



# Is that really a Kuznets curve? Turning points for income inequality in China

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## Abstract

The path of income inequality in post-reform China has been widely interpreted as “China’s Kuznets curve.” We show that the Kuznets growth model of structural transformation in a dual economy, alongside population urbanization, has little explanatory power for our new series of inequality measures back to 1981. Our simulations tracking the partial “Kuznets derivative” of inequality with respect to urban population share yield virtually no Kuznets curve. More plausible explanations for the inequality turning points relate to determinants of the gap between urban and rural mean incomes, including multiple agrarian policy reforms. Our findings warn against any presumption that the Kuznets process will assure that China has passed its time of rising inequality. More generally, our findings cast doubt on past arguments that economic growth through structural transformation in poor countries is necessarily inequality increasing, or that a turning point will eventually be reached after which that growth will be inequality decreasing.

**Keywords** China · Inequality · Growth · Kuznets · Lewis · Inverted U

**JEL Classification** I32 · O15

## 1 Introduction

Famously, Simon Kuznets (1955) argued that rising inequality is likely when a primarily agrarian economy starts to grow through the absorption of labor into its fledgling non-farm sector, which is primarily urban, richer and more unequal, than the rural sector. However, Kuznets predicted that, in due course, as mean income grows in this process of structural

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transformation, a turning point will be reached, after which inequality reverses course. This came to be variously known as the “Kuznets curve,” “the inverted-U” or simply the Kuznets Hypothesis (KH).<sup>1</sup> A similar prediction of an initial rise in inequality, but an eventual turning point, emerged from another influential development model by Arthur Lewis (1954). The subsequent literature formalized and developed the insights from the Kuznets-Lewis models.<sup>2</sup> The influence of the KH has been considerable; as Milanovic (2016a) puts it:

“The Kuznets curve was the main tool used by inequality economists when thinking about the relationship between development or growth and inequality over the past half century.”

As the most populous country, and one that has gone through massive structural transformation with urbanization over the last 40 years, there is obvious interest in seeing whether these classic development models carry insights for China. As is well known, income inequality has generally been rising in China since the pro-market reforms began.<sup>3</sup> Nonetheless, measures of absolute poverty have fallen, though the picture is more ambiguous for relative poverty measures, which put higher weight on inequality.<sup>4</sup> Inequality has become a prominent concern, both in its own right, and as a possible threat to future growth prospects, to the extent that high inequality restricts investment by relatively poor people (including investment in human capital) and possibly undermines growth-promoting policy reforms, which get blocked by the new, economically and politically powerful, elites.

In this context, many observers have been relieved that, sometime around 2010, China appears to have reached its Kuznets-Lewis turning point. Indeed, it is now widely agreed that China has passed this turning point, with inequality trending downwards. The famous “inverted U” is also evident in our estimates of inequality measures for China (discussed later in this paper).<sup>5</sup> Yet (as we also show) there is more than one turning point in the (generally) upward trend in inequality in China since the early 1980s.

This paper focuses on the turning points in the path of inequality in China. When an important trended economic variable changes direction it is clearly of interest to understand why. As an explanation, the Kuznets Hypothesis has been the leading contender with regard to inequality in China; indeed, many observers have simply jumped to the conclusion that this is the reason. The paper aims to test whether the time path of inequality in China really is a “Kuznets curve,” as has been so widely assumed.

<sup>1</sup> Kuznets (1955) discusses other sources of rising inequality as an economy develops, including an increasing concentration of capital among the rich due to their higher savings rate (anticipating Piketty 2014). Rising inequality in China (notably within in urban areas) has been linked empirically to the functional distribution, with a rising share of income from capital relative to labor (Molero-Simarro 2017). However, it is the emphasis Kuznets gave to the role of structural transformation in determining the inter-personal distribution that came to be seen as the foundation of the KH.

<sup>2</sup> Including contributions by Ranis and Fei (1961), Robinson (1976), Fields (1979), Kakwani (1988) and Anand and Kanbur (1993a), among others.

<sup>3</sup> On the rise in inequality in China see (inter alia) Khan and Riskin (1998), Benjamin et al. (2005), Wu and Perloff (2005), Knight (2014), Li and Sicular (2014), Wang et al. (2014) and Piketty et al. (2019).

<sup>4</sup> New measures of weakly relative poverty for China confirm a large reduction in poverty, though still less so than found for absolute measures (Chen and Ravallion 2021).

<sup>5</sup> Regressing our estimates of China’s Gini index of income inequality (1981–2014) on year and year squared, the regressions coefficients positive and negative (respectively), and both are statistically significant; the implied turning point is 2011 with a standard error of 2.8 years.

The paper assesses what role the mechanisms of development through modern sector expansion—as postulated by the classic Kuznets-Lewis models—have played in generating the time profile of inequality in China. New measures of income inequality are presented, namely the Gini index and the Mean Log Deviation (MLD), which are used to identify turning points and to assess whether they might have been generated by the Kuznets or Lewis models. Methodologically, the paper demonstrates how one can combine survey-based empirics with simulation methods to derive counterfactual trajectories for inequality under a pure Kuznets process. This provides a new test of whether the data are consistent with the KH. For China, we show that the Kuznets process would have generated an inverted U, but a very flat one, with virtually no explanatory power for what we have seen in the data. Yes, our series on inequality in China can be said to look like a Kuznets curve, but that is clearly not due to the KH, though the Lewis model cannot be ruled out as a part of the explanation.

The following section points to some key insights from the (large) literature on Kuznets-Lewis type models of development, both globally and for China. Section 3 describes our data for China and our estimation methods and provides some descriptive statistics. Section 4 presents our main results analyzing the evolution of MLD. Section 5 discusses alternative explanations for our findings. Section 6 concludes.

## 2 Insights and issues from the literature

The Kuznets Hypothesis started to attract a great deal of attention from around 1970.<sup>6</sup> The new field of Development Economics was concerned about inequality from the outset, and it was looking for theories. A strand of the literature focused on the conditions for rising inequality under structural transformation, and (in particular) for a turning point (TP). The latter idea has been influential and often invoked in policy discussions. It has been used at times to justify a policy stance that essentially tells developing countries not to worry about rising inequality during structural transformation since the rise will (it is claimed) eventually be reversed, and (in any case) absolute poverty measures will decline along the way; “just be patient” the story goes. Gradin et al. (2021, p.4) summarize this view (without endorsing it):

“...there was no need to push for a more equal society because this would be an automatic outcome that would eventually result from higher development, in line with the inverted-U hypothesis proposed by Simon Kuznets.”

The KH also promises an eventual acceleration in poverty reduction. The initial rise in inequality is seen as an inevitable trade-off that will naturally dampen the gains to the poor from economic growth through structural transformation, but the trade-off will vanish once the country has passed its TP.

**Theoretical arguments** Dualistic development models in the tradition of Kuznets and Lewis have focused on the evolution of inequality between an emerging modern, primarily urban, sector and a traditional rural sector, though recognizing that the overall

<sup>6</sup> This is evident if one enters “Kuznets hypothesis” in the Google n-gram viewer. References to the KH in all digitized texts peaked around 2000, though the level since 2010 is still higher than in the early-1990s.

distributional outcomes also depend on sectoral differences in the extent of within-sector inequality. Structural transformation occurs through the progressive re-allocation of economic activity, including labor, from the rural to urban sectors.

There has been much debate on the importance of this process to development outcomes, including poverty reduction. Some observers have argued that this process of structural transformation is the key dynamic for growth and poverty reduction while others have argued that policy needs to focus more on raising incomes and productivity in the traditional sector, as a pre-condition for pro-poor structural transformation.<sup>7</sup>

Formulations of the KH in the literature are typically based on three assumptions:

- (i) that inequality is higher in urban areas than rural areas;
- (ii) that urban areas have a higher mean real income; and
- (iii) that the population urbanization process is distribution-neutral within each sector.

Under Assumption (i), population urbanization will tend to put upward pressure on overall inequality initially. This assumption is testable even with only one (national) survey round. Regarding Assumption (ii), a higher income gap between the sectors will (of course) be inequality increasing, but here the issue is what it would imply for the effect of urbanization on inequality. This interaction effect has not, however, received much formal attention in the literature.

Assumption (iii) assures that the driving force for the evolution of the overall distribution of income is the population urbanization process. Essentially, one ends up studying what we dub the “Kuznets derivative,” defined as the partial derivative of aggregate inequality with respect to the urban population share, holding distribution constant within each sector, as in Robinson (1976), Kakwani (1988) and Anand and Kanbur (1993a). While analytically convenient, (iii) may be considered a strong assumption. Migrants might be expected to have quite different economic characteristics to non-migrants, in both rural and urban areas, such that the migration process alters distribution within both sectors, though in potentially complex ways.

Despite some confusion in the literature, Assumptions (i) to (iii) do not guarantee that we will see a turning point in inequality. With higher inequality and a higher mean income in the urban sector, upward pressure on overall inequality coming from structural transformation can be expected. Whether inequality eventually starts to fall is an open question. Consider the point where the last segment of the rural population joins the urban sector. There are two opposing forces. The gain to the poor rural segment will tend to be inequality decreasing, but the share of the population in the high-inequality sector will have risen. If urban inequality is high enough, then overall inequality need not exhibit the inverted U. A careful theoretical formulation of the KH by Anand and Kanbur (1993a) points to the potential ambiguities in the outcomes for specific inequality measures.<sup>8</sup>

The Lewis model, as typically formalized, does not make Assumption (i), but instead ignores inequality within each sector, implying that Assumption (iii) also holds. In the Lewis model, a turning point in the rise in inequality is predicted, once the rural labor surplus is absorbed through structural transformation. After this “Lewis turning point,” rural

<sup>7</sup> Ravallion (2016, Chapter 8) reviews this debate.

<sup>8</sup> The prediction of falling (or at least non-increasing) absolute poverty measures under the Kuznets model is more robust as it only requires that migrants gain.

wages start to rise as the rural labor force continues to migrate to urban areas, narrowing the urban–rural income gap. The formalized and extended version of the Lewis model by Ranis and Fei (1961) emphasized the importance of a balanced growth process, including sufficient agricultural growth to feed the expanding urban sector.<sup>9</sup>

A nagging question about the Lewis model is whether “surplus labor” exists, at least in equilibrium. Alternatives to Lewis’s essentially Classical model relaxed his assumption that a declining rural workforce with urbanization does not reduce agricultural output (Jorgenson 1967).<sup>10</sup> If one takes the alternative “neoclassical” view that workers cannot be redundant in equilibrium in the fully specified model then one might not expect a Lewis TP. However, as will be demonstrated in Sect. 4, one can still have a Lewis TP without assuming that there is surplus labor, similarly to the Kuznets TP. This is generated by urbanization even if that does not narrow the urban–rural income gap.

**Evidence from cross-country comparisons** The early empirical work of Kuznets (1955), Ranis and Fei (1961) and Robinson (1976) used numerical simulations. (Kuznets refers to inequality measures for a handful of, mostly rich, countries.) This changed over subsequent decades. Many empirical studies using cross-country comparisons appeared to support the KH, finding that inequality traced out an inverted U relationship with mean income, to the point where writers such as Oshima (1970, p.7) claimed that “...most of the studies...on this topic have fully confirmed this finding.” With more data, tests using regression became popular. An influential paper by Ahluwalia (1976) regressed income shares from survey data across countries on a quadratic function of log GDP per capita, which suggested strong support for the KH (indicated by a significant negative coefficient on the squared term). Similar findings were reported by Ram (1995) and Jha (1996).<sup>11</sup> The regressions in this literature were often augmented with other variables such as education attainments, demographic variables and economy-wide policy variables. In some studies, the KH survived the augmentation of the cross-country tests (as in Jha 1996 and Milanovic 2000) and sometimes not (as in Lin 2009).

These tests of the KH using cross-country comparisons came to be questioned from a number of points of view, related to the data and econometric specifications used (Anand and Kanbur 1993b; Ravallion 1997; Bruno et al. 1998; Deininger and Squire 1998). As time series data began to accumulate, more evidence emerged that did not support the KH as a generalization (Bruno et al. 1998; Barro 2000; Fields 2001; Gallup 2012). Kuznets’s (1955) arguments as to why inequality had declined in the rich world (seen from the time Kuznets was writing) came to be questioned in the light of rising inequality since the 1980s, notably by Piketty (2014).

**Evidence for China** While all this was happening in the development economics literature, the idea of a turning point in inequality was being much anticipated in China, and

<sup>9</sup> The model is further elaborated in Fei and Ranis (1964). Lipton and Ravallion (1995) and Timmer (2002) provide an overview of the history of thought on these debates; also see Ravallion (2016, Chapter 2).

<sup>10</sup> Also see the discussion in Rosenzweig (1988).

<sup>11</sup> Surveys of the earlier literature are found in Adelman and Sherman (1988), Bruno et al. (1998) and Fields (2001).

attracted much attention among scholars.<sup>12</sup> The pre-1980 data are less reliable for China, but scattered, often localized, studies suggest quite low inequality measures around the time that Deng Xiaoping's reforms began in earnest.<sup>13</sup> The policies of the Maoist period kept inequality low within communes but less so between them. Tabulations of income distributions from the national household survey data collected by the National Bureau of Statistics (NBS) became available after 1980. The NBS tabulations for 1981 suggest quite low inequality, with a Gini index below 0.30. The time series from the same source indicate a strong trend increase in income inequality from the mid-1980s (Ravallion and Chen 2007). Other survey data have been consistent with this finding (Benjamin et al. 2005; Li and Sicular 2014; Wang et al. 2014).

The expectations of a steep initial rise in inequality under urbanizing structural transformation reflected a distinctive feature of China, namely the large gap in average incomes between urban and rural areas, which had become a focus of some of the literature (including Knight and Song 1999; Sicular et al. 2006). Sicular et al. (2006, p.1) write that:

“According to most estimates mean per capita income in urban China is more than triple that in rural areas, giving China one of the highest urban-rural income ratios in the world.”

The gap persists with seemingly reasonable allowances for differences in the cost-of-living between urban and rural areas (Ravallion and Chen 2007). Rural migrants in urban areas do not typically have the same labor market opportunities. Nor do they have the same access to urban services as those with local urban *hukou* (the internal registration system). This urban-rural inequality is clearly an important dimension of overall inequality in China, and it is likely to entail that urbanization under the KH will tend to be more inequality-increasing.

From the early 2000's, there were discussions in the Chinese language literature of the possibility of a forthcoming turning point in inequality, and in English language literature from around 2005/6.<sup>14</sup> By around 2015, a widespread view emerged that China had in fact passed its turning point for inequality.<sup>15</sup> This was based on the signs of a decline in overall inequality as suggested by the Gini index and other inequality indices, as calculated from multiple surveys as well as regional databases (Wan et al. 2018; Cai 2021; Kanbur et al. 2021). Prominent global scholars of inequality such as Milanovic (2016b) and Kanbur (2019) interpreting the recent signs of a TP for inequality in China in terms of the Kuznets-Lewis models or extensions, though noting alternative explanations. Li et al. (2021, p.133) identify the “Kuznets inverted U path of inequality” as the first of several reasons for the observed changes in China's measures of income inequality over the last 40 years.

<sup>12</sup> Contributions include Cai and Wang (2010), Zhang et al. (2011), Jalil (2012), Huang and Cai (2014), Li (2016), Cheng and Wu (2017), Wan et al. (2018), Piketty et al (2019), Kanbur et al. (2021) and Cai (2021).

<sup>13</sup> Putterman (1993, Chapter 10) provides a review of these studies.

<sup>14</sup> In Chinese, and early discussion of the prospect of a Kuznets TP was Yang and Zhang (2003). In English, early discussions included Wang (2006), Garnaut and Huang (2006) and Islam and Yokota (2008). In advance of knowing whether the TP had been reached, a special issue of the *China Economic Journal* in 2010 was devoted to this topic.

<sup>15</sup> For example, the Financial Times (2015) writes that “Economists now broadly agree that China has reached its Lewis turning point.” As a further indication of the attention this topic has received, if one enters “Kuznets curve”+China+inequality in Google Scholar (mid-2021) it returns over 15,000 entries, 6,000 of which are since 2017.

Yet there are some features of the Chinese economy that make one pause, and suspect that there is more to the story of how overall inequality has evolved. In contrast to the assumption of Kuznets (1955) that inequality is higher in urban areas than rural areas, it has been noted by some observers that it is the reverse in China, i.e., that inequality tends to be higher in rural areas (Ravallion and Chen 2007; Kanbur and Zhuang 2013). However, as we will see in Sect. 4, the Kuznets assumption that inequality is higher in urban areas is not necessary for a Kuznets curve.

There are also impediments to internal migration in China, notably through the *hukou* registration system and administrative land allocation processes.<sup>16</sup> These cast further doubt on the relevance of Kuznets-Lewis, although substantial migration from rural to urban areas has still occurred, along with rural areas becoming urban.

Some observers have also questioned whether the claimed TP in inequality is even true, pointing to concerns about income under-reporting by China's rich (see, for example, Piketty et al. 2019, and Li et al. 2021). Such under-reporting (and selective compliance with survey samples) cannot be ruled out, although it remains unclear why it would have created a TP, reversing rising inequality.

A clue to the effect of income under-reporting in NBS surveys at the high end of the distribution is found in the calculations of top income shares by Piketty et al. (2019), drawing on income tax records, though these are only available for high income earners in the formal sector. The Piketty et al. results suggest higher inequality than the surveys used here.<sup>17</sup> Given that the extent of income under-reporting at low and middle-income levels is unknown (since the tax records only relate to the relatively well-off), we cannot know if this higher level of inequality is correct. (Possibly the proportionate corrections would be similar at lower incomes, though the absolute differences are obviously lower.) However (as we will show), this is a moot point in the present context since the pattern over time appears to be very similar in the Piketty et al (2019) results, with TPs at around the same dates. There are also attractions of internal consistency and construct validity in relying on the surveys (Ravallion 2022).

There is evidence for China supporting the surplus labor assumption of Lewis (1954). An attempt to resolve the matter empirically for various crops in China by Kwan et al. (2018) suggests that the actual amount of labor employed is in excess of the technically efficient level, as identified by a parametric stochastic frontier in which a regression-error component (with positive mean) is introduced, and interpreted as technical inefficiency. Econometric identification of such frontiers is not straightforward, of course. And there is a concern that what one measures as "redundant labor" actually reflects latent (market or other) constraints on farm-household resource allocation, such that more labor is required than appears to be technically efficient. While those constraints remain, removing the "surplus labor" will lower output.

The literature has pointed to other possible explanations for the path of inequality in China besides the urbanization dynamic in the Kuznets-Lewis models. The main competing hypotheses for the TPs have emphasized policies, which we return to in Sect. 5.<sup>18</sup> If these

<sup>16</sup> On the *hukou* system see Young (2013). On administrative land re-allocation see Giles and Mu (2018).

<sup>17</sup> Piketty et al. (2019) do not calculate inequality indices, but only shares. For example, for our most recent year, we find that the poorest 50% have 23% of total income, while it is 15% in Piketty et al.

<sup>18</sup> The role of China's various policies affecting inequality is discussed in (inter alia) Yang (1999), Ravallion and Chen (2007), Knight and Ding (2012, Chapter 10), Knight (2014), Li and Sicular (2014), Wang et al. (2014) and Li et al. (2021).



competing explanations turn out to be more credible than neither the rise in inequality nor its reversal should be taken for granted as mere by-products of structural transformation.

The links between empirics and theory have often been weak in the literature on the KH (not only for China). It seems that almost anytime that an inverted U is seen in an inequality series (or other series such as environmental or political variables) a “Kuznets curve” is declared, even when no evidence is produced that the turning point has anything to do with the Kuznets model.

### 3 Data, measures and descriptive results

Two measures of inequality are used in this paper. The first is the popular Gini index (G), given by half the average absolute difference found among all the  $n^2$  pairs  $(Y_i/\bar{Y}, Y_j/\bar{Y})$  of mean-normalized incomes where  $Y_i$  denotes household income per person for person  $i$  ( $= 1, \dots, n$ ) in a population of size  $n$ , with population-weighted mean,  $\bar{Y}$ . The second inequality measure is the MLD, which is the population weighted mean of  $\ln(\bar{Y}/Y_i)$ . While descriptive results will be provided for the Gini index, the paper’s main analytic contributions are for the MLD, which is one of a class of measures proposed by Theil (1967). MLD has a number of advantages over the Gini index for our purpose.<sup>19</sup> As is well known, the national Gini index is not exactly additively decomposable between rural and urban indices but also reflects a component for the overlap in the distributions (Lambert and Aronson 1993). The MLD, by contrast, is exactly decomposable by population sub-groups, so total inequality is the inequality within groups plus the inequality between them (Bourguignon 1979). When comparing two distributions that differ in one person’s income, MLD also has the intuitively appealing property that the greater the distance from equality, the higher the inequality (Cowell and Flachaire 2018).

**Data and measures** The micro data from the national (rural and urban) household surveys by China’s National Bureau of Statistics (NBS) are not publicly available. To estimate the historical measures back to the 1980s, we have to rely on the available tabulations of grouped distributional data from these surveys. The tabulations are available in the household survey yearbooks produced by NBS (NBS 2000–2012 and NBS 2013–15).<sup>20</sup> NBS uses a standard household income definition, with both formal and informal sources (including inputted incomes in kind from own-farm production). The yearbooks provide the percentage of households in each income group ranking by per capita income and the average per capita income in each income group (weighted by household size and sampling expansion factors). They also provide the average household size in each income group, so that the percentage of households can be converted into percentages of individuals to form the population-weighted distributions. Different tabulation practices over time entail that these calculations are not feasible for all years, including after 2014.<sup>21</sup> So there are gaps in our series.

<sup>19</sup> Anand and Kanbur (1993a) and Kanbur and Zhuang (2013) note the advantages of MLD in this context.

<sup>20</sup> The grouped distributions are provided in the annual household survey yearbooks, under the category of “Basic Conditions of rural (or urban) households (grouped by annual per capita net income).” (The precise table numbers vary between yearbooks.)

<sup>21</sup> Since the population weighting is essential, we require that the yearbook tabulations provide average household size by each per-capita-income-group. At the time of writing these data were not available in all years, including (at the time of writing in late 2021) since 2014.



Our calculations from the tabulated distributions and related data use parameterized Lorenz Curves. We tested the functional forms proposed by Kakwani (1980) and Villaseñor and Arnold (1989).<sup>22</sup> The latter generally gave the best fit. We tested each empirical Lorenz curve (for each year and urban and rural areas separately) to assure that it satisfied the theoretical conditions for validity, most importantly that it is strictly increasing and convex on the (0, 1) interval. Once one has assured that the parametric Lorenz curve is valid, it is straightforward to calculate the inequality index corresponding to that Lorenz curve by integration.<sup>23</sup> The Lorenz curves for urban and rural areas are then aggregated consistently to a population-weighted national Lorenz curve, from which we calculate the national Gini index (the national MLD can be calculated from its components without the national Lorenz curve).<sup>24</sup>

As a further check on our calculations from the grouped data, with the help of staff of China's NBS household survey teams, we have compared our results to their calculations of the Gini index for each of urban and rural areas using individual record data from the same surveys. We could do these tests for all years before 2002, 2005–2009, and 2011–2014.<sup>25</sup> In all these tests, the differences for the Gini index were minor, with absolute gaps less than 0.0003, or 0.03 percentage points (pp) when the Gini index is expressed as a percentage.

Following Chen and Ravallion (2008, 2010) it is assumed that there is a 37% higher cost-of-living in urban areas in 2005 prices.<sup>26</sup> Thus, one obtains slightly lower Gini indices than those (including NBS) that ignore the higher cost-of-living in urban areas. Our 37% allowance is anchored to the consumption patterns of poor people in China. Ideally, we would allow for different urban–rural cost-of-living differentials by levels of income, but this is not feasible.

A data problem specific to China is notable in this context. Until recently, the sample frame for the Urban Household Surveys done by China's NBS had incomplete coverage of migrants from rural areas because it was based on place of registration (*hukou*) rather than place of residence. Some rural migrants manage to get urban registration, but many do not.

This has theoretically ambiguous implications for measures of inequality in China's urban areas (contrary to some claims made in the literature). Rural migrants are known to be generally poorer on average than those with urban *hukou*. That does not, however, imply that there will be an underestimation of urban inequality when one excludes those migrants in urban areas who still have rural *hukou*. Working against the fact that the migrants are poorer, inequality could well be lower among them than the rest of the urban population,

<sup>22</sup> For further discussion of these options and their properties for the purposes of measuring inequality see Datt and Ravallion (1992).

<sup>23</sup> Datt and Ravallion (1992) provide more detail on this step for both the Kakwani (1980) and Villaseñor and Arnold (1989) parametric Lorenz curves.

<sup>24</sup> Let  $L_R(p)$  and  $L_U(p)$  denote the (differentiable) rural and urban Lorenz curves, with corresponding quantile functions  $y_R(p)$  and  $y_U(p)$ , which are the inverses of the cumulative distribution functions  $F_R(y)$  and  $F_U(y)$ . For a given rural population share ( $p_R$ ) one finds its quantile ( $y_R(p_R)$ ) and then the value of the urban population share corresponding to that quantile, i.e.,  $p_U^*(p_R) = F_U[y_R(p_R)]$ . (In cases outside the region of common support, the relevant  $p$  is set to zero and the other is renormalized.) Mean incomes are then calculated for the poorest  $p_R$  and  $p_U^*(p_R)$  in rural and urban areas, and then aggregated by population weights to derive the national Lorenz curve.

<sup>25</sup> Our reported Gini indices are those from the grouped data. We do not use the results estimated by NBS from household-level data for two reasons: (i) we don't have their estimates data for all years; and (ii) we don't have their estimates for other variables including MLD.

<sup>26</sup> Note that the urban–rural cost-of-living differential adjusts over time consistently with the urban and rural CPIs. The 37% corresponds to 28.5% figure in 2011 prices (Ferreira et al. 2016, p.157).

such that including the rural migrants has an inequality-decreasing effect. It is then an empirical question as to which of the two effects dominates. Evidence on this question can be found in Du and Wang (2010, Table 3), who compare urban inequality measures for China in 2005 with and without the migrants. This indicates that excluding the migrants leads to an over-estimation of urban inequality.

Another consideration is that in 2013 the NBS sampling frame switched from being based on the place of registration (*hukou*) to being census based, such that rural migrant workers who had been in the city more than six months were re-classified as members of the urban population. Our results for 2013 and 2014 offer a clue as to the extent of possible bias due to this property of the prior samples. It should be noted, however, that other aspects of the survey changed in 2013, notably the unification of the urban and rural survey instruments, which entailed (among other things) the inclusion of imputed rents for owner-occupied housing in urban and rural areas. It is difficult to say what the combined effect of the changes introduced in 2013 would have been on inequality measures.

For the urban population share we use the implicit shares in the urban, rural and national measures of mean incomes. This is close to linear in time, as can be seen in Fig. 1, though the pace of urbanization sped up in the 1990s. On average, the share of the population living in urban areas increased by 1.1 pp per year over the period as a whole.

**Descriptive results** Applying these methods to the tabulated income distributions produced by NBS we obtain Fig. 2, which shows how the Gini index and MLD have evolved over time. Tables 1 and 2 provide our estimates by year. Both measures show a strong positive trend over the period, with rates of increase of 0.48 pp and 0.53 pp per annum for the Gini index and MLD respectively (using regressions of each index on time, with robust standard errors of 0.09 and 0.10 pp respectively). We also see a marked TP around 2008/09, with a downward trend since then.

As is well known, unambiguous rankings of distributions in terms of inequality are not possible if Lorenz curves intersect internally; the ranking will depend on specific attributes of the inequality index. However, between the low point in China's Gini index (1984) and the high point (2008), we find Lorenz dominance, implying that all inequality measures satisfying the usual Pigou-Dalton transfer principle will rank the distributions the same way (Atkinson 1970). Lorenz dominance also holds between 2008 and 2014, indicating that the main TP is also robust to the choice of inequality index.<sup>27</sup> While we only provide two specific inequality indices in this paper, this basic pattern in the data of a longer-term increase in inequality, and a major turning point after 2008, is robust to the choice of measure.

Notice that there are two TPs, with another “inverted U” TP in the mid-1990s (Fig. 2). (There are three periods of declining inequality, namely the early-1980s, the mid-1990s and the mid-2000s.) Someone writing this paper around 20 years ago may well have declared that a Kuznets TP had occurred already. However, within a few years after the 1994 TP, the upward trajectory for overall inequality had been restored (Fig. 2). A little over 10 years later a new TP appeared, in the period 2008–09, with 2008 as the peak in the Gini index. The 1994 TP was at an urban population share of 30% (for both inequality measures) while the latest TP was at 44% for the Gini index and 48% for MLD. The decline after the first TP

<sup>27</sup> These claims on Lorenz dominance are readily verified using the distributions for China in *PovcalNet*.

did not last, but that for the second continues. Over the period as a whole, the three series in Fig. 2 are more like roller coasters than inverted U's.

The fact that we see more than one TP does not (on its own) rule out the possibility of a Kuznets process at work. There may well have been inequality-increasing shocks, side-by-side with urbanization, such that a new Kuznets curve emerges after the shock. Section 4 will provide simulations that isolate the pure Kuznets effect.

The second TP has attracted much more attention than the first. Indeed (to our knowledge), all those who refer to China reaching its Kuznets or Lewis turning point refer only to the second TP, ignoring the first. (It is not uncommon to see graphs of China's Gini index or its urban–rural income gap, starting around 2000.) The trend rates of decline after 2008 are of similar (absolute) magnitude to the prior upward trends. For the Gini index, the trend rate of decrease after 2008 is almost identical to that before (-0.66 pp per annum after 2008, with a s.e. = 0.04 pp, versus a rate of prior increase of 0.65 pp, with s.e. = 0.04). MLD saw somewhat lower rates of decrease after 2008 compared to before (-0.65 pp after versus 0.86 pp). For both inequality indices, the difference in the coefficients before and after 2008 is statistically significant.<sup>28</sup>

Two further points are immediate from Fig. 3, which plots the Gini indices for urban and rural areas. First, in contrast to the Kuznets assumption, we find that the Gini index is higher in rural China than urban China, though there are signs of inequality convergence between the two sectors. Recalling the change in NBS surveys in 2013, it is notable that the urban Gini index rose sharply in 2013, with a mirror-image reversal in rural areas. If the change in 2013 was due to the aforementioned changes in sampling (Sect. 3) then one would expect it to persist in the following year. Instead, we see the Gini index bounce back, largely re-aligned with its pre-2013 trend in the following year (2014). With only two years, this cannot be conclusive, but it does not suggest that the sampling changes in 2013 point to the need for an overall adjustment of the time series data on inequality.

Second, inequality did not remain constant within each sector, but trended upwards. This would of course put upward pressure on overall inequality. However, from around 2005, the Gini indices become close to stationary in both sectors, albeit with fluctuations.

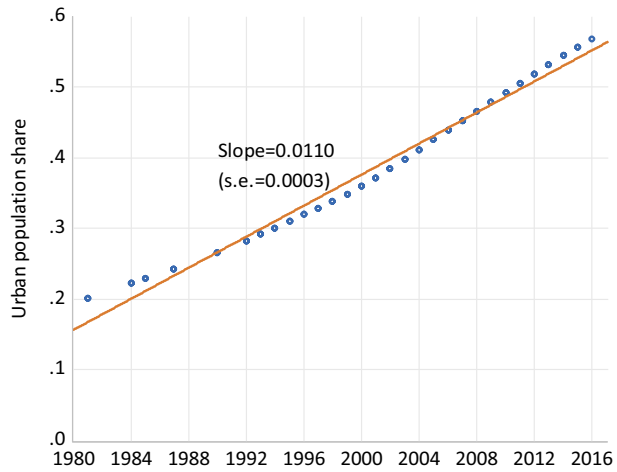
Could it be that the urbanization process has been driving inequality upwards within either rural or urban areas? This is not easy to assess, given that the urban population share is highly correlated with time (Fig. 1). Controlling for a trend and the lagged value, we find no correlation between the urban population share and the rural Gini index (prob. = 0.16). However, we find a strong negative correlation with the urban Gini index (prob. < 0.00005).<sup>29</sup>

So, we find some signs in the data that China's urbanization process was actually inequality decreasing within urban areas. Recall that rural migrants who have not obtained urban *hukou* were generally missing from the urban sample frame (which was registration based until recently). Under the assumption that there is less inequality among the rural migrants to urban areas than found in the rest of the urban population, we can understand this negative correlation between the urban population share and the urban Gini index. As

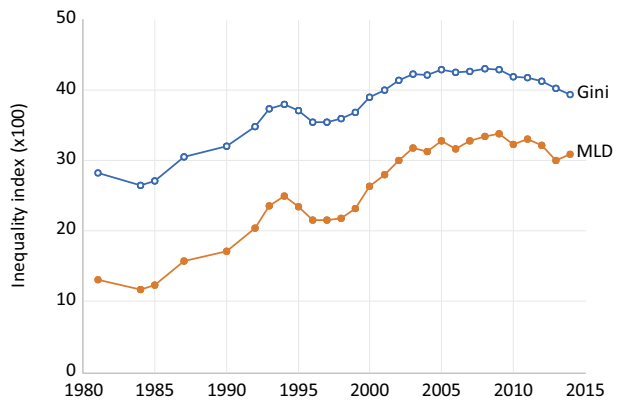
<sup>28</sup> The differences in the regression coefficients on time are -1.31 and -1.82 with robust standard errors of 0.06 and 0.07 respectively.

<sup>29</sup> The regression coefficient on the urban population share ( $\times 100$ ) is -1.29, with a robust standard error of 0.19. (The other regressors were the lagged urban Gini index and time, which had a regression coefficient of 1.77 (s.e. = 0.25)).

**Fig. 1** Urbanization in China. Note: Urban population shares implicit in estimates of mean incomes for urban, rural and national from China's National Bureau of Statistics



**Fig. 2** Time series for the inequality indices. Note: Authors' estimates (see Section 3 for details)



the urban population share rises in part due to rural migrants, some of whom obtain urban *hukou*, this will put downward pressure on measured urban inequality.<sup>30</sup>

### 4 The Kuznets process and MLD

We now take a closer look at MLD, the decomposability properties of which lend itself to a deeper investigation of whether the pattern in Fig. 2 is in fact a Kuznets curve.

**MLD in theory** The overall MLD is the sum of within-sector and between-sector values:

$$MLD = MLD^W + MLD^B \tag{1}$$

where the “within” ( $MLD^W$ ) and “between” ( $MLD^B$ ) components are:

<sup>30</sup> Recall that there are two effects of migration on urban inequality, working in opposite directions; on the one hand, migrants tend to be poorer than the urban residents, but on the other hand, there is also likely to be less inequality among the migrants.

**Table 1** Summary statistics and our estimates of the annual Gini

	(1)			(2)			(3)	(4)			(5)	(6)	(7)
	Mean income (\$/day/ person; 2011 prices)			Gini index (× 100)			Urban pop. share (%)	National			Rural	Urban	
	National	Rural	Urban	National	Rural	Urban		National	Rural	Urban			
1981	1.18	1.00	1.89	28.18	24.73	18.46	20.13						
1984	1.64	1.49	2.16	26.40	26.69	17.79	22.22						
1985	1.72	1.53	2.35	27.04	27.12	17.05	22.86						
1987	1.86	1.58	2.73	30.51	29.45	20.20	24.26						
1990	1.94	1.60	2.90	32.00	29.87	23.42	26.45						
1992	2.19	1.71	3.41	34.81	32.03	24.17	28.20						
1993	2.34	1.77	3.73	37.27	33.71	27.18	29.11						
1994	2.54	1.90	4.05	38.00	33.84	29.22	30.04						
1995	2.75	2.09	4.25	37.02	33.98	28.27	30.95						
1996	3.01	2.36	4.41	35.43	32.98	28.52	31.91						
1997	3.18	2.50	4.56	35.42	33.12	29.35	32.89						
1998	3.36	2.61	4.82	35.87	33.07	29.94	33.87						
1999	3.60	2.71	5.27	36.84	33.91	29.71	34.86						
2000	3.79	2.76	5.61	38.94	35.70	31.87	35.89						
2001	4.07	2.88	6.09	39.97	36.49	32.32	37.09						
2002	4.52	3.03	6.90	41.35	37.03	32.65	38.43						
2003	4.89	3.16	7.53	42.27	38.04	32.51	39.77						
2004	5.32	3.37	8.10	42.12	36.84	33.32	41.14						
2005	5.88	3.66	8.88	42.83	37.68	34.01	42.52						
2006	6.53	3.97	9.81	42.54	37.33	33.66	43.87						
2007	7.36	4.35	11.00	42.61	37.38	33.26	45.20						
2008	8.06	4.69	11.93	42.96	37.70	34.02	46.54						
2009	8.93	5.10	13.10	42.91	38.41	33.52	47.88						
2010	9.82	5.65	14.12	41.87	37.79	33.01	49.23						
2011	10.85	6.30	15.30	41.67	39.01	32.91	50.57						
2012	11.93	6.70	16.78	41.22	38.66	31.64	51.89						
2013	13.15	8.07	17.63	40.16	36.51	34.01	53.17						
2014	14.26	8.82	18.81	39.38	37.74	32.86	54.41						

Authors' calculations based on distributions of household per capita income produced by China's National Bureau of Statistics. (See text for details.)

$$MLD^W = S \cdot MLD_U + (1 - S) \cdot MLD_R \tag{2}$$

$$MLD^B = \ln \left[ S \cdot \bar{Y}_U + (1 - S) \cdot \bar{Y}_R \right] - \left[ S \cdot \ln \bar{Y}_U + (1 - S) \cdot \ln \bar{Y}_R \right] \tag{3}$$

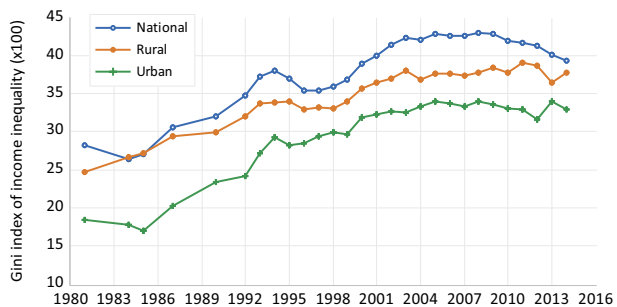
Here S is the urban population share and  $MLD_i$  ( $i = U, R$ ) are the MLD measures and  $\bar{Y}_i$  ( $i = U, R$ ) are the mean incomes, for urban and rural areas. Equation (3) can be re-written as:

**Table 2** MLD and its rural–urban decomposition

	(1) Rural	(2) Urban	(3) Within	(4) Between	(5) Total MLD
1981	10.20	5.90	9.33	3.73	13.06
1984	11.81	5.36	10.38	1.28	11.65
1985	12.28	4.80	10.57	1.72	12.28
1987	14.56	6.94	12.71	2.99	15.70
1990	14.81	9.35	13.36	3.70	17.07
1992	17.27	9.76	15.15	5.24	20.39
1993	19.32	12.17	17.24	6.27	23.51
1994	20.13	14.15	18.34	6.55	24.89
1995	19.63	13.21	17.64	5.79	23.44
1996	18.72	13.40	17.02	4.50	21.52
1997	18.89	14.24	17.36	4.22	21.58
1998	18.57	15.04	17.37	4.45	21.82
1999	19.65	14.69	17.92	5.29	23.21
2000	22.18	17.02	20.33	6.05	26.38
2001	23.36	17.49	21.18	6.81	27.99
2002	23.89	17.98	21.62	8.35	29.96
2003	25.46	17.81	22.42	9.31	31.73
2004	23.78	18.71	21.69	9.50	31.19
2005	25.62	19.47	23.01	9.74	32.75
2006	24.52	19.05	21.58	10.10	31.68
2007	24.96	18.62	22.10	10.61	32.71
2008	25.53	19.55	22.75	10.66	33.41
2009	26.66	18.94	22.97	10.86	33.83
2010	25.35	18.70	22.08	10.18	32.26
2011	28.73	18.28	23.44	9.53	32.97
2012	27.73	16.74	22.02	10.05	32.07
2013	25.59	20.13	22.68	7.29	29.97
2014	30.43	18.72	24.06	6.80	30.86

MLDx100. Authors’ calculations based on distributions of household per capita income produced by China’s National Bureau of Statistics. (See text for details.)

**Fig. 3** Gini indices



$$MLD^B = \ln[S \cdot \Psi + (1 - S)] - S \cdot \ln\Psi \tag{4}$$

where  $\Psi \equiv \bar{Y}_U/\bar{Y}_R$ , the ratio of the urban to the rural mean. Equation (3) shows that the between-sector MLD depends solely on the urban population share and the ratio of the urban mean to the rural mean. The Kuznets derivative can be written as:

$$\frac{\partial MLD}{\partial S} = \frac{\partial MLD^W}{\partial S} + \frac{\partial MLD^B}{\partial S} \tag{5}$$

where:

$$\frac{\partial MLD^W}{\partial S} = MLD_U - MLD_R \tag{6}$$

$$\frac{\partial MLD^B}{\partial S} = \frac{\bar{Y}_U - \bar{Y}_R}{\bar{Y}} - \ln\left(\frac{\bar{Y}_U}{\bar{Y}_R}\right) = \frac{\Psi - 1}{1 + S \cdot (\Psi - 1)} - \ln\Psi \tag{7}$$

(Recall that, in keeping with the KH, this is a partial derivative holding the distribution constant within each sector.)

The Kuznets derivative helps us understand when a TP can be expected with urbanization. In the special case of the Lewis (1954) model, we have  $MLD_U = MLD_R = 0$ , so all that matters is the between-sector component. Clearly, the latter component is a strictly concave function of the urban population share ( $\partial^2 MLD^B/\partial S^2 < 0$ ). So, if there is a Lewis TP, there can only be one. But is there even one (for  $0 \leq S \leq 1$ )? It must be the case that  $\Psi - 1 \geq \ln\Psi$  for any  $\Psi > 1$ .<sup>31</sup> Then, on evaluating (5.2) at  $S = 0$ , we see that in the Lewis model, and the Kuznets model with  $MLD_U > MLD_R$  (Assumption (i)), the national MLD must increase in the initial stages of urbanization ( $\partial MLD/\partial S > 0$ ). At the opposite extreme, consider the point just before the country becomes fully urbanized. As one approaches the upper limit,  $S = 1$ , we have  $\partial MLD^B/\partial S = 1 - \Psi^{-1} + \ln\Psi^{-1} < 0$  (with  $0 < \Psi^{-1} < 1$ ). So, there must be a unique TP for the Lewis model. In other words, the Lewis TP does not in fact require a narrowing of the urban–rural income gap as the rural labor surplus is fully absorbed by modern-sector enlargement; the urbanization process itself will generate the Lewis TP.

For the Kuznets model, however, we cannot sign the Kuznets derivative ( $\partial MLD/\partial S$ ) at  $S = 1$ . If  $MLD_U$  is sufficiently high relative to  $MLD_R$  then no TP will exist (for  $0 \leq S \leq 1$ ). The necessary and sufficient condition for the (interior) Kuznets TP is that  $MLD_U - MLD_R < \Psi^{-1} + \ln\Psi - 1 (> 0)$ . That is an empirical issue.

As is also clear from the above analysis, one can obtain an inverted U without the classic Kuznets assumption that  $MLD_U > MLD_R$ . Suppose instead that  $MLD_U < MLD_R$  implying that  $\partial MLD^W/\partial S < 0$  (for all  $S$ ). However, as noted, the between-sector component is increasing in  $S$  in a neighborhood of  $S = 0$ . If this effect is large enough then we will see rising total inequality at low  $S$  despite the falling  $MLD^W$ . More precisely, if  $MLD_R - MLD_U < \Psi - 1 - \ln\Psi$  then we will see rising total inequality at low  $S$ . Noting that the RHS of this inequality is strictly increasing in  $\Psi$ , we can see that the combination of “modestly” higher rural inequality with a relatively large gap in mean incomes between

<sup>31</sup> Note that, since  $\varphi(\Psi) \equiv \Psi - 1 - \ln\Psi$  is strictly convex with its minimum at  $\Psi = 1$ ,  $\varphi(\Psi) > 0$  for all  $\Psi > 1$ .



urban and rural areas can yield rising inequality at low  $S$  under the Kuznets process of migration. Also, recalling that the between-sector component is concave in  $S$ , we can see that the overall sign of  $\partial\text{MLD}/\partial S$  can reverse at high  $S$ , giving the inverted U. This too is an empirical issue.

Another factor is the urban–rural gap in mean incomes. Two observations are relevant here. First, holding distribution within sectors and the urban population share constant, a higher value of  $\Psi$  will be inequality increasing:

$$\frac{\partial\text{MLD}}{\partial\Psi} = \frac{\partial\text{MLD}^B}{\partial\Psi} = S \cdot \bar{Y}_R \cdot \left( \frac{1}{\bar{Y}} - \frac{1}{\bar{Y}_U} \right) > 0 \quad (8)$$

Second, there is an interaction effect between population urbanization and the urban–rural income gap, as given by:

$$\frac{\partial^2\text{MLD}}{\partial\Psi\partial S} = \frac{1}{[1 + S \cdot (\Psi - 1)]^2} - \Psi^{-1} \quad (9)$$

This vanishes in the limit when  $\Psi = 1$ , but it also has an interior turning point. For  $\Psi > 1$ , it is readily verified that the sign of the interaction effect is unambiguously positive at  $S = 0$  and negative at  $S = 1$ . In other words, at the beginning of the urbanization process, a larger gap between urban and rural incomes will make urbanization more inequality increasing, but by the end of the process the opposite is true—near 100% urbanization, a larger gap makes it more likely that further urbanization will be inequality decreasing.

**MLD in China** Turning to the data for China, Table 2 gives our estimates of MLD and its urban–rural decomposition as plotted in Fig. 4. As for the Gini index, the first TP is in 1994. For MLD the second TP is in the same period as the Gini, though the peak is one year later, in 2009.

Similarly to the Gini index (Fig. 3), we see a rise (fall) in the urban (rural) MLD in 2013, but a roughly compensating recovery in 2014. As for the Gini index, we do not see the kind of persistent effect of the changes in sampling and survey design in 2013 that would warrant any adjustment to the urban–rural inequality comparisons. However (as noted), other evidence suggests that the change in sampling alone in 2013 (to include recent migrants) would have lowered urban inequality.

We see a difference between the first and second TPs in Fig. 4. The first stemmed from TPs in both the between and within components of MLD, and the within component reflected TPs in both urban and rural inequality. By contrast, the second TP is mainly due to the between-sector component, which co-moves closely with the overall MLD. If one imagines simply closing off all changes in the between-sector component—so that changes in overall inequality were driven solely by the within-sector component—then there would have been no second TP.

Recall that formal statements of the KH in the literature have made three key assumptions (Section 2): higher inequality in urban areas; higher mean income in urban areas; and that the migration process is distribution-neutral within sectors. We find that two of these assumptions do not hold for MLD in China. First, we see that there has been a trend increase in the within-sector component of MLD, although this component has been close to stationary in the new Millennium (Fig. 4). When we decompose the within-sector component we see movements both up and down in the rural MLD, although in 2014 it

was well above its value in 2009—indeed, rural inequality had reached the same level as national inequality, similarly to the beginning of the period (Fig. 4). Also, as we saw for the Gini index, the urbanization process appears to have been inequality decreasing within urban areas, but had no significant effect on rural inequality.<sup>32</sup>

Second, consistently with the Gini indices,  $MLD_U < MLD_R$ , so the sign of the Kuznets derivative at  $S = 0$  is ambiguous, while  $\partial MLD / \partial S < 0$  at  $S = 1$ . It is unclear whether there will be a rising segment of the inverted U under the Kuznets process, but the downward segment will exist.

Thus, despite the repeated references in the literature to “China’s Kuznets curve,” it is unclear whether an urbanization process postulated by Kuznets would yield a Kuznets curve in China. The data can help resolve the matter. Figure 5 shows our calculations of the Kuznets derivative by year. We find that the Kuznets process would have been inequality decreasing in most years; the exceptions are 1981 and the first half of the 1990s. There are two inverted U’s, with three TPs: 1983, 1988 and 1999.<sup>33</sup>

However, what is striking about the estimates of the Kuznets derivatives in Fig. 5 is how small they are, noting that the annualized increase in the urban population share over the whole period is only 0.011 (about 1 pp increase per year). Consider, for example, the median year, 2000. The “within” component of the Kuznets derivative is -0.05 ( $MLD_U = 0.17$ ;  $MLD_R = 0.22$ ). This is largely counterbalanced by the “between” component of 0.04 ( $\bar{Y}_U = 5.61$ ;  $\bar{Y}_R = 2.76$ ;  $\bar{Y} = 3.79$ ). The total Kuznets derivative is only -0.01, or a 1 pp reduction in the MLD in going from zero urban population share to 100% urbanization. Granted the mean Kuznets derivative over the entire period is higher, at -0.04, but the point is clear.

To bring the observations in this section together, Fig. 6 plots both the actual MLD (from Fig. 4) and a simulation using our estimates of the Kuznets derivatives, which can be interpreted as the “pure Kuznets curve” for China. This is obtained by starting from the same value in 1981 but only incrementing the empirical MLD value for each year by the change in the urban population share multiplied by the relevant Kuznets derivative. We see that the pure Kuznets process of urbanization does yield the Kuznets curve for China despite the fact that inequality is higher in rural areas. However, the simulated series is clearly very flat until the late 1990s; MLD rises only slightly, from 13.00 in 1984 to 13.10 in 1998. From about 2000, we see declining inequality attributable to the Kuznets process. Taken as a whole, however, it is evident from Fig. 6 that the Kuznets process has virtually no power to explain the path of inequality in China.

Could it be that the urbanization process was in fact driving up the urban–rural income gap, even though it contributed very little to the rise in overall inequality via the Kuznets process (recalling that the Kuznets derivative is a partial derivative, holding  $\bar{Y}_U$  and  $\bar{Y}_R$  constant)? The values of  $\Psi$  are plotted in Fig. 7.<sup>34</sup> Again, controlling for the lagged value of  $\Psi$  and a time trend, we find a negative partial correlation between  $\Psi$  and  $S$  (as %); the regression coefficient is -0.051 with a standard error of -0.026 (significant at the 6% level). If we use the two-year moving average of  $S$  then there is a small gain in precision

<sup>32</sup> For the urban MLD, the regression coefficient on  $S$  ( $\times 100$ ) is -0.88 (s.e. = 0.17) (with the lagged urban MLD and time as the controls).

<sup>33</sup> Using linear interpolation and rounding to the nearest integer.

<sup>34</sup> To the extent that income under-reporting is a greater problem in urban areas there will be a bias in the series in Fig. 7. The estimates by Piketty et al. (2019 Fig. 5) incorporating income tax records and national accounts data show a very similar pattern over time to Fig. 7, but with higher ratios of urban to rural, peaking at around the same time but at a level of about 3.7 instead of 2.6.

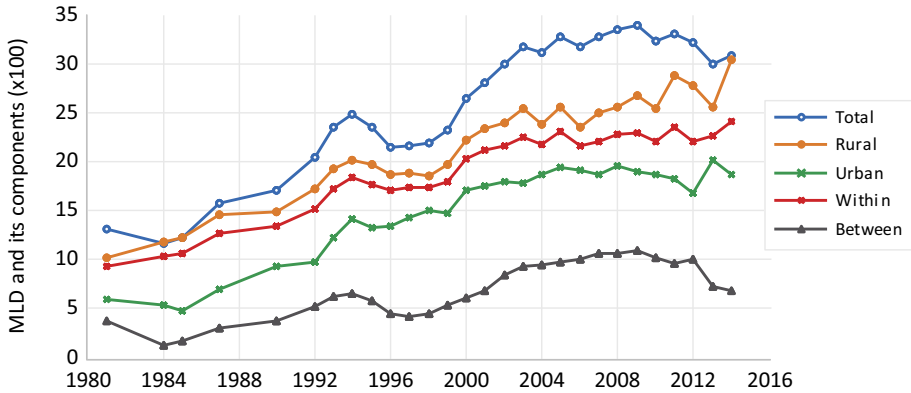


Fig. 4 MLD and its decomposition. Note: Authors’ estimates (see Section 3 for details)

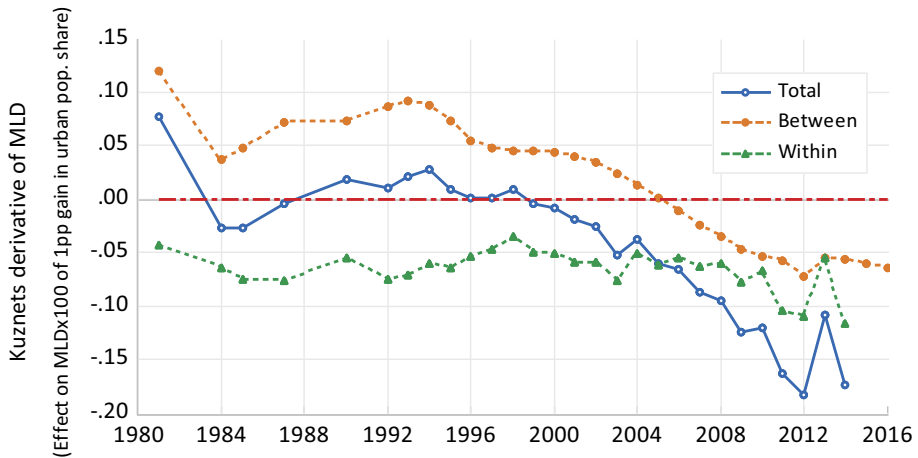


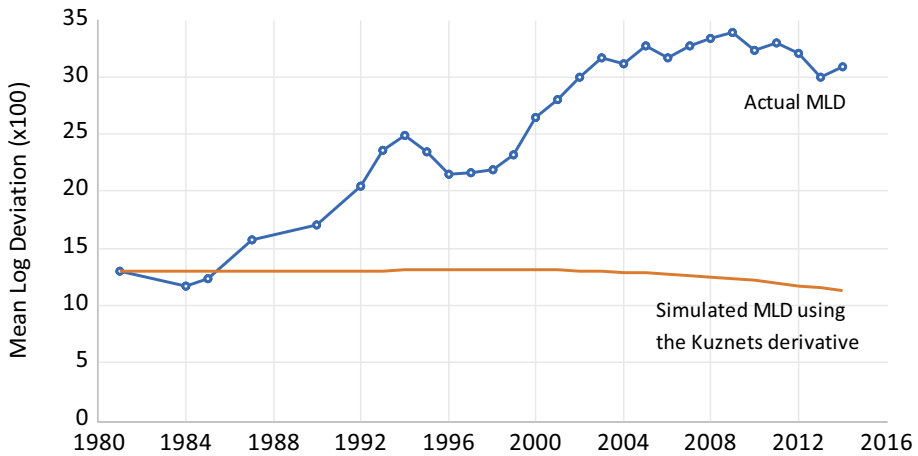
Fig. 5 The Kuznets derivatives of MLD

(a coefficient of  $-0.054$ ,  $s.e.=0.024$ ,  $prob.=0.04$ ). So, the data are more suggestive that urbanization has reduced the urban–rural income gap in China.

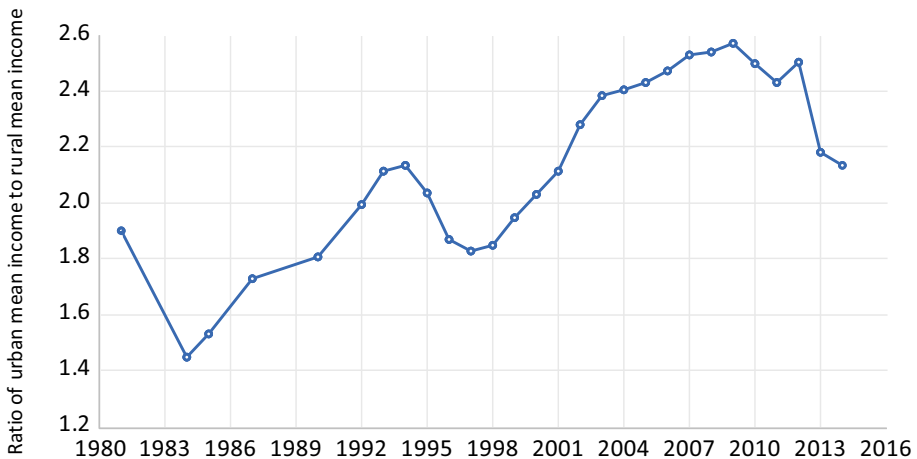
### 5 Alternative explanations for the turning points

This still leaves begging the question as to why we saw the turning points in inequality, given that it appears to have little to do with the Kuznets Hypothesis. While causal attribution is difficult (as always), the economic history of China suggests some plausible candidates. As noted in the Introduction, we focus on explanations for the TPs, rather than the underlying long-term trend.

We develop our argument in two steps. First, we demonstrate how important the urban–rural mean income gap has been to the evolution of overall inequality in China, and we show that changes in agricultural output per capita were key to the changes in the



**Fig. 6** Actual MLD and a pure Kuznets curve. Note: Authors' estimates (see Section 3 for details)



**Fig. 7** Ratio of urban mean to rural mean ( $\Psi$ )

urban–rural income gap. Second, we describe the main agrarian policy reforms, noting when they occurred.

**The role of the urban–rural income gap** Comparing Figs. 3 or 4 with Fig. 7 for the ratio of the urban mean income to the rural mean, strong co-movement is evident; both levels and changes are highly correlated. (In the levels, the correlation coefficients of the overall inequality measures with  $\Psi$  are 0.93 and 0.94 for Gini and MLD respectively; the corresponding correlations for the first differences are 0.80 and 0.75.) Focusing on the turning points, the first, in 1994, coincided with a sharp reduction in the ratio of the urban mean to the rural mean (Fig. 7) for both inequality indices. The next peak in the ratio is in 2009, again coinciding closely with the TPs in the inequality indices.

To further quantify the importance of the urban–rural income gap to the TPs, Fig. 8 gives the counterfactual series (one for the Gini index and one for MLD) obtained by controlling for changes in the ratio of the urban mean to the rural mean. For this purpose, a cubic polynomial in  $\Psi$  was used as the regression control function, and the control value was set at the value of  $\Psi$  at the beginning of the series, in 1981.<sup>35</sup> We see that without any change in  $\Psi$  both TPs would have vanished (for both inequality indices). The Gini index would have been on a trend decline since the mid-1990s.<sup>36</sup> The MLD would have been a nearly stationary process.

A more flexible representation of the correlation with the distribution of income is found in Fig. 9, which gives the estimated elasticity of the national decile shares to  $\Psi$ . These are estimated using a regression of log decile share on  $\ln\Psi$ , with controls for both a time trend and the lagged dependent variable. (Strong serial correlations in the error terms are indicated otherwise.) We see that the elasticity varies from -0.755 (s.e. = 0.116) for the poorest decile to 0.311 (0.114) for the richest, with an elasticity of almost exactly zero at decile 8. The redistributive impact of the urban–rural income gap is obvious from Fig. 9.

In drilling down further, we find a strong link in China between agricultural output and the gap between urban and rural mean incomes. Regressing the (log)  $\Psi$  on (log) primary sector GDP per capita (GDP1) at constant prices with one-period lags and a time trend, we find that<sup>37</sup>:

$$\ln\Psi = -41.234 + 0.831\ln\Psi_{-1} - 1.626\ln\text{GDP1} + 0.858\ln\text{GDP1}_{-1} + 0.024\text{year} + \hat{\varepsilon} \quad R^2 = 0.896, n = 27 \quad (10)$$

(18.473)      (0.131)      (0.299)      (0.287)      (0.010)

The parameter values are suggestive of a simple difference model<sup>38</sup>:

$$\Delta\ln\Psi = 0.047 - 1.013\Delta\ln\text{GDP1} + \hat{\varepsilon} \quad R^2 = 0.403, n = 27 \quad (11)$$

(0.020)      (0.235)

In terms of the year-to-year changes we see that  $\Psi$  has an elasticity w.r.t. GDP1 of about unity. A similar elasticity is obtained if one uses agricultural value added per worker at constant prices, for which the corresponding elasticity is -0.910 (s.e. = 0.289).

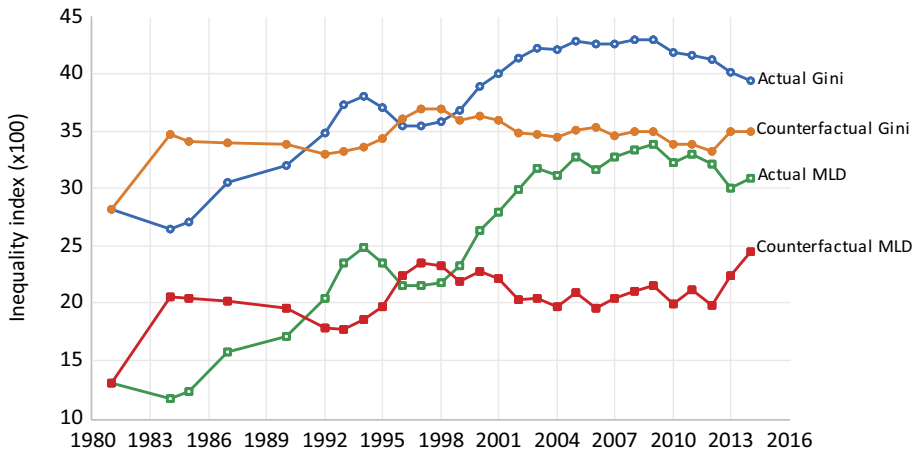
This is suggestive of the mechanism proposed in Lewis (1954). As noted in the Introduction, a segment of the literature has declared a “Lewis turning point” in China, having anticipated this for some time. The theories behind the Kuznets and Lewis TPs are different, with the latter dependent on the success of the expanding urban economy in absorbing the (claimed) labor surplus in rural areas. The argument is that once the rural labor surplus is absorbed, the wage rate of agricultural workers will start to rise. (As noted in Sect. 5, this is not in fact required for a Lewis TP.) The data on agricultural output per worker offers some support for the view that China has recently passed a Lewis turning point, whereby falling inequality comes in the wake of a large gain in agricultural output per worker.

<sup>35</sup> Polynomials in  $\Psi$  were tested up to order 5. For both inequality indices, the cubic gave the best fit using adjusted  $R^2$  as the criterion.

<sup>36</sup> Post-1995, the trend decline in the Gini index (regressing log Gini on time) is 0.4% per annum (with a standard error of 0.08%).

<sup>37</sup> The standard errors (in parentheses) are robust to the presence of both heteroskedasticity and autocorrelation of unknown form (assuming that the autocorrelations fade for more distant observations); see Newey and West (1987).

<sup>38</sup> The joint F-test of the parameter restrictions gives  $F(3,22) = 2.76$  (prob. = 0.07).



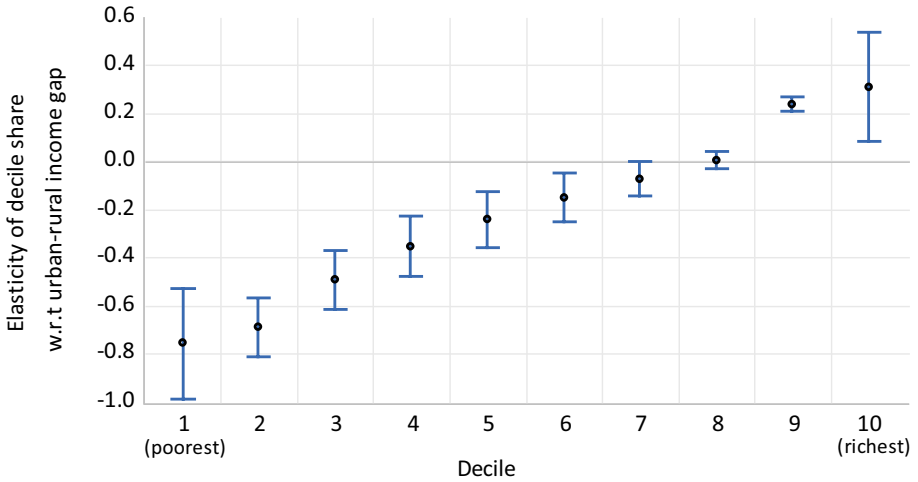
**Fig. 8** Contribution of changes in the urban–rural income gap to total inequality. Note: Authors’ estimates (see Section 4 for details)

Given the relatively equitable distribution of use rights for agricultural land in China (a legacy of the Deng’s agrarian reforms), the agricultural labor market is very thin (compared to, say, India). Nonetheless, the available data on wages for hired farm labor in rural China do suggest a marked increase around 2004–6, consistent with the idea of a Lewis TP stemming from absorption of the rural labor surplus (Wang 2010; Cai and Du 2011).

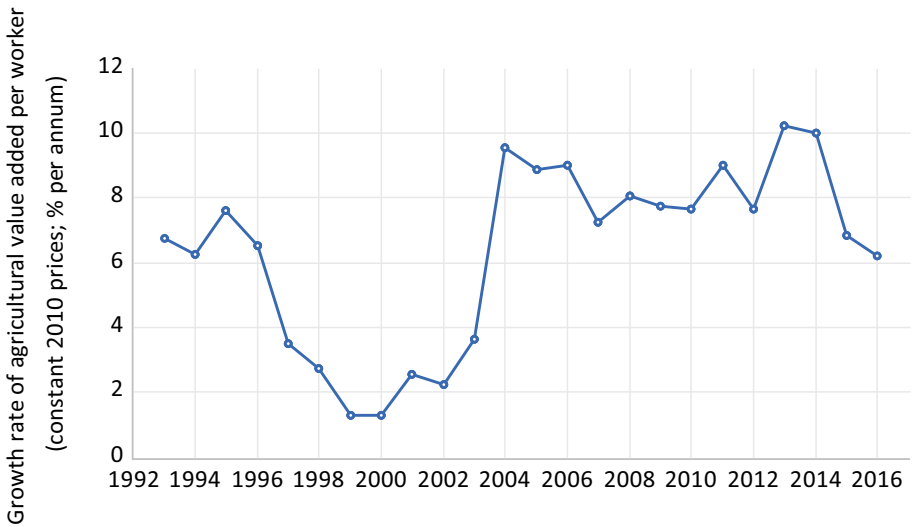
Two other sources of data support this view. The first is agricultural output per worker (which is also in keeping with the formalization of the Lewis model in Ranis and Fei 1961). Figure 10 gives the series on the growth rate of real agricultural value added per worker in China.<sup>39</sup> We see a marked increase in growth rates from 2004 onwards. The second source is survey data on unskilled, non-agricultural, wages. The expectation is that these should reflect the change in the opportunity cost of agricultural labor once the rural labor surplus was absorbed. Cai and Du (2011) and Feng (2013) provide a survey-based compilation of average wage rates for rural migrant workers in urban areas, which (on deflating by the CPI) shows a marked increase from the early 2000s. These data are at least consistent with the idea that, allowing for a lag, the second inequality TP we see in Fig. 2 was indeed a Lewis TP.

**Agrarian policies** There has been a long-standing urban bias in China’s development policies, with urban areas favored through public subsidies and other forms of public spending that assured better access in the cities to cheap food, finance, infrastructure, and social policies including education, health and social protection. The *hukou* system reinforced this bias, by restricting migrant access to the services available to registered urban residents. The bias goes back to development policy making under the Maoist regime in which central planning strived for rapid industrialization, financed in part by extractive policies in

<sup>39</sup> The series on agricultural value added per worker is from the World Bank’s *World Development Indicators*. The series starts in 1991.



**Fig. 9** Elasticities of decile shares to the urban-rural income gap. Note: Based on regressions of log decile shares on the log of the ratio of the urban mean to the rural mean, including the lagged dependent variable and a time trend. Bands indicate  $\pm$  two (robust) standard errors. N=27



**Fig. 10** Agricultural value added per worker. Note: 2010 prices. Includes forestry and fishing, Source: World Bank's *World Development Indicators*, combining output data from the national accounts with employment data from the ILO



the rural sector.<sup>40</sup> The bias continued into the period of study, though with various reforms (Putterman 1993; Yang 1999). The urban bias in public spending and the migration restrictions appear to be deeply rooted in China's political economy. The urban bias was compounded by a geographic bias in policy making favoring coastal areas over inland areas.

The main enforcement mechanisms for urban bias have involved various agrarian policies, and reforms to those policies appear to have been a powerful instrument against inequality. In what follows we will argue that the history of China's agrarian policies can help us understand the turning points we have seen in the urban–rural income gap. A key aspect is how much agriculture was (implicitly or explicitly) taxed to support industrial development. Over time, we have seen a switch from taxing agriculture this way to more neutral and even agricultural subsidies.<sup>41</sup> This did not (of course) happen continuously, but in discrete jumps. We will argue that these coincided fairly closely with the turning points in inequality.

All three periods of declining inequality in China since 1980 coincided with significant agrarian reforms. The first was the set of reforms introduced under Deng Xiaoping, notably the Household Responsibility System, which abandoned collective agriculture to return to peasant family farming. It is not widely appreciated that the market-based reform agenda that put China on its impressive trajectory over the last 40 years started in agriculture.<sup>42</sup> The first set of reforms entailed a massive land reform, whereby virtually all the agricultural land was privatized (in terms of use rights, but not ownership rights) in a fairly equitable way within communes, and it created stronger incentives for individual production by assuring that farmers received the marginal revenue product of their labor and by reducing impediments to trade.<sup>43</sup> Naturally, this reduced the urban–rural gap in real incomes.

The second decline in inequality came with the first TP. This coincided with the reversal in the mid-1990s of one aspect of the policy package introduced by Deng Xiaoping's administration in 1978. Between the beginning of Deng's reforms and the mid-1990s, the government had a domestic foodgrain procurement policy in which farmers were obliged to sell fixed quotas to the government at prices set below the local market price. This was done to help assure an adequate supply of cheap food to urban areas. Reducing this tax by raising procurement prices to market prices in the mid-1990s stimulated primary sector GDP and thus reduced overall inequality (Ravallion and Chen 2007). There is also evidence that reforms to implement local (village-level) democracy around the same time were inequality decreasing within rural areas (Shen and Yao 2008).

The third set of policy changes were around the middle of the first decade of the new Millennium.<sup>44</sup> (This is not well documented in the English-language literature, so we will provide details.) The first step in this policy change was the removal (in August 2003) of agricultural taxation in Shanghai. In 2004, the Government cut the agricultural tax rate by one percentage point and eliminated other special agricultural product taxes (with the exception of tobacco). At the same time, pilot testing was underway for a plan to remove

<sup>40</sup> For further discussion of this aspect of the history of China's development policies see Ravallion (2021) and references therein.

<sup>41</sup> For a recent review of the history of agricultural policy see Lin and Huang (2021).

<sup>42</sup> This observation about the sequencing of reforms is arguably one of the key lessons from China's success for other developing countries (Ravallion 2009, with reference to lessons for Sub-Saharan Africa).

<sup>43</sup> Deng's reforms have been described and analyzed quite fully in the literature. See, in particular, Ling (1991) and Lin (1992).

<sup>44</sup> An earlier reform in the early 2000s, "Tax-for-fee" (*feigaishui*), had helped reduce the tendency for local governments to prey on poor farmers with various ad hoc levies and taxes (Yep 2004).

all agricultural taxes in Jilin and Heilongjiang provinces. In 2005, testing began to remove all agriculture taxes in 592 national poor counties. On December 29, 2005, at the 19th meeting of the Standing Committee of the 10th National People's Congress, it was decided that the Agricultural Tax Regulations would be repealed from January 1, 2006. These policy changes also came with the introduction of price support policy for rice (in 2004) and wheat (2006) (Lin and Huang 2021).

The poor tended to benefit the most (proportionally) from the reduction in agriculture taxes and fees since the agricultural tax had been regressive (World Bank 2009, p11). It was not based on farmer's net income (or net agriculture income), but rather it was typically based on the size of land that the farmer contracted. As noted, Deng's reforms at the time of de-collectivization assured relatively equitable land allocation. Thus, poor farmers ended up paying a high tax, and their tax rate (agriculture tax as a share of total net income) could be higher than average, since poor farmers have less off-farm income. Hence, removal of the agriculture tax has a significant impact on the rural poor. The average agricultural tax cut was about 120 Yuan per capita in 2006, which accounts for 17% of the net income of the poorest 6.1%. The average agricultural tax rate was only about 3.3% for the rural sector as a whole.<sup>45</sup>

**Reforms ahead** New policy reforms relevant to inequality in China will be needed over the coming years. The gap in living standards between urban and rural areas reflects in part a long-standing inequality in social policies (health, education and social protection) (Knight and Song 1999). The large urban–rural gap in education attainments is of special concern (Rozelle and Hell 2020). Expanding the coverage of social policies to include rural areas will clearly reduce urban–rural inequality and (hence) overall inequality in China.<sup>46</sup> Less inequality of educational opportunity will also be needed nationally. Further progress toward eliminating the *hukou* registration system would also help. The coverage of the income tax system has expanded in the new Millennium and this can be expected to play an important future role as both a redistributive instrument and as a means of financing redistributive social policies.

## 6 Conclusions

There has been a tendency to declare a “Kuznets curve” whenever one sees an inverted U in how some social, economic, political or environmental variable evolves with economic development. Yet the turning point in the inverted U may have little or nothing to do with the process of economic development through modern-sector enlargement postulated in the classic models of Kuznets and Lewis. And the implications (including for policy) may depend on why we see such a turning point.

The paper has provided new series of inequality measures back to 1981 and used these to assess whether the claimed “Kuznets curve” for China has anything to do with Kuznets. We confirm that our new measures look like a “Kuznets curve,” at least since the late

<sup>45</sup> Authors' calculations based on the Tables 3.7 and 3.8 in NBS (2007).

<sup>46</sup> For example, China's *Dibao* program (aiming to provide a floor to incomes using cash and in-kind benefits) started in urban areas, but a version has been created for rural areas.

1990s. Statistically, one would be confident in declaring this to be a “significant” inverted U. However, our analysis indicates that the country’s trajectory for inequality (since soon after the time that Deng Xiaoping’s reforms began) has had rather little to do with the Kuznets Hypothesis as formalized in development economics. We have extracted a “pure Kuznets curve” showing the evolution of inequality (measured by the mean log deviation) under the Kuznets process, but we find that it a very flat inverted U. Nor do the data for China support the view that the urbanization process has been driving up urban–rural disparities in mean incomes, or inequalities within either urban or rural areas; if anything it is the opposite.

More plausibly, the turning points for inequality have stemmed from date-specific reversals in the longer-term pattern of divergence between urban and rural mean incomes. Indeed, once we control for the ratio of the urban mean to the rural mean we find no sign of a trend increase (or decrease) in income inequality in China since the mid-1990s. The counterfactual Gini index would have seen a trend decline. Causal attribution is difficult of course, but we have also pointed to specific policy changes that helped the rural sector, and coincided with all three periods of declining inequality in China’s economic history since 1980, including the two (known) inverted-U turning points.

Just as China’s first turning point for inequality was short lived, we cannot be complacent about the latest turning point, which has received so much attention. These reversals in the direction of change in overall inequality are not the realizations of some more-or-less inevitable, theoretically grounded, process in economic development through urbanizing structural transformation. In large part, for China, they appear to reflect policies. Just as we saw in the first turning point, unless there is a continuing commitment to redistributive effort, China could well return to its upward trajectory for overall inequality.

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**Data availability** The primary archival data on the distribution of income used here are tabulations done by China’s National Bureau of Statistics and found in that annual NBS yearbooks going back to the early 1980s. These archival data were assembled by the authors over a number of years and then used to estimate a standardized time series of inequality indices according to the methods reported in the paper. The results are given in Tables 1 and 2 of the paper.

## Declarations

**Conflict of interest** There is no conceivable conflict of interest regarding this research and the paper. No financial or other support was received from any source besides the normal salaries of the authors. No party has reviewed the paper aside from providing purely scholarly commentary.

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