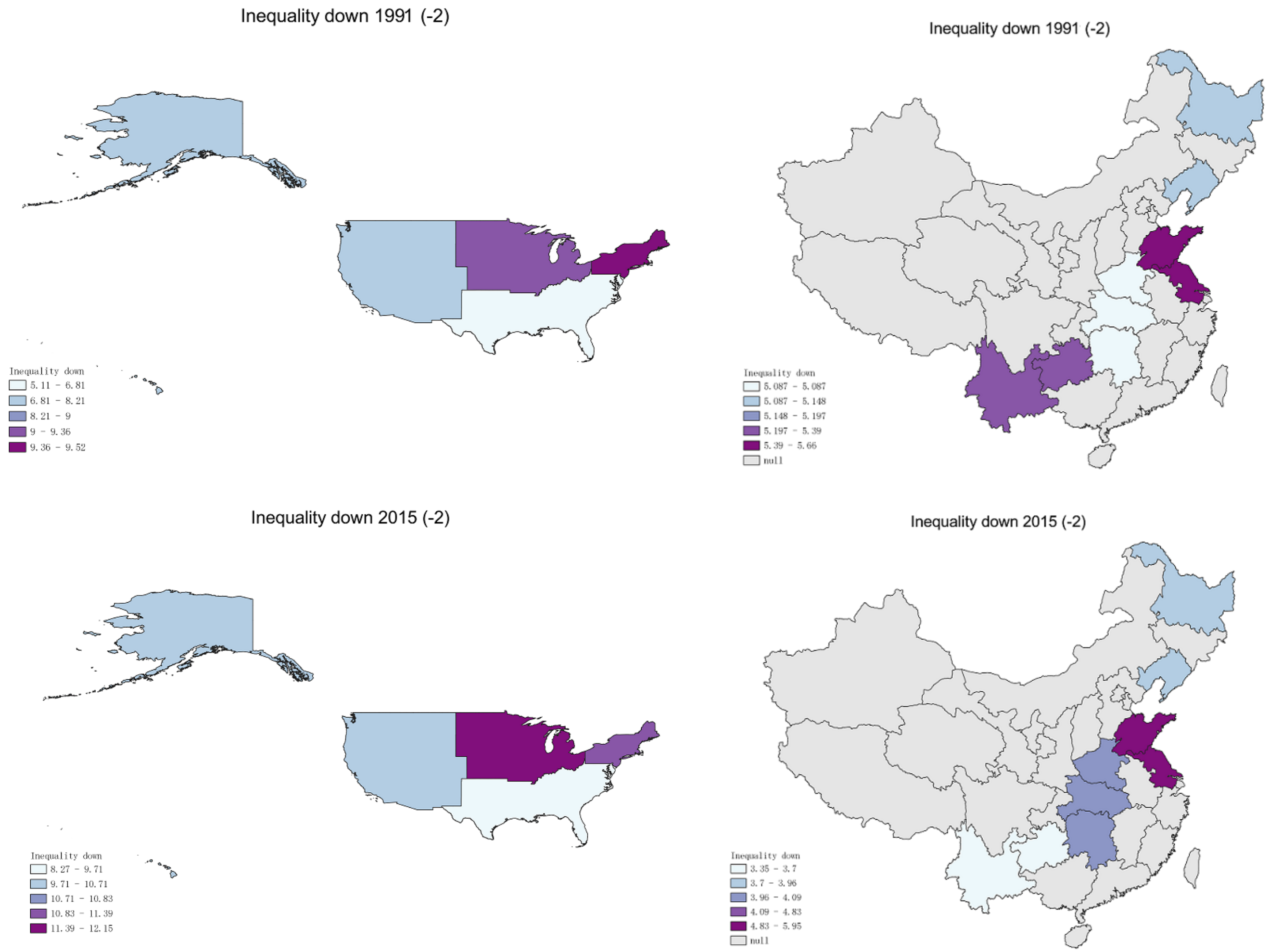
Note: The graphs show the regional distribution of the SAH-inequality estimates for downward-looking status in the US and China in 1991 and 2015. $\alpha = 0.99$. The two figures in the top use the 1991 data for the US (top right) and China (top left). The two figures in the bottom use the 2015 data for the US (bottom right) and China (bottom left). The light-coloured areas indicate lower SAH inequality and the dark-coloured areas represent higher SAH inequality.

Figure 6: The US and China, 1991 and 2015: $\alpha = 0.99$ upward



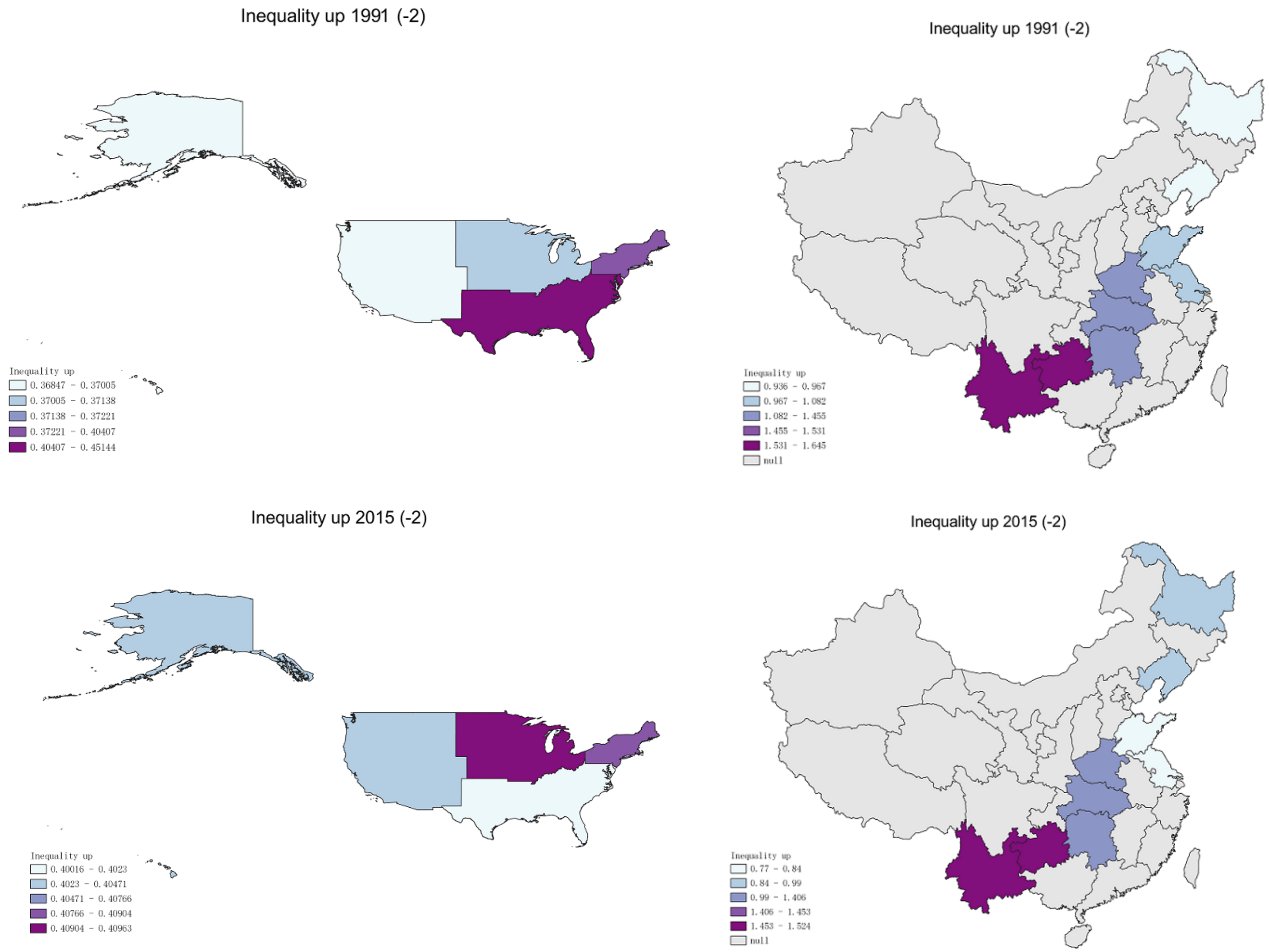
Note: The graphs show the regional distribution of the upward-looking SAH inequality measures for the US and China in 1991 and 2015. $\alpha = 0.99$. The two figures in the top use the 1991 data for the US (top right) and China (top left). The two figures in the bottom use the 2015 data for the US (bottom right) and China (bottom left). The light-coloured areas indicate lower SAH inequality and the dark-coloured areas represent higher SAH inequality.

Figure 7: The US and China, 1991 and 2015: $\alpha = -2$ downward



Note: The graphs show the regional distribution of the downward-looking SAH inequality measures for the US and China in 1991 and 2015. $\alpha = -2$. The two figures in the top use the 1991 data for the US (top right) and China (top left). The two figures in the bottom use the 2015 data for the US (bottom right) and China (bottom left). The light-coloured areas indicate lower SAH inequality and the dark-coloured areas represent higher SAH inequality.

Figure 8: The US and China, 1991 and 2015: $\alpha = -2$ upward



Note: The graphs show the regional distribution of SAH-inequality estimates for downward-looking status in the US and China in 1991 and 2015. $\alpha = -2$. The two figures in the top use the 1991 data for the US (top right) and China (top left). The two figures in the bottom use the 2015 data for the US (bottom right) and China (bottom left). The light-coloured areas indicate lower SAH inequality and the dark-coloured areas represent higher SAH inequality.

g represents regions in the US and provinces in China to obtain more observations. We use OLS regression to estimate the parameters of the model in (5): H_{gt} is affected by the HI reforms in the US and China. In using this approach, we are not claiming to identify any causal effects of HI expansion on SAH inequalities; rather, we show the potential correlations between the key determinants, H_{gt}, and the outcome variable, y_{gt}. Although regression estimates do not have a causal interpretation, the regression results provide additional information by quantifying the relationship between HI coverage and SAH inequality, as opposed to the corresponding graphical representations. The regression coefficients reveal the magnitudes of the associations between SAH inequality, HI coverage, income inequality, and other covariates. For example, the value of γ_1 indicates how much the SAH inequality varies associate with 1 unit changes in HI coverage.

In the basic version of the model the inequality outcome y_{gt} in (5) is given by $I_\alpha(\mathbf{s}_{gt})$ where $I_\alpha(\mathbf{s})$ is defined in (3), α is a distributional sensitivity parameter and $\mathbf{s}_{gt}$ is the status vector for region g in year t, where status can be either downward-looking or upward-looking – see section 3.2.

The principal regressor of interest is H_{gt}, the HI coverage in region g at time t.[19] SAH outcomes are not only related to HI coverage but also to age, gender and socioeconomic status. Accordingly, the controls $\mathbf{X}_{gt}$ include income inequality (the Gini index), average age, sex (percentage of males), and the logarithm of the average household income (Loghhincome).[20] The period of data from the NHIS is restricted to the period 1991 to 2018 to conform to the period covered by the seven waves of the CHNS. The regression model (5) is estimated using OLS with robust standard errors.[21]

Tables 3 - 6 report the estimates of the coefficients on HI coverage and other controls. The tables correspond to four different values of the parameter α. In each table, results are reported for downward-looking status (*down*) and upward-looking status (*up*), and for each case, we report two specifications of (5), the first with the "regional" and year fixed effects without controls, and the second with the "regional" and year fixed effects and controls.

4.3.1 The correlations between HI coverage and SAH inequalities

For non-negative values of the sensitivity parameter α (Tables 3 and 4), a clear story emerges in the US: extending HI coverage is negatively correlated with SAH inequality. This correlation applies to both upward-looking and downward-looking status; but the

[19]The information is collected from research reports from various institutions in the US, including Kaiser Commission on Medicaid and the Uninsured, the United States Census Bureau, and epi.org.

[20]The independent variables are region-level data for the US and provincial-level data for China. They are the Gini index of pre-tax income, average age, average sex ratio, the percentage of people having hypertension, and the natural logarithm of average household income. For the Gini index in the US, we use a simple average of state-Gini as a proxy in the regressions for the regional-Gini Index.

[21]Because of limited information, there are unobservable determinants that might also correlate with SAH inequality.

Table 3: SAH-inequality regression, $\alpha = 0.99$

	SAH Inequality, US				**SAH Inequality, China**			
	down	*down*	*up*	*up*	*down*	*down*	*up*	*up*
HI coverage	-0.902	-1.473**	-0.924***	-1.472**	-0.551	-1.903	-0.542	-1.903
	(0.550)	(0.717)	(0.546)	(0.711)	(1.958)	(3.082)	(1.965)	(3.088)
Inc.Inequality	-	-6.879***	-	-6.826***	-	-6.605	-	-6.655
	-	(2.573)	-	(2.549)	-	(10.58)	-	(10.61)
Age	-	-0.0540***	-	-0.0544**	-	-0.290	-	-0.292
	-	(0.0241)	-	(0.0237)	-	(0.236)	-	(0.237)
Sex	-	-8.955	-	-8.725	-	-18.82	-	-18.88
	-	(6.773)	-	(6.710)	-	(27.31)	-	(27.36)
Loghhincome	-	0.602	-	0.581	-	-0.311	-	-0.331
	-	(1.354)	-	(1.341)	-	(2.082)	-	(2.086)
Observations	100	100	100	100	60	60	60	60
R-squared	0.874	0.911	0.847	0.912	0.717	0.825	0.717	0.825
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variables are the SAH-inequality estimates for downward- and upward-looking status; the reference status is the maximum self-assessed health level. The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

Table 4: SAH-inequality regression, $\alpha = 0$

	SAH Inequality, US				**SAH Inequality, China**			
	down	*down*	*up*	*up*	*down*	*down*	*up*	*up*
HI coverage	-0.0344***	-0.0389*	-0.0833***	-0.0517***	-0.00401	-0.0130	0.0161	-0.0330
	(0.0152)	(0.02094)	(0.0132)	(0.0139)	(0.0262)	(0.0429)	(0.0308)	(0.0465)
Inc.Inequality	-	-0.159**	-	-0.0851*	-	-0.0679	-	-0.108
	-	(0.0750)	-	(0.0498)	-	(0.147)	-	(0.160)
Age	-	-0.00115	-	-0.00134***	-	-0.00379	-	-0.00510
	-	(0.000699)	-	(0.000463)	-	(0.00329)	-	(0.00356)
Sex	-	-0.0816	-	0.336**	-	-0.293	-	-0.213
	-	(0.197)	-	(0.131)	-	(0.380)	-	(0.412)
Loghhincome	-	-0.0115	-	-0.0413	-	-0.000251	-	-0.0345
	-	(0.0395)	-	(0.0262)	-	(0.0290)	-	(0.0314)
Observations	100	100	100	100	60	60	60	60
R-squared	0.865	0.894	0.705	0.869	0.478	0.776	0.674	0.814
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variables are the SAH-inequality estimates for downward- and upward-looking status; the reference status is the maximum self-assessed health level. The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

Table 5: SAH-inequality regression, $\alpha = -1$

	SAH Inequality, US				**SAH Inequality, China**			
	down	*down*	*up*	*up*	*down*	*down*	*up*	*up*
HI coverage	0.148***	0.0302	-0.185***	-0.105***	0.132*	0.102*	-0.131**	-0.105
	(0.0427)	(0.0505)	(0.0247)	(0.0259)	(0.0415)	(0.0544)	(0.0543)	(0.0670)
Inc.Inequality	-	0.112	-	-0.0732	-	-0.00908	-	0.0682
	-	(0.181)	-	(0.0929)	-	(0.187)	-	(0.230)
Age	-	0.00148	-	-0.00137	-	-0.00452	-	0.0116**
	-	(0.00169)	-	(0.000865)	-	(0.00417)	-	(0.00513)
Sex	-	-1.525***	-	0.986***	-	-0.535	-	0.907
	-	(0.477)	-	(0.245)	-	(0.482)	-	(0.593)
Loghhincome	-	0.245**	-	-0.107**	-	0.0234	-	-0.0223
	-	(0.0954)	-	(0.0489)	-	(0.0367)	-	(0.0452)
Observations	100	100	100	100	60	60	60	60
R-squared	0.693	0.820	0.566	0.809	0.478	0.776	0.445	0.789
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variables are the SAH-inequality estimates for downward- and upward-looking status; the reference status is the maximum self-assessed health level. The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

Table 6: SAH-inequality regression, $\alpha = -2$

	SAH Inequality, US				**SAH Inequality, China**			
	down	*down*	*up*	*up*	*down*	*down*	*up*	*up*
HI coverage	7.909***	-0.542	-0.453***	-0.270***	3.469**	2.354	-1.040	-0.776
	(3.557)	(4.318)	(0.0558)	(0.0614)	(1.343)	(2.104)	(0.903)	(1.195)
Inc.Inequality	-	3.958	-	-0.133	-	1.711	-	1.045
	-	(15.49)	-	(0.220)	-	(7.226)	-	(4.103)
Age	-	0.253*	-	-0.00130	-	-0.0610	-	0.188**
	-	(0.144)	-	(0.00205)	-	(0.161)	-	(0.0916)
Sex	-	-87.29**	-	2.468***	-	-10.55	-	7.883
	-	(40.77)	-	(0.579)	-	(18.65)	-	(10.59)
Loghhincome	-	19.32**	-	-0.255**	-	0.769	-	0.868
	-	(8.151)	-	(0.116)	-	(1.421)	-	(0.807)
Observations	100	100	100	100	60	60	60	60
R-squared	0.679	0.800	0.571	0.789	0.451	0.663	0.326	0.706
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variables are the SAH-inequality estimates for downward- and upward-looking status; the reference status is the maximum self-assessed health level. The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

magnitudes of the key coefficient change if controls are included. In China, there are no significant correlations between HI coverage and SAH-inequality measures, but the signs of the key coefficients are mostly negative as well.

However, for negative values of α – where the inequality index is sensitive to the bottom of the SAH-distribution – the effect of HI coverage in the US depends on the nature of status. For upward-looking status, the results in Tables 5 and 6 (where $\alpha = -1; -2$) follow a similar pattern to those in Table 3 for the US and China. For downward-looking status, HI coverage can have a *positive* association with SAH inequality, particularly in the case where $\alpha = -1$ in China with full regression specification.[22]

4.3.2 The correlations between controls and SAH inequalities

There is, once again, a very clear story for the US. For non-negative values of α, Tables 3 and 4 show that average age and income inequality are generally negatively correlated with SAH-inequality. For negative values of α (Tables 5 and 6), the coefficient of each of these controls, especially the proportion of males and log of household income, depends on the nature of status. The signs of the coefficients are mostly reversed for downward- and upward-looking status in Tables 5 and 6.

In the case of China, the average age is positively associated with SAH inequality, but only in cases where status is upward-looking and the sensitivity parameter α is negative. For such cases, this control can be negatively associated with SAH inequality in the US. For both the US and China, there is an interesting negative result: income inequality does not have a significant correlation with SAH inequality in any of the regressions when the sensitivity parameter α is negative. The negative sensitivity parameter α means the inequality index is more sensitive toward people with lower SAH. This finding may indicate the problem of accessing health care in both the US and China.

4.4 Regression Results: extensions

We can use the basic model (5) to examine the associations of HI coverage and other indicators of health and wellbeing, holding other controls unchanged. In some cases, these indicators can be interpreted as channels for the outcome of SAH-inequality used in the baseline results of section 4.3. We want to examine whether the HI coverage at the regional level is also associated with these health and wellbeing indicators.

[22]From Table 2, the average value of upward-status I_{-2} (taken over the period 1991 to 2018) is 0.4157 for the US and 1.1148 for China. If the model (5) is under full significant, from Table 6, the estimate of γ_1, the coefficient on H_{gt} is -0.270 (US) and -0.776 (insignificant, China), so the ratio γ_1/I_{-2} is about -0.650 in the US and -0.696 in China.

4.4.1 Hypertension and overweight

Suppose that, instead of examining the inequality of the subjective health indicator SAH, we focus on an objective indicator such as hypertension, one of the most prevalent health conditions (Johnston et al. 2009). In (5), we let y_{gt} be the percentage of people having hypertension. The coefficient estimates for the modified model are in Table A.3. HI coverage is positively correlated with the percentage of people having hypertension in the US, but this correlation is negative yet insignificant in China. The negative correlation in China is more suitable for the prediction: higher HI coverage should result in better health conditions. In both countries, age has a positive coefficient when running against this outcome variable. Having more males alleviates the hypertension situation in China but raises it in the US, but income works the other way around: higher income is associated with a higher percentage of people having hypertension in China, but with a lower percentage in the US.

The statistical variance is a simple inequality measure and can be applied easily to a dummy variable such as whether a person has hypertension (Cowell 2000). In (5), we let y_{gt} be the variance of hypertensive prevalence, and the results are in the same table, Table A.3. The correlations between HI coverage and the variance of hypertensive prevalence in the US and China are similar to the correlation between HI coverage and the variance of people with hypertension, but both are insignificant. The correlations between other variables and the variance of hypertensive prevalence are also similar to the first and second columns in the same table.

The Body Mass Index (BMI) is a reasonable indicator of individuals being overweight. Being overweight is defined as a BMI of 25 or higher (24 for Asians), and there are numerous health risks associated with being overweight or obese.[23] Hence, we examine the associations between HI coverage and the percentage of people with overweight and the variance of overweight prevalence (inequality). The results are reported in Appendix A.3, Table A.4. Although both coefficients for HI coverage are insignificant, we can still observe negative relationships in the US and China between HI coverage and the percentage of people with overweight problems, implying HI coverage might improve the overweight problem in both countries. Both coefficients of HI coverage are positive in the US and China for the outcome measuring overweight inequality, and we find a positive and significant correlation in the US. Income inequality is positively associated with the percentage of overweight people, though reveals a negative association with the variance of overweight prevalence in the US. Finally, the log of the average household income is positively associated with the percentage of overweight people in China. The coefficients for the average age of the population are all negative for both countries and outcomes, mostly insignificant. A higher share of the male population reduces the percentage of overweight people in the US and the

[23]Source: The Centers for Disease Control and Prevention, the US. Website: https://www.cdc.gov/healthyweight/effects/index.html.

variance of overweight in China, while it increases overweight inequality in the US.

4.4.2 Household income and income inequality

Now consider the associations between HI coverage and household income and the correlations between HI coverage and income inequality. Changes in income might be concentrated amongst those at the bottom of the income distribution, in line with recent evidence from the ACA extension in the US (Buettgens et al. 2021). The estimates in Table A.5 (in Appendix A.3) suggest that HI expansion and household income are positively associated in both the US and China. However, estimates for the income inequality in Appendix A.3, Table A.6 show no evidence of correlations between HI expansion and income inequality.

4.4.3 "Health poverty"

It could be that SAH-inequality estimates are driven mainly by changes within lower categories of the SAH distribution, especially in the CHNS. One way of directly addressing this is to take "health poverty" as an outcome variable in a variant of (5), by letting y_{gt} be the percentage of people who are in either "poor" or "fair" SAH categories in region g and year t. The variable is generated using the NHIS from 1991 to 2018 and the CHNS from 1991 to 2015. However, estimates in Appendix A.3, Table A.7 suggest that HI coverage is not significantly correlated with the percentage of people to be found in health poverty.

A more fruitful approach would be to model individual SAH responses. An appropriate specification is an ordered logit model with the probability of being in each of the ordered health categories as the dependent variable and, as independent variables, the HI coverage for the relevant religion and the individual counterparts to the controls used in the model (5). In the case of China, the model specifications also include individual-level random effects and fixed effects.[24]

The first five columns in Table 7 show the parameter estimates for the US (1991-2018) with basic controls and specifications. HI coverage is positively correlated with the probability of being in the "Excellent" categories and negatively related to the probability of being in the other SAH categories. These results imply that higher HI coverage is associated with lower health poverty. Controlling for extra demographic variables and the regional fixed effects (the last five columns), it is clear that this result survives: only the magnitudes of the coefficients decrease.

In the case of China, the first four columns in Table 8 show that the higher HI coverage rate at the regional level is positively associated with higher probabilities of

[24]The model broadly follows that in Van Doorslaer and Jones (2003). Adding individual effects is possible using the CHNS. For the US, given that the NHIS is a cross-sectional dataset, we cannot run the ordered logit model with individual-level random effects nor fixed effects. We can only control for more individual-level controls, such as marital status, race, education level, the regional level Medicaid spending and general government spending per capita, and the regional fixed effects.

Table 7: Individual-level SAH ordered logit regression, US

	poor	fair	good	very good	excellent	poor	fair	good	very good	excellent
HI coverage	-0.0427***	-0.115***	-0.211***	-0.00678***	0.376***	-0.0310***	-0.0875***	-0.160***	-0.00281***	0.282***
	(0.000794)	(0.00210)	(0.00379)	(0.000256)	(0.00675)	(0.00267)	(0.00753)	(0.0138)	(0.000309)	(0.0242083)
Inc.Inequality	-0.0233***	-0.0632***	-0.115***	-0.00370***	0.205***	-0.000842	-0.00237	-0.00434	-0.0000764	0.00763
	(0.00295)	(0.00799)	(0.0146)	(0.000486)	(0.0260)	(0.090)	(0.097)	(0.298)	(0.159)	(0.0437)
Hhincome	-2.47e-05***	-6.7e-05***	-1.22e-04***	-3.93e-06***	2.18e-04***	-1.07e-05***	-3.03e-07***	-5..54e-05***	-9.75e-07***	9.75e-05***
	(1.16e-06)	(3.12e-06)	(5.67e-06)	(2.25e-07)	(1.01e-05)	(1.12e-06)	(3.16e-06)	(5.78e-06)	(1.22e-07)	(1.02e-05)
Age	0.000719***	0.00194***	0.00355***	0.000114***	-0.00633***	0.000708***	0.00200***	0.00365***	6.43e-05***	-0.00642***
	(3.32e-06)	(5.40e-06)	(5.78e-06)	(3.89e-06)	(1.03e-05)	(3.67e-06)	(6.13e-06)	(6.71e-06)	(4.43e-06)	(1.18e-05)
Sex	0.00221***	0.00599***	0.0109***	0.000351***	-0.0195***	0.00159***	0.00448***	0.00820***	0.000144***	-0.0144***
	(0.0000588)	(0.000158)	(0.000287)	(0.0000151)	(0.000512)	(0.000062)	(0.000174)	(0.000318)	(0.0000115)	(0.000559)
Observations	1,888,179	1,888,179	1,888,179	1,888,179	1,888,179	1,888,179	1,888,179	1,888,179	1,888,179	1,888,179
Wald chi2	284189.15	284189.15	284189.15	284189.15	284189.15	245257.96	245257.96	245257.96	245257.96	245257.96
Pseudo R2	0.0486	0.0486	0.0486	0.0486	0.0486	0.0520	0.0520	0.0520	0.0520	0.0520
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Regional FE	-	-	-	-	-	Yes	Yes	Yes	Yes	Yes
Extra controls	No	No	No	No	No	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the SAH, and the coefficients presented are the marginal effects from the logit regressions representing the probability of being in each of the ordered health categories as the dependent variable. The period covered is 1991-2018 for the US, with a few years or regions missing when collecting information for the control variables. Hence, we have five categories in SAH compared to four categories in the SAH-inequality index. The region represents regions in the US. The controls are the proportion of the population covered by HI, age and sex composition, average household income, and income inequality and the extra controls include marital status, race, education level, the regional level Medicaid spending, and general government spending per capita.

Table 8: Individual-level SAH ordered logit regression, China

	poor	fair	good	excellent	poor	fair	good	excellent
HI coverage	-0.0347***	-0.0986***	0.0570***	0.0762***	-0.00222	-0.00798	0.00641	0.00379
	(0.00416)	(0.0117)	(0.00679)	(0.0090894)	(0.007958)	(0.02460)	(0.02426)	(0.01386)
Inc.Inequality	0.113***	0.320***	-0.185***	-0.247***	0.0451	0.162*	-0.130	-0.0770
	(0.0154)	(0.0435)	(0.0252)	(0.0337)	(0.090)	(0.097)	(0.298)	(0.159)
Hhincome	-9.01e-08***	-2.56e-07***	1.48e-07***	1.98e-07***	-4.62e-08	-1.66e-07**	1.33e-07	7.89e-08
	(1.74e-08)	(4.02e-08)	(2.65e-08)	(3.57e-08)	(8.67e-08)	(6.92e-08)	(2.93e-07)	(1.64e-07)
Age	0.00181***	0.00514***	-0.00298***	-0.00398***	-0.00115	-0.00413	0.00331	0.00196
	(0.0000438)	(0.0000678)	(0.0000564)	(0.0000627)	(0.00135)	(0.0106)	(0.00235)	(0.00958)
Sex	-0.0115***	-0.00327**	0.0189***	0.0253***	0.0404	0.145	-0.117	-0.0691
	(0.000928)	(0.00258)	(0.00150)	(0.00201)	(0.0930)	(0.129)	(0.285)	(0.151)
Observations	551,311	551,311	551,311	551,311	551,311	551,311	551,311	551,311
Wald chi2	5881.26	5881.26	5881.26	5881.26	26625.14	26625.14	26625.14	26625.14
Pseudo R2	-	-	-	-	0.5604	0.5604	0.5604	0.5604
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Individual Effects	RE	RE	RE	RE	FE	FE	FE	FE

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the SAH, and the coefficients presented are the marginal effects from the logit regressions representing the probability of being in each of the ordered health categories as the dependent variable. The period covered is 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The controls are the proportion of the population covered by HI, age and sex composition, average household income, and income inequality. The table presents the results with individual random effects and fixed effects.

people rating themselves as "Good" and "Excellent" categories when using individual random effects. It is also negatively associated with the probability of being in the "Poor" and "Fair" SAH categories. So we can conclude from these results that higher HI coverage is associated with lower health poverty. However, when we control for the individual fixed effects (the last four columns), the correlations between the percentage of the HI-covered population and the improvement in SAH are no longer significant. These results show that regional differences may be the main driver of SAH inequalities in China, implying the geographic maldistribution of health care resources in China.

4.4.4 Healthy behaviours

Finally, we examine the changes in two health behaviours, smoking and drinking that affect one's health status. We have examined whether the share of current smokers or drinkers in both countries are associated with HI coverage. The results are reported in Appendix A.3, Table A.8. The number of observations in the NHIS is smaller because the NHIS only collects information on smoking and drinking status for the full sample on or after 1997.[25] There is a positive correlation between HI coverage and the percentage of current smokers/drinkers in the two countries, but the coefficients are insignificant. While in the US, income inequality and log of household income are negatively associated with health behaviours, age and percentage of the male population are positively and negatively correlated with the percentage of current smokers only. Changes in health inequality do not appear to be driven by changes in health behaviours.

5 Conclusion

The expansion of health insurance in the United States and China has led to an extension of HI coverage to lower-income populations: did this also lead to a reduction of SAH inequality? The answer depends on whether the inequality index is sensitive to the lower tail of the SAH distribution.

In the US, if the inequality measure is not sensitive to the lower tail, expanded HI is clearly associated with lower SAH-inequality. This is true for both upward-looking and downward-looking concepts of health status. But if inequality *is* sensitive to the lower tail, then there is a more nuanced story. For upward-looking status, there is again the conventional negative relationship between HI coverage and SAH inequality; but if the status is downward-looking with negative sensitive parameter α, the relationship is reversed – higher HI coverage is associated with *higher* SAH inequality. In the case of China, there is no significant correlation between HI coverage and SAH-inequality for inequality measures that are not sensitive to the lower tail. But for measures that are sensitive to the lower tail, the effect is similar to that for the US but weaker.

[25] Also, there are a few years missing in the NHIS when adding the controls.

The different associations with the health insurance expansion can be explained by different mechanisms in the US and China. In the US, the expansion of HI was a combination of offering public insurance (Medicaid) expansion and subsidies for the update of private insurance (also known as exchanges or insurance marketplaces). However, in China, it entails expansions of public HI alone. Furthermore, the insignificant correlation in China might be attributed to the geographic maldistribution of health care resources limiting the effectiveness of insurance expansion in improving access to high value health care.

Why could there sometimes be an apparently perverse relation between HI and SAH inequality? The formal extension of public HI coverage does not automatically entail take-up, especially by people with poor health and in weak financial positions. HI alone, even when it gives broader access to health care, may not suffice to improve the self-assessed health status of the population. HI expansion can exert direct effects on health by extending access to less salient preventative health care that otherwise would not be delivered in the absence of insurance, as documented in Baicker et al. (2015). It can reduce health inequality indirectly as insurance expansion gives rise to an income effect among previously uninsured people, as previously uninsured individuals do not have to keep preventative savings to pay for health care needs, and such extra income can lead to giving rise to health improvements in the event of need. Other barriers to health care access may be more important; including the systematic regional differences between the US and China.[26]

Although there is scope for HI intervention to reduce SAH inequality, reducing the financial barriers to access to health care alone might not be enough to increase access to health care. However, our results suggest some evidence that SAH inequality is responsive to the reduction in financial barriers to health care use, prompting improvement in the health of those at the bottom of the health distribution.

[26]HI programmes are often introduced in some specific regions first, in a way that may initially increase inequality, especially when some US states have not expanded Medicaid. Some US states and some Chinese provinces have traditionally been front runners in implementing reforms, an important potential source of heterogeneity.

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Appendix

A.1 Intermediate values for α

Figures A.1 and A.2 in the Appendix depict the inequality trends in the US and China when $\alpha = 0, -1$. The trends when $\alpha = 0$ are comparable to those when $\alpha = 0.99$, and there is a strong resemblance between the trends at $\alpha = -1$ and those at $\alpha = -2$. Figures A.3 and A.4 in the Appendix supplement the maps of Figures 5 to 8 with the central case, $\alpha = 0$. The US maps in Figure A.3 show a pattern similar to those in Figures 5 and 6. The China maps in Figure A.3 show SAH inequality increasing for all regions with regional ranking unchanged, with the lowest health inequality increasing from 0.488 to 0.529. The US maps in Figure A.4 show a general SAH-inequality decrease from 1991 to 2015. With regional rankings unchanged the highest health inequality decreased from 0.442 to 0.426. In China, the Southwest region's SAH inequality ranking moved up from 4th to 1st place, and the ranking of the East decreased.

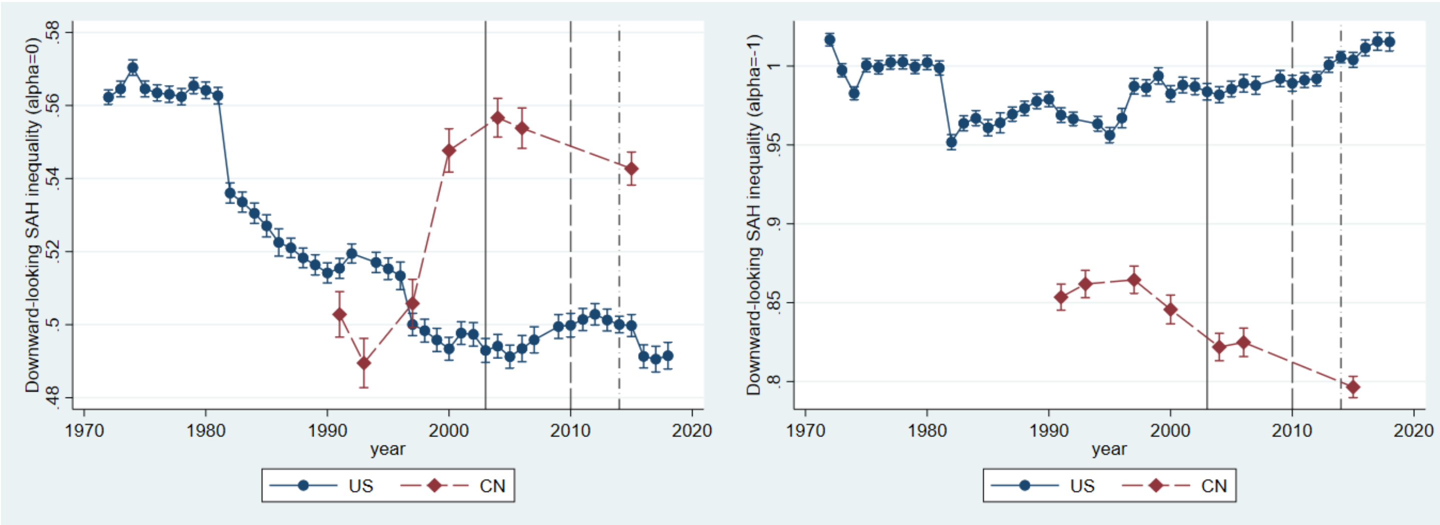
Table A.1 in the Appendix supplements the results of Table 2, covering the cases $\alpha = 0, -1$.

Table A.1: 5-year average SAH inequality indices, US and China

	$\alpha = 0$				$\alpha = -1$			
	US		**China**		**US**		**China**	
	down	*up*	*down*	*up*	*down*	*up*	*down*	*up*
1972-1974	0.5657	0.4094	-	-	0.9989	0.2900	-	-
1975-1979	0.5638	0.4086	-	-	1.0008	0.2895	-	-
1980-1984	0.5454	0.4192	-	-	0.9767	0.3158	-	-
1985-1989	0.5210	0.4254	-	-	0.9690	0.3374	-	-
1990-1994	0.5165	0.4254	0.4962	0.4441	0.9694	0.3404	0.8577	0.5340
1995-1999	0.5046	0.4248	0.5058	0.4571	0.9781	0.3475	0.8645	0.5254
2000-2004	0.4951	0.4228	0.5522	0.5097	0.9846	0.3507	0.8338	0.5237
2005-2009	0.4950	0.4238	0.5538	0.5100	0.9886	0.3530	0.8249	0.5297
2010-2014	0.5011	0.4242	-	-	0.9957	0.3484	-	-
2015-2018	0.4933	0.4173	0.5427	0.5275	1.0116	0.3375	0.7965	0.5686

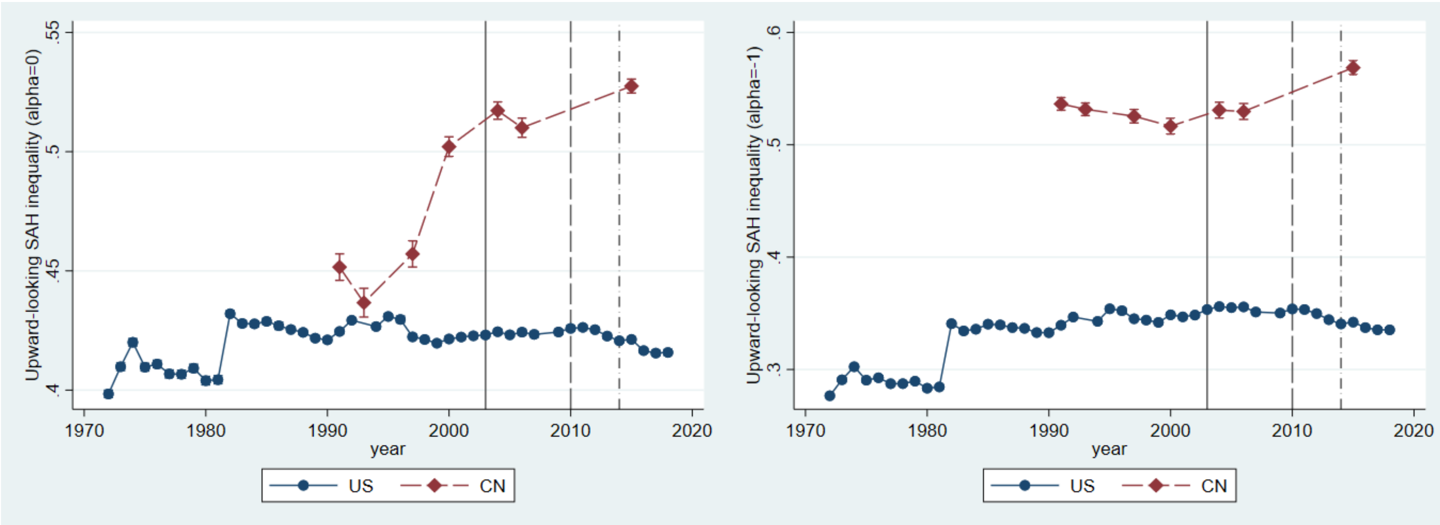
Note: The table shows the 5-year average SAH inequality indices in the US and China. For the US, the number showed in the table is usually the average. The numbers for China are sometimes the single-year SAH inequality indices due to data limitation. For example, from 1995-1999, the CHNS only provides one data point in 1999, so the corresponding number showed in the table is the 1999 SAH inequality index.

Figure A.1: SAH-Inequality, the US and China. $\alpha = 0, -1$; *downward*-looking status.



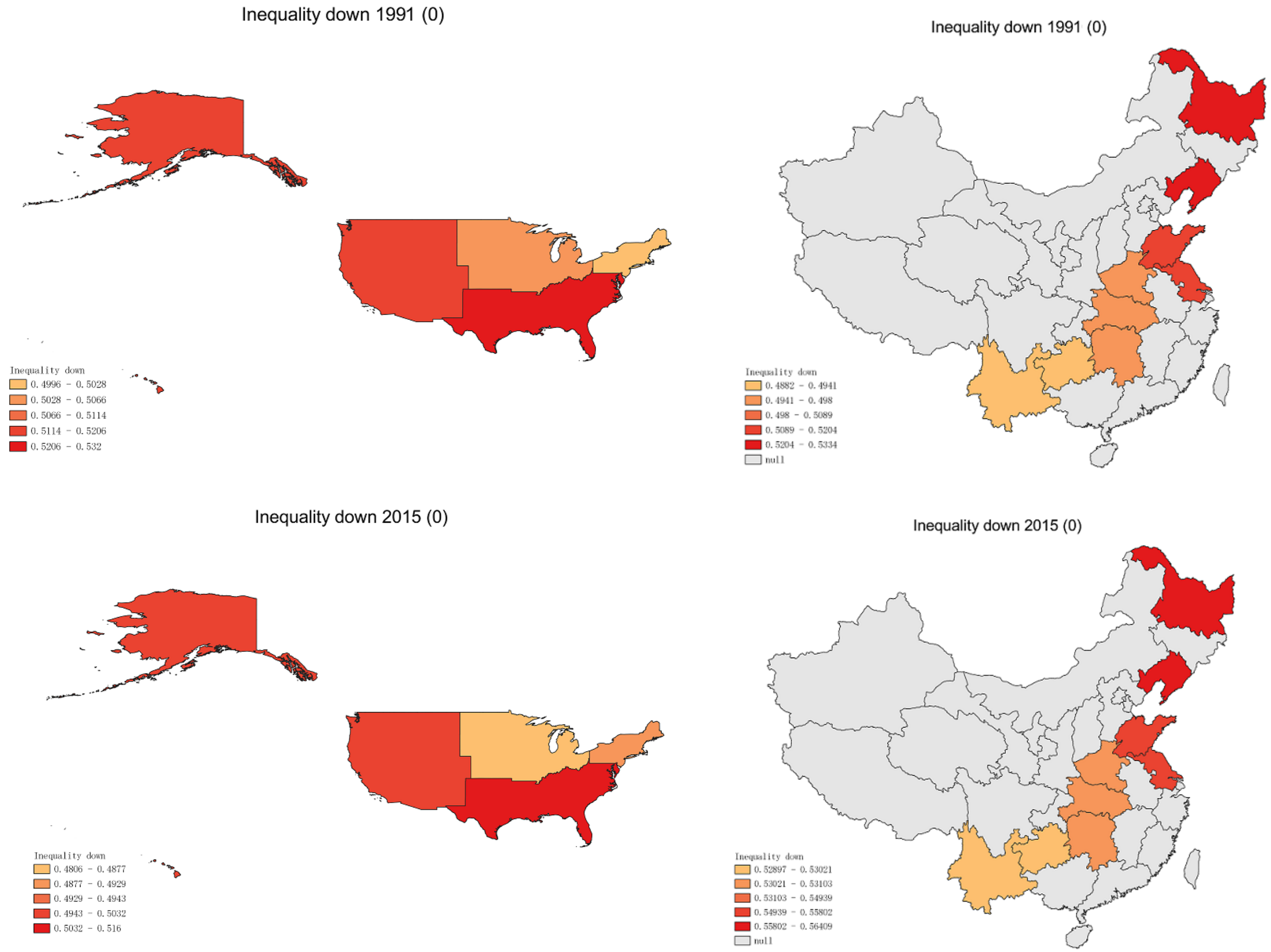
Vertical lines mark reform dates: NCMS reform in China (2003), start of ACA in US (2010), Medicaid expansion in US (2014).

Figure A.2: SAH-Inequality, the US and China. $\alpha = 0, -1$; *upward*-looking status.



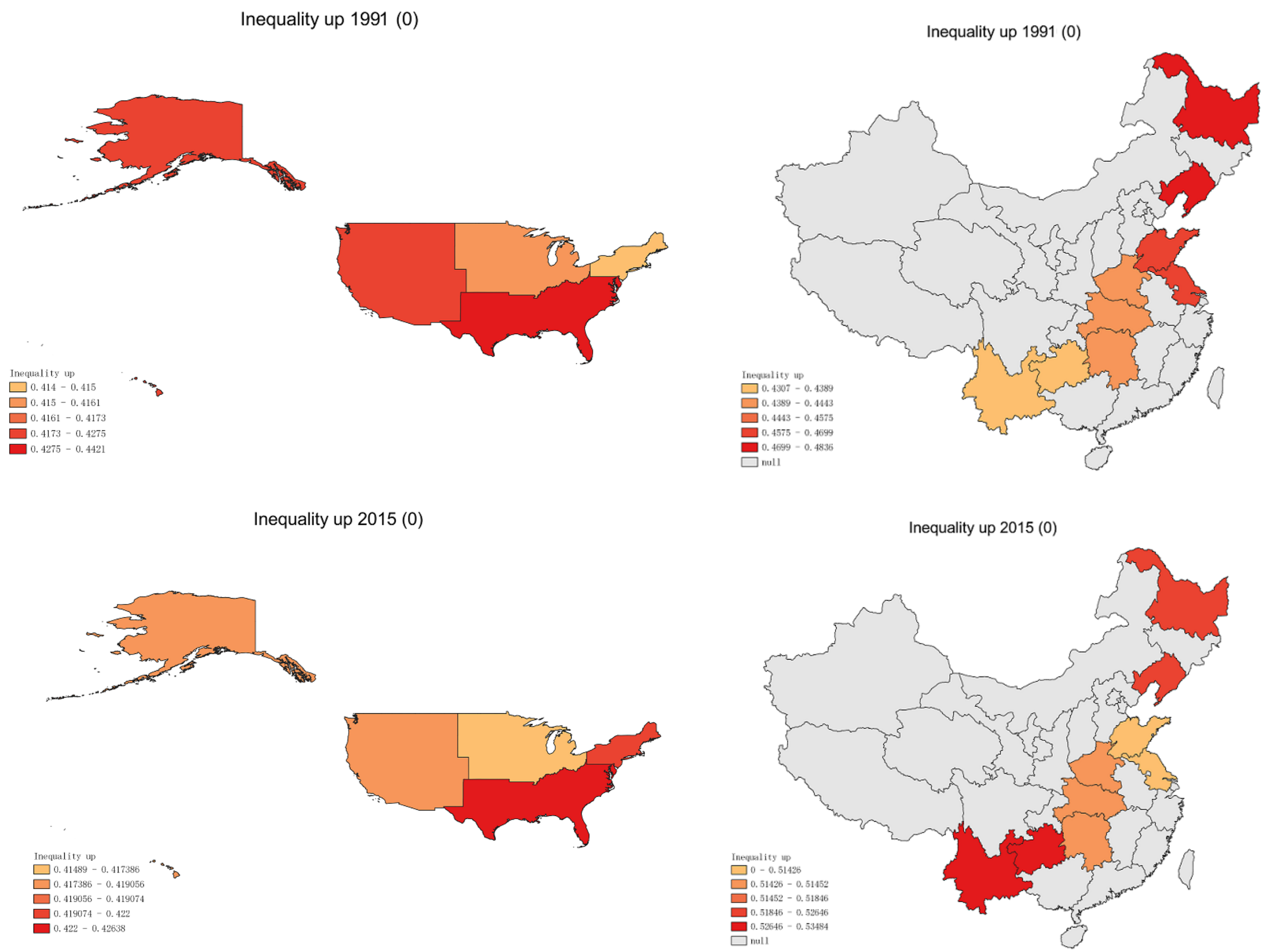
Vertical lines mark reform dates: NCMS reform in China (2003), start of ACA in US (2010), Medicaid expansion in US (2014).

Figure A.3: The US and China, 1991 and 2015: $\alpha = 0$, downward



Note: The graphs show the regional distribution of SAH-inequality estimates for downward-looking status in the US and China in 1991 and 2015. $\alpha = 0$ and the reference status is the maximum self-assessed health level. The two figures in the top use the 1991 data for the US (top right) and China (top left). The two figures in the bottom use the 2015 data for the US (bottom right) and China (bottom left). The light-coloured areas indicate lower SAH inequality and the dark-coloured areas represent higher SAH inequality.

Figure A.4: The US and China, 1991 and 2015: $\alpha = 0$, upward



Note: The graphs show the regional distribution of SAH-inequality estimates for downward-looking status in the US and China in 1991 and 2015. $\alpha = 0$ and the reference status is the maximum self-assessed health level. The two figures in the top use the 1991 data for the US (top right) and China (top left). The two figures in the bottom use the 2015 data for the US (bottom right) and China (bottom left). The light-coloured areas indicate lower SAH inequality and the dark-coloured areas represent higher SAH inequality.

A.2 SAH inequality indices: method by Jenkins (2021)

Table A.2: SAH inequality indices by Jenkins (2021)

US				China	
Year	Jenkins' index	Year	Jenkins' index	Year	Jenkins' index
1972	0.464986	1995	0.426185	1991	0.41316
1973	0.466775	1996	0.425201	1993	0.39988
1974	0.47184	1997	0.417749	1997	0.42656
1975	0.467796	1998	0.417441	2000	0.4663
1976	0.467445	1999	0.41605	2004	0.47689
1977	0.467515	2000	0.413007	2006	0.47454
1978	0.466753	2001	0.416353	2015	0.47269
1979	0.46954	2002	0.416259		
1980	0.46853	2003	0.412051		
1981	0.467409	2004	0.412189		
1982	0.44407	2005	0.42334		
1983	0.44257	2006	0.418656		
1984	0.440805	2007	0.414332		
1985	0.437945	2009	0.417979		
1986	0.434414	2010	0.417138		
1987	0.434039	2011	0.41944		
1988	0.432942	2012	0.421521		
1989	0.470492	2013	0.421957		
1990	0.430368	2014	0.419351		
1991	0.42995	2015	0.42019		
1992	0.431227	2016	0.41567		
1993	0.355788	2017	0.438861		
1994	0.4307	2018	0.415985		

Note: The indices in the US and China are calculated using the formular in equation 4 developed by Jenkins (2021).

A.3 Alternative representations of SAH inequality

Table A.3: Hypertension prevalence regression

	Percent with hypertension		**Variance of hypertensive prevalence**	
	US	**China**	**US**	**China**
HI coverage	0.00744*	-0.0162	0.00926	-0.0662
	(0.00403)	(0.0311)	(0.00843)	(0.0414)
Inc.Inequality	-0.0357***	-0.0588	-0.0689*	0.0276
	(0.0132)	(0.116)	(0.0365)	(0.142)
age	0.000595***	0.0147***	0.000512*	0.0.00249
	(0.000137)	(0.00260)	(0.000269)	(0.00318)
sex	0.0731**	-0.526*	0.0717*	-0.427
	(0.0303)	(0.300)	(0.0418)	(0.367)
loghhincome	-0.0366***	0.0604***	-0.0265	0.0162
	(0.00746)	(0.0229)	(0.0181)	(0.0280)
Observations	100	60	100	60
R-squared	0.974	0.780	0.976	0.877
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the percentage of people with hypertension at the "regional level".The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

Table A.4: Overweight prevalence regression

	Percent with overweight		Variance of overweight prevalence	
	US	**China**	**US**	**China**
HI coverage	-0.0729	-0.00381	0.0503**	0.0182
	(0.0563)	(0.0671)	(0.0197)	(0.0314)
Inc.Inequality	0.394***	0.0305	-0.146***	-0.120
	(0.130)	(0.230)	(0.0454)	(0.108)
age	-0.000635	-0.00283	-0.000222	-0.00436*
	(0.00208)	(0.00514)	(0.000726)	(0.00240)
sex	-0.469***	-0.773	0.272***	-0.967***
	(0.153)	(0.594)	(0.0535)	(0.278)
loghhincome	-0.0517	0.0929**	0.0216	-0.00238
	(0.0662)	(0.0453)	(0.0231)	(0.0212)
Observations	100	60	100	60
R-squared	0.991	0.958	0.996	0.917
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the percentage of people with hypertension at the "regional level". The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

Table A.5: Log household income regression

	Loghhincome, US		Loghhincome, China	
HI coverage	0.173***	0.168***	0.542**	0.494**
	(0.0601)	(0.0596)	(0.230)	(0.226)
Inc.Inequality	0.155	-	0.828	
	(0.191)		(0.781)	
age	0.00128	0.00126	-0.0210	-0.0227
	(0.00223)	(0.00223)	(0.0186)	(0.0186)
sex	0.908	0.870	1.023	0.842
	(0.611)	(0.608)	(2.050)	(2.046)
Observations	100	100	60	60
R-squared	0.986	0.986	0.969	0.968
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is log household income at "regional level"; the reference status is the maximum self-assessed health level. The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, and income inequality.

Table A.6: Income inequality regression

	Inc.Inequality, US		Inc.Inequality, China	
HI coverage	-0.0409	-0.0320	-0.0737	-0.0574
	(0.0367)	(0.0350)	(0.0475)	(0.0450)
loghhincome	0.0534	-	0.0330	-
	(0.0657)		(0.0311)	
age	-0.000230	-0.000162	-0.00130	-0.00205
	(0.00131)	(0.00131)	(0.00377)	(0.00371)
sex	-0.294	-0.247	-0.247	-0.219
	(0.362)	(0.356)	(0.409)	(0.408)
Observations	100	100	60	60
R-squared	0.970	0.969	0.820	0.815
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the Gini income inequality at "regional level"; the reference status is the maximum self-assessed health level. The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, and average household income (in logs).

Table A.7: SAH-poverty regression

	Percent with Poor/Fair SAH	
	US	China
HI coverage	0.00347	0.0500
	(0.0363)	(0.0744)
Inc.Inequality	-0.0761	0.0972
	(0.121)	(0.255)
age	0.000966	-0.00423
	(0.00134)	(0.00570)
sex	0.551	-1.433**
	(0.383)	(0.659)
loghhincome	-0.0324	-0.0849*
	(0.0653)	(0.0502)
Observations	100	60
R-squared	0.832	0.907
Year FE	Yes	Yes
Region FE	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the percentage of people whose self-rated health is poor or fair at the "regional level". The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

Table A.8: Smoking and drinking behavours regression

	Percent of current smoker		Percent of current drinker	
	US	**China**	**US**	**China**
HI coverage	0.00667	0.0216	0.0611	0.0559
	(0.0202)	(0.0233)	(0.168)	(0.0605)
Inc.Inequality	-0.168**	-0.0588	-0.0689*	0.0276
	(0.0788)	(0.116)	(0.0365)	(0.142)
age	-0.000651	0.0147***	0.000512*	0.0.00249
	(0.000682)	(0.00260)	(0.000269)	(0.00318)
sex	-0.259	-0.526*	0.0717*	-0.427
	(0.205)	(0.300)	(0.0418)	(0.367)
loghhincome	-0.0833*	0.0604***	-0.0265	0.0162
	(0.0435)	(0.0229)	(0.0181)	(0.0280)
Observations	77	60	100	60
R-squared	0.974	0.780	0.976	0.877
Year FE	Yes	Yes	Yes	Yes
Region FE	Yes	Yes	Yes	Yes

Notes: Robust standard errors in parentheses. *** p¡0.01, ** p¡0.05, * p¡0.1. The outcome variable is the percentage of people with hypertension at the "regional level". The period covered is 1991-2018 for the US and 1991-2015 for China, with a few years or regions missing when collecting information for the control variables. The region represents regions in the US and provinces in China to obtain more observations. The controls are the proportion of the population covered by HI, age and sex composition, average household income (in logs), and income inequality.

A.4 Breakdown by Subgroups

Figures A.5 to A.11 in the Appendix give the breakdown of inequality trends by key population characteristics. In each picture, the short vertical bars represent the 95% confidence intervals of inequality estimates, and the full-length vertical lines mark the years when health reforms came into effect, 2003 (China) and 2010 and 2014 (the US).

Males and females

In Figure A.5, we divide the sample by gender and calculate the downward-looking SAH inequalities separately for male and female samples. Males are on the left column and females are on the right one in this graph. From top to bottom, the sensitivity parameter takes the values $\alpha = -2$, $\alpha = -1$, $\alpha = 0$, $\alpha = 0.99$.

In Figure A.5 shows that, although the US/China inequality comparison differs considerably according to the value of α (going down the rows of the figure) the pattern is not significantly different between males and females (left and right sides of the figure). We find that for low values of α, SAH inequality is systematically higher in the United States than in China. Conversely, for positive values of α we find that inequality before 2000 was larger in the United States than in China and only after 2000 became higher in China. Also, an interesting fact is that when we have non-negative values of α, the health inequality is lower for males in the year 2015 than for females in China. This might imply that males, on average, have better SAH than females in China.

Regions

In Figures A.6 and A.7, we calculate the downward-looking SAH inequalities separately for four different regions in each country and compare China and the US, region by region. In Figure A.6 the Northeast (US/China) regions on the left are compared with Midwest (US)/East (China) regions on the right; In Figure A.7 the South (US)/Central (China) on the left us compared with West (US)/Southwest(China) on the right. Again from top to bottom α takes the values $-2, -1, 0, 0.99$.

In comparing inequality patterns by region, we find that nearly all of the action comes from the distributional sensitivity parameter α. For values of $\alpha < 0$ – where the inequality index is sensitive to the bottom of the distribution, the US is unambiguously more unequal than China in every region for each year. Furthermore, inequality in the US rose throughout the period, while it fell in China. But for $\alpha \geq 0$, there is a mixed picture. Typically, the US is less equal than China for the first part of the period, and then the roles are reversed with China becoming more unequal. In each region, US inequality fell throughout the period. One region where the behaviour over time is different is Northeast region in China. In the case where $\alpha = 0$ inequality was at first (1991) higher than in the US Northeast: inequality in the Chinese Northeast then fell below the US Northeast and afterwards again became greater than the US Northeast.

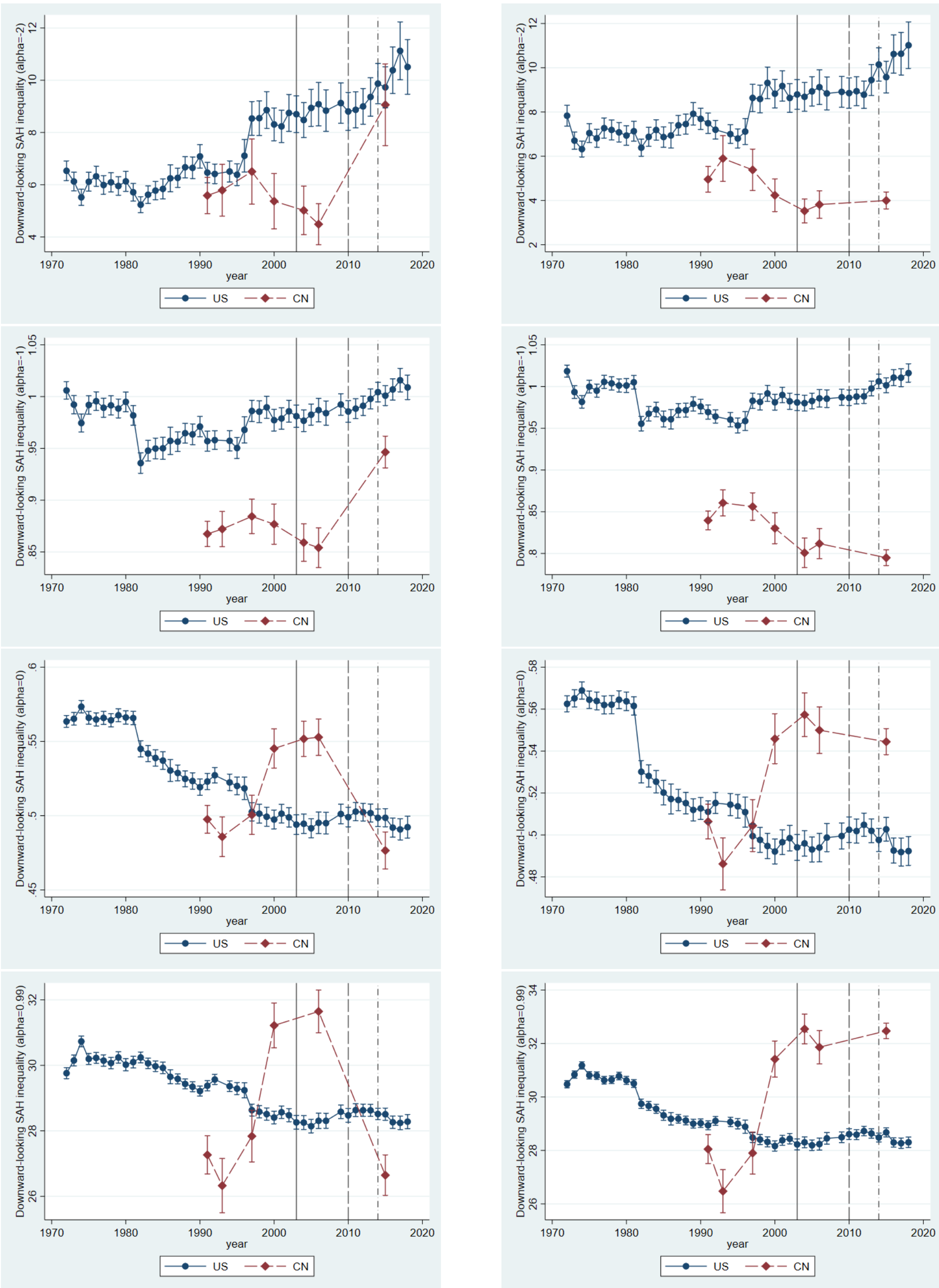
Age groups

In Figures A.8 ($\alpha = -2$), A.9 ($\alpha = -1$), A.10 ($\alpha = 0$), and A.11 ($\alpha = 0.99$), we divide the sample by age groups and calculate the downward-looking SAH inequalities separately for eight different age groups. From left to right and from top to bottom, the graphs show the following age groups: 10¡age$\leq$20, 20¡age$\leq$30, 30¡age$\leq$40, 40¡age$\leq$50, 50¡age$\leq$60, 60¡age$\leq$70, 70¡age$\leq$80 and 80¡age$\leq$90.

As far as the age breakdown is concerned, once again, Figures A.8 to A.11 show that there is an important α-effect in the pattern of US-China inequality comparisons. But for $\alpha \geq 0$ (Figures A.10, A.11), there is also a clear age effect: for the under-30s (top three panels), inequality is at first greater in the US than in China, but in later years this is reversed as health-inequality in China grows; this reversal does not happen for the middle-aged when $\alpha = 0.99$. Furthermore, we find that SAH inequality is always higher in the US than in China when $\alpha \leq 0$, which could imply better SAH inequality in China than the US when the index is sensitive to the low tail of the SAH distribution.

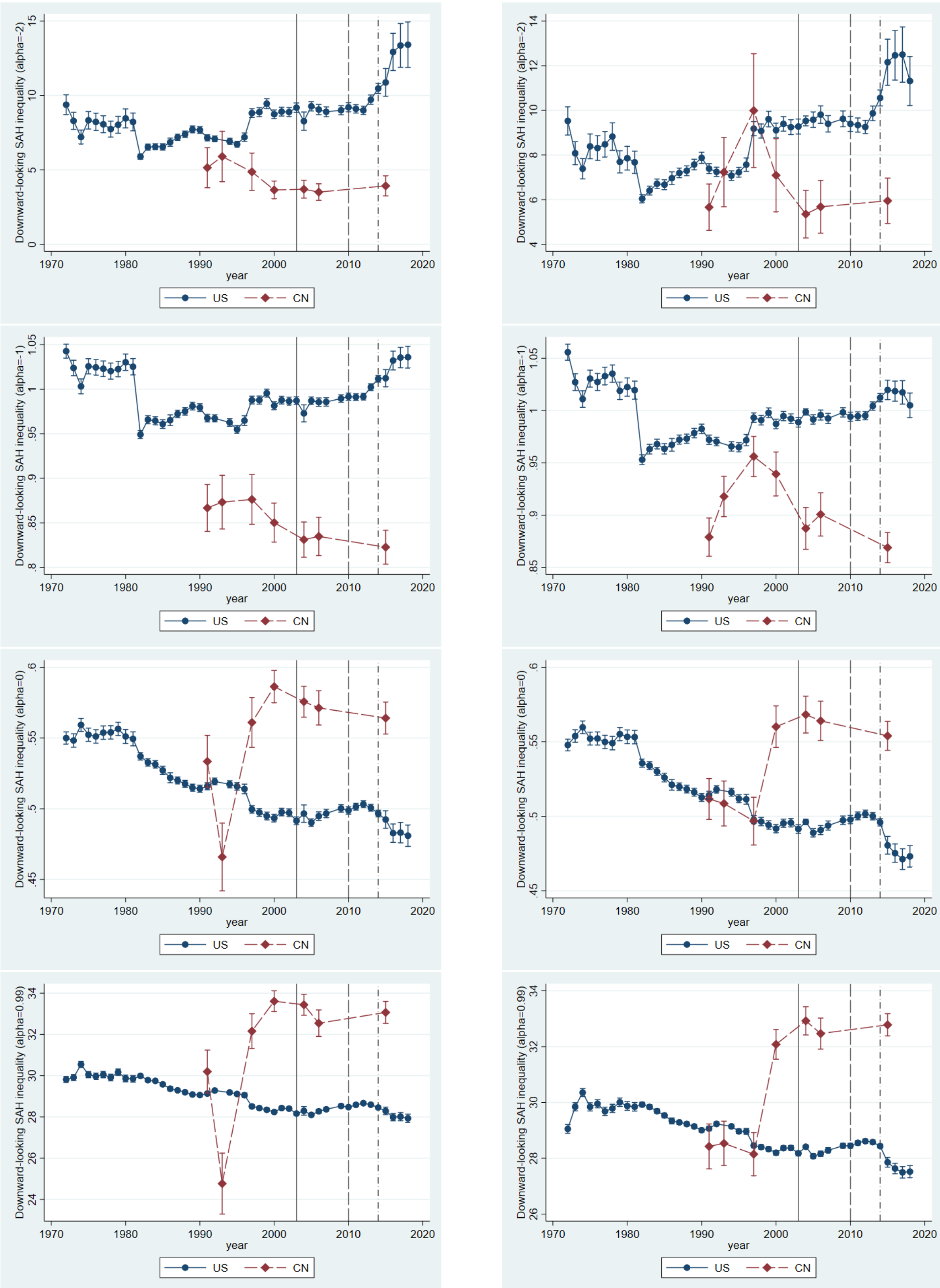
The breakdown by age shows that for $\alpha = 0.99$ in Figure A.11, the US-China inequality pattern depicted in the left-hand panel of Figure 2 also appears for the under-50 age groups. But, for the elderly, SAH inequality in China remains above that in the US throughout the period. This result implies the US has lower SAH inequality among the elderly when the inequality index puts more weight on higher status.

Figure A.5: The US & China SAH-inequality trends (downward-looking status): male (left) and female (right), $\alpha = -2$ (top) to $\alpha = 0.99$ (bottom)



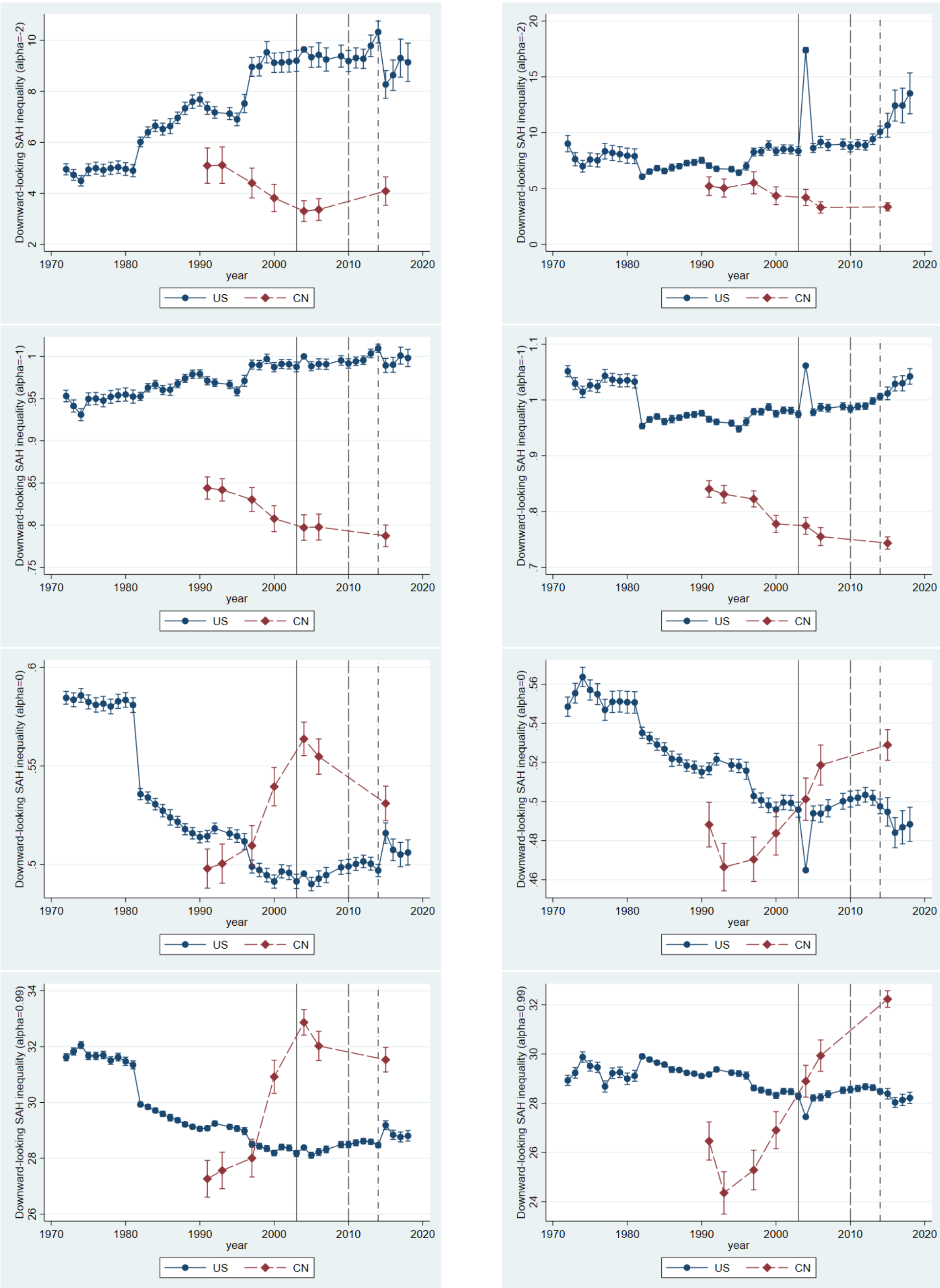
Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for males and females separately. From top to bottom, the sensitivity parameter takes the values $\alpha = -2, -1, 0, 0.99$. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.

Figure A.6: Left: the US & China Northeast. Right: the US Midwest & China East downward-looking status inequality trends: $\alpha = -2$ (top) to $\alpha = 0.99$ (bottom)



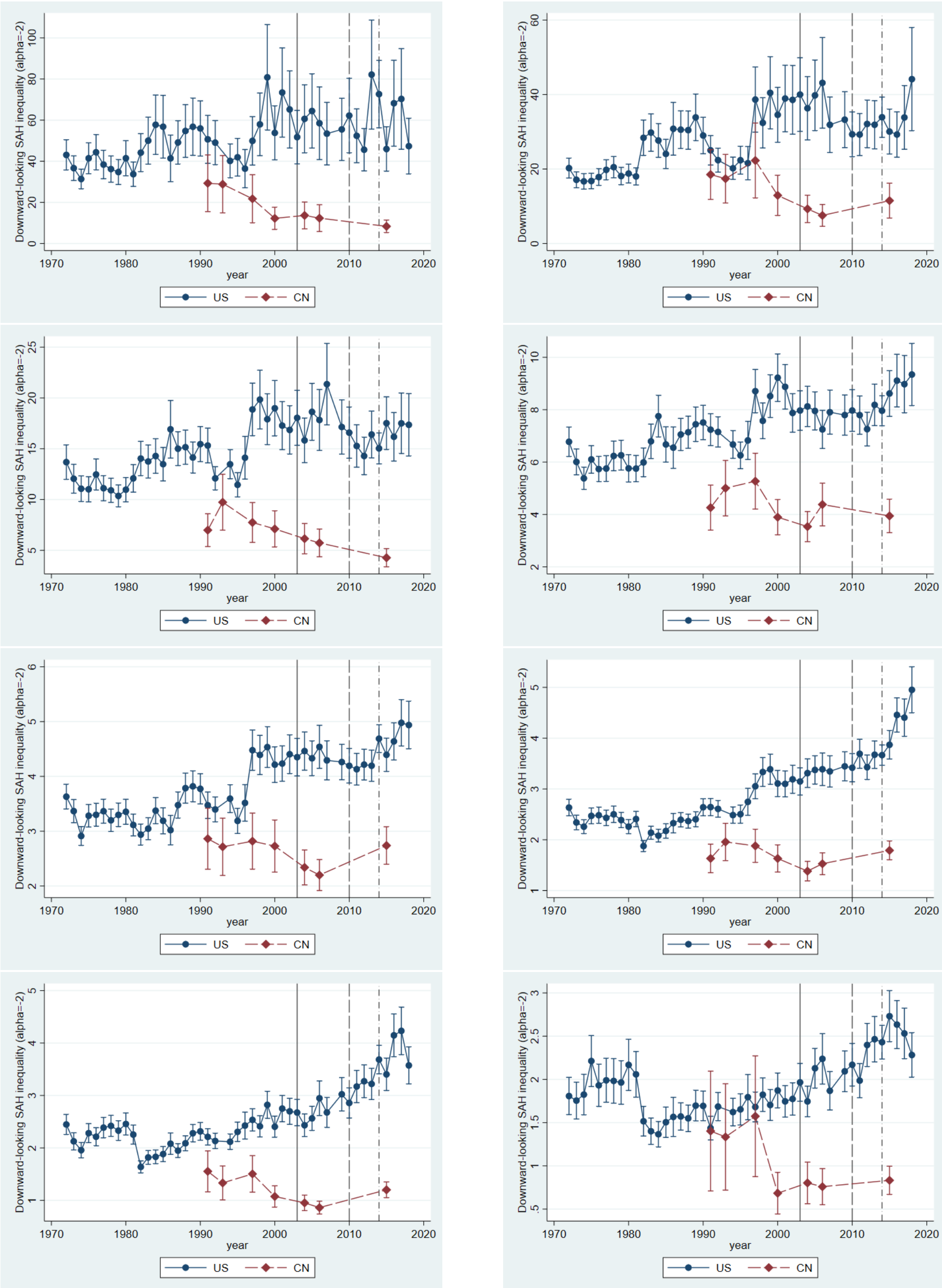
Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for different regions. From top to bottom, the sensitivity parameter takes the values $\alpha = -2, -1, 0, 0.99$. The reference status is the maximum self-assessed health level. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.

Figure A.7: Left: the US South & China Central. Right: the US West & China Southwest downward-looking status inequality trends: $\alpha = -2$ (top) to $\alpha = 0.99$ (bottom)



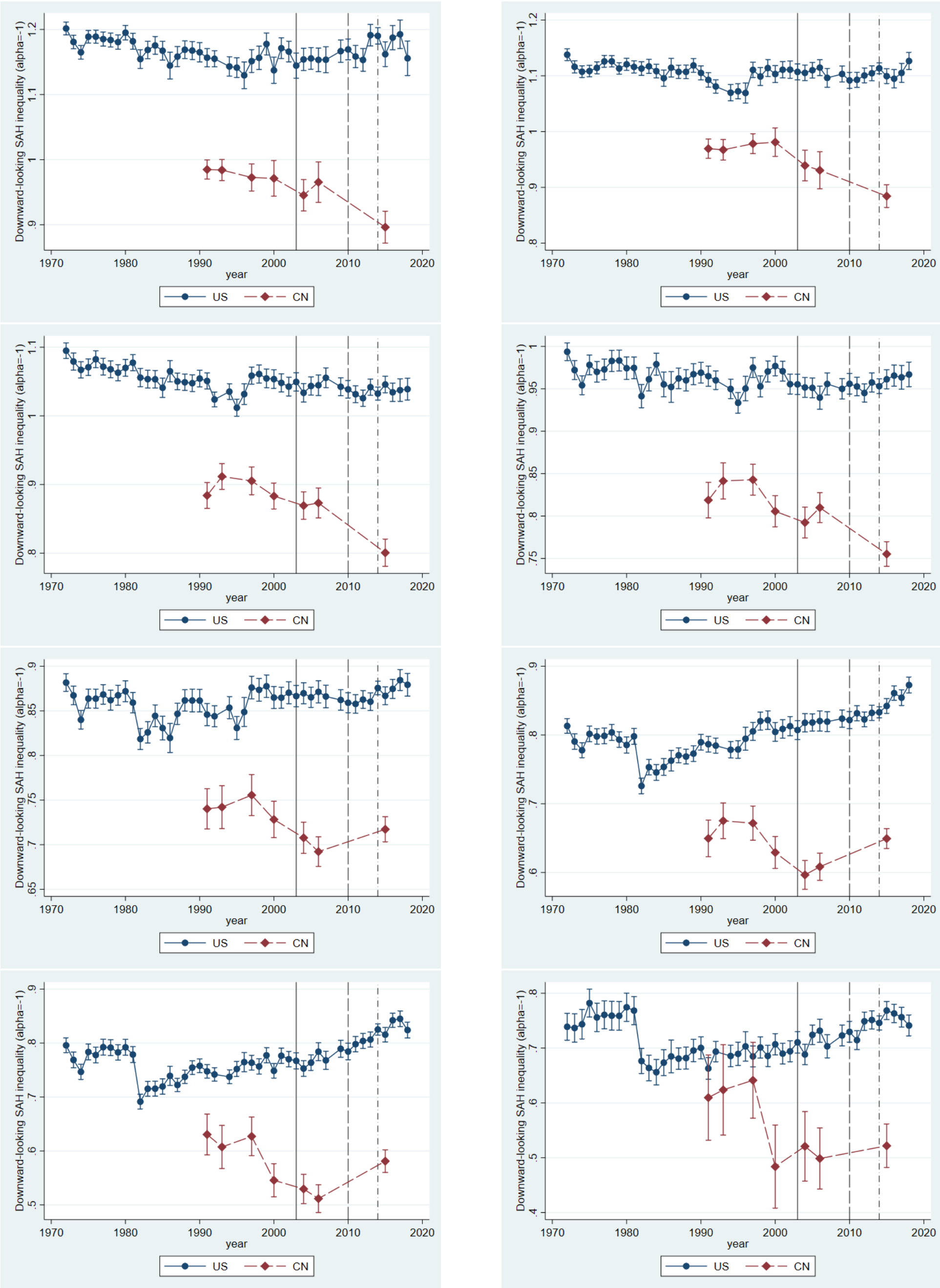
Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for different regions. From top to bottom, the sensitivity parameter takes the values $\alpha = -2, -1, 0, 0.99$. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.

Figure A.8: The US & China SAH-inequality trends (downward-looking status): $\alpha = -2$, youngest (top left) to oldest (bottom right) groups



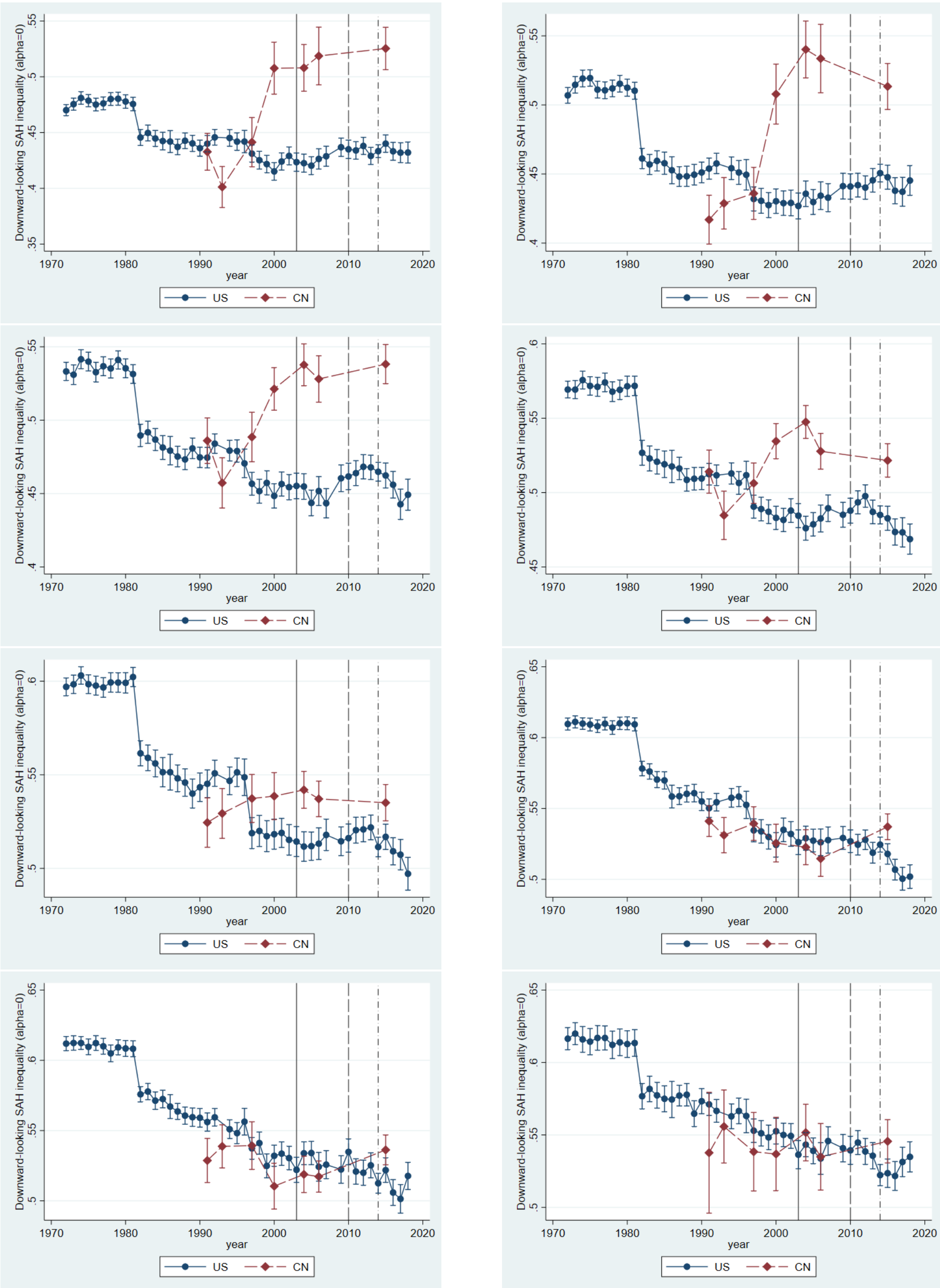
Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for different age groups. The sensitivity parameter takes the value $\alpha = -2$. From left to right and from top to bottom, each graph represents a age-group of 10 years, from 10-20 to 80-90. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.

Figure A.9: The US & China SAH-inequality trends (downward-looking status): $\alpha = -1$, youngest (top left) to oldest (bottom right) groups



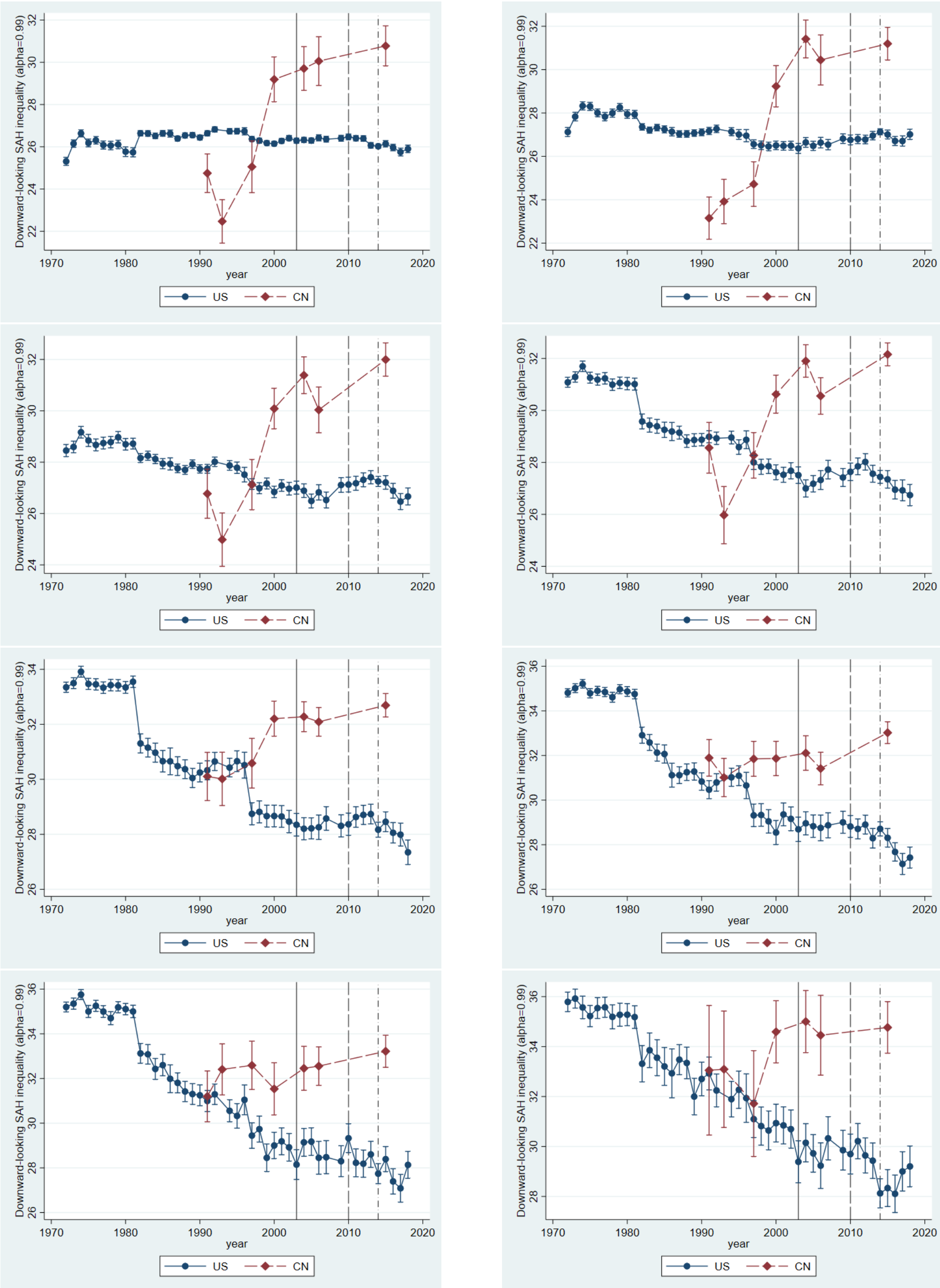
Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for different age groups. The sensitivity parameter takes the value $\alpha = -1$. From left to right and from top to bottom, each graph represents a age-group of 10 years, from 10-20 to 80-90. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.

Figure A.10: The US & China SAH-inequality trends (downward-looking status): $\alpha = 0$, youngest (top left) to oldest (bottom right) groups



Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for different age groups. The sensitivity parameter takes the value $\alpha = 0$. From left to right and from top to bottom, each graph represents a age-group of 10 years, from 10-20 to 80-90. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.

Figure A.11: The US & China SAH-inequality trends (downward-looking status): $\alpha = 0.99$, youngest (top left) to oldest (bottom right) groups



Note: The graphs show SAH-inequality estimates for downward-looking status in the US and China for different age groups. The sensitivity parameter takes the value $\alpha = 0.99$. From left to right and from top to bottom, each graph represents a age-group of 10 years, from 10-20 to 80-90. The time frame for the US is 1972-2018, and it is 1991-2015 for China. The first vertical line in 2003 indicates the NCMS reform in China, the second vertical line in 2010 is the starting year for the ACA in the US, and the third line in 2014 is for the Medicaid expansion in the US.