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Highlights

- China's economic development in recent decades has been tremendous, and reported poverty reduction very high, but exact numbers are subject to debate.
- This paper uses Engel curves to identify price levels and real incomes that are comparable across both time and space.
- Urban and coastal areas that have experienced the fastest economic development are reported to have smaller price increases than the poorer rural and inland areas.
- China has experienced substantial poverty reduction in a time with high economic growth, but more moderate than reported by the World Bank and the official consumer price index.

The cost of a growth miracle – reassessing price and poverty trends in China

Ingvild Almås and Åshild Auglænd Johnsen*

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Abstract

China's economic development in recent decades has been tremendous, but also subject to debate. This paper uses Engel curves to identify price levels and real incomes that are comparable across both time and space. Based on these, new poverty trends are presented. We find that the urban and coastal areas that have experienced the fastest economic development have also seen smaller price increases than the poorer rural and inland areas. Our measures reveal that China has experienced substantial poverty reduction in a time with high economic growth, but compared to both the World Bank measures and those based on official CPI adjustments, our measures suggest a more moderate poverty reduction. Our findings imply that poverty was reduced by 40 and not 66 percent using the $1 dollar a day measure.

(*JEL*: D1, E31, F01)

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1 Introduction

Since the "Reform and Opening-up" policy was initiated in late 1978, the economic development of China has been tremendous.[1] The average annual growth rate in this period is reported to be about ten percent (World Bank, 2018; Song et al., 2011). Since Simon Kuznets' seminal work on economic growth and inequality, it has been debated whether or not inequality and poverty increase or decrease for economies in transition (Kuznets, 1955; Dollar and Kraay, 2002; Lübker et al., 2002). The World Bank indicators show large poverty reductions in China in this period of high growth rates; for example, the one dollar a day measure reveals a decrease from 84 percent poor in 1981 to 12 percent poor in 2009. Although the numbers on economic performance in China are crucial inputs to both national and international debates and policy designs, there is significant uncertainty related to these numbers. Not only is there uncertainty related to the income and GDP estimates, e.g., the World Bank shrunk China's GDP by 40 percent in November 2007 (Feenstra et al., 2013), but there is also severe challenges related to the standard price adjustments conducted.

In this paper, we use nationally representative micro data from urban and rural areas in China, and the estimation of Engel curves through the Almost Ideal Demand System, to identify both spatial and temporal price indices. We then use the identified indices to report trends in poverty. In order to study poverty in China, including rural areas is crucial as a large fraction of the country's poor reside in rural areas, and there are large economic inequalities between urban and rural areas.

Our findings suggest that the areas that experienced the highest growth, the coastal and urban areas, also experienced the lowest price growth. The official statistics does not reveal this as they report very similar and very small price changes in *all* areas in the time under study. Urban prices were initially substantially higher than rural prices, and hence our temporal price indices reveal price convergence between urban and rural areas. As rural areas tend to be poorer, our estimates also reveal a more moderate poverty reduction than what was reported by the World Bank.

Since people who are classified as poor tend to reside in rural areas, our finding - that inflation in rural areas was higher - results in a more moderate poverty and inequality reduction. When we compare poverty estimates based on our spatial price measure (SPI) and the consumer price index (CPI), we find that the CPI adjusted incomes implies that rural poverty was reduced by about 60 percent between 1995 and 2002. SPI adjusted incomes implies that this reduction was only half this size, around

[1] "Reform and Opening-up" in Chinese: 改革开放.

30 percent. The CPI adjusted incomes are also underestimating the reduction in urban poverty, but to a lesser extent than for rural areas. In sum, our findings imply that poverty was reduced by 40 and not 66 percent using the $1 dollar a day measure.

The period we study in this paper, 1995 to 2002, was greatly influenced by the official adoption of a landmark reform program in November 1993 aimed at guiding China to become a "socialist market economy" (Qian and Wu, 2003).[2] This period encompassed both an official embrace of liberalization and a more market-orientated economy, and high economic performance and substantial poverty reduction. Our finding of price convergence is consistent with four documented developments (price liberalization, regional economic reforms, labor migration, the outlet effect) which we review in the discussion following the results.

The World Bank has made some adjustments to correct for spatial price differences, but fundamentally, their approach to measure poverty in China relies on the use of official CPI measures.[3]

Our methodology relies on the estimation of one Engel curve. We estimate the Engel curve for food, but in principle, we could use the estimation of an Engel curve for any good, that is, we could in principle use any good as an indicator good. However, there are several reasons why food is an ideal indicator good (see Hamilton (2001) and Costa (2001)). First, the method does not rely heavily on micro *price* data. Micro price data are scarce in any country, and China is no exception. To our knowledge, there are no official and available price indices that allow for cross-province comparisons, and price data on specific goods are extremely limited. Second, the Engel method is founded in consumer theory, and the method automatically ensures that the resulting price indices are consistent with observed consumer behavior. Third, we do not have to rely on the official CPIs that have been subject to debate. Fourth, as we use the reported food shares and total expenditures by households, the indicators are not politically sensitive to the same extent as local and national GDPs and CPIs.

The idea of using Engel curves to reveal biases in CPI was pioneered by Hamilton (2001). Several papers have afterwards applied the Engel method to estimate biases in

[2]The reform program was officially outlined in "Decisions on Issues Concerning the Establishment of a Socialist Market Economic Structure". In Chinese: 关于建立社会主义市场经济体制若干问题的决定.

[3]The exact deflators used by the World Bank have not been made available to us, and hence we are unable to make any direct comparison to the World Bank deflators here as both the price deflators and the income measures used by the World Bank differ from ours. We do, however, compare our poverty results to those resulting from the World Bank methodology, and we also compare our price estimates to those of Brandt and Holz (2006), who exploit regional price data published in various yearbooks around 1990 to construct spatial deflators for rural and urban areas (separately and combined) and then combine these with official CPI measures to estimate price variation across time and space.

the CPI. [4]

The Engel approach is applied to identify *urban* prices in China in two other independently developed studies; Gong and Meng (2008) identify province specific prices for the urban part of the provinces in the period 1986-2001, whereas Nakamura, Steinsson and Liu (2016) identify biases in the urban CPI.[5] As we aim to study the price development *and* its relation to trends in poverty, we find it of outmost importance to *both* being able to capture province specific prices, *and* including the rural part of the country. However, this focus comes at a cost of being limited to a shorter sample period for which we have available data.

We use detailed household data from the "Chinese Household Income Project" (CHIP), collected in 1995 and 2002 by an independent group of economists in collaboration with the Chinese Academy of Social Sciences.[6] The data consist of an urban and a rural part, and the households were selected from a larger sample collected by the National Bureau of Statistics. The benefits of using these detailed micro household data instead of aggregate shares reported in official yearbooks, are many. Not only do the micro data allow us to control for potential consumption shifters, such as demographic variables, but it also allows to run a full set of robustness checks: First, we test thoroughly whether inaccuracies created by the use of equivalence scales could drive the results of this paper; among the tests we run, is an analysis based on a subset of households with identical composition and size. Second, we investigate alternative ways of valuating housing and self-production. Valuation of these consumption categories poses challenges to all studies on real income, consumption, inequality, and poverty, and the use of micro data allows us to investigate these challenges in detail. Third, we address the potential concern of measurement error in the expenditure aggregate by using household income as an instrument for expenditure, and by grouping variables into county specific observations. Fourth, we test the functional form assumption by estimating the Quadratic Almost Ideal Demand system that is more flexible than the Almost Ideal Demand system used in our main estimation and in most other papers

[4] See e.g., Beatty and Larsen (2005) for Canada, Costa (2001) for the US, Larsen (2007) for Norway, de Carvalho Filho and Chamon (2012) for Brazil and Mexico, Gibson, Stillman, and Le (2008) for Russia, Barrett and Brzozowski (2010) for Australia, Gibson and Scobie (2010) for New Zealand, and Chung, Gibson, and Kim (2010) for Korea. See also Nakamura (1996) for a first discussion of what Engel curves can reveal about CPI bias and e.g., Aguiar and Bils (2013), Blundell, Browning and Meghir (1994) and Hurst, Li, and Pugsley (2014) for applications of the Engel method for other purposes and CPI bias measurement.

[5] See also Woo and Wang (2011).

[6] The survey also covers 1988 and 2007, but the detailed expenditure data necessary for our analysis are not collected in 1988 and are collected for the urban areas only in 2007. Specifically, in 1988 a much more limited set of expenditure information was collected (the focus was on income and not expenditure) and in the 2007, only "minimum expenditure" (and not actual expenditure) was reported in rural areas.

applying the Engel method. All robustness checks confirm our main findings.

The paper is organized as follows. Section 2 explains the methodology in detail. Section 3 discusses the household data applied in the analysis and Section 4 outlines the empirical results. Section 5 concludes the paper.

2 Methodology

In our main estimation, we estimate a log-linear Engel curve for food in the tradition of Working (1943), Leser (1963) and Deaton and Muellbauer (1980). Household data for several provinces and municipalities in China for 1995 and 2002 are used to estimate the relationship between the budget share for food and household income. Based on the assumptions that the demand function is correctly specified, that consumer preferences are stable throughout the period, and that the micro data contain no systematic errors, a set of urban and rural dummy variables reveals a set of price levels. The set includes comparable price levels for urban and rural parts of the different provinces in the different years.

There are several reasons why food is an ideal indicator good (see Hamilton (2001) and Costa (2001)). First, the indicator good should be sensitive to variation in income, which is the case for food because the income elasticity of food is substantially different from unity. Second, food can be characterized as a nondurable good. Expenditures on food and consumption of food in one period are nearly identical, as opposed to a durable good, which is bought in one period but consumed throughout several periods of time. Third, the definition of food is straightforward, as opposed to other goods such as leisure.

The main estimation model (the Almost Ideal demand system) is given by:

$$m_{h,p,u,t} = a + b(\ln y_{h,p,u,t} - \ln P_{p,u,t}) + \gamma(\ln P^{f}_{c,u,t} - \ln P^{n}_{c,u,t}) + \theta X_{h,p,u,t} + \varepsilon_{h,p,u,t},^{7} \quad (1)$$

where $m_{h,p,u,t}$ is the budget share for food for household h, in province p in rural/urban

[7] There is a large literature discussing the properties of different demand systems, see e.g., Fry et al. (1996), Aitchison (1982) and Barten (1977). A possible downside of the Almost Ideal Demand System (AIDS) and the Quadratic Almost Ideal Demand System (QUAIDS) is that it can predict zero and negative shares for some combinations of prices and incomes. Another potential downside is that it does not guarantee regularity in the sense of a negative semi-definite Slutsky matrix negative, for all points in the distribution. Alternative demand systems have been suggested to tackle these potential downsides (see e.g., McLaren and Wong, 2009, and McLaren and Yang, 2016). Even so, AIDS and QUIADS continues to be widely used mainly due to its flexibility and the fact that they seem to give good approximations to real micro data on consumer behavior. We choose to use it here for these reasons and because it is standard in the literature on Engel curves and price index identification (Hamilton, 2001, Costa, 2001 and Almås, 2012).

area u at time t. $P_{p,u,t}$ is a price index that is homogenous of degree one in prices and $P^f_{c,u,t}$ and $P^n_{c,u,t}$ are the prices for food and non-food, respectively, in county c. $X_{h,p,u,t}$ is a vector of demographic control variables and $\varepsilon_{h,p,u,t}$ is the residual.

The identification strategy is the following: $P_{p,u,t}$ is the only variable that is specific for each province p, area u and time t, and, hence, by including dummy variables indicating province, area and time, $d_{p,u,t}$, we can identify the local time specific price-levels.[8] The specification given by (1) can be estimated by:

$$\begin{aligned} m_{h,p,u,t} = a + b(\ln y_{h,p,u,t}) + \gamma(\ln P^f_{c,u,t} - \ln P^n_{c,u,t}) + \theta X_{h,p,u,t} \\ + \sum_{p=1}^{N} d_{p,u,t} D_{p,u,t} + \varepsilon_{h,p,u,t}. \end{aligned} \tag{2}$$

The price level of province p and area u at time t can then be expressed as follows:[9]

$$d_{p,u,t} = -b \, ln P_{p,u,t} \Longleftrightarrow P_{p,u,t} = e^{(-d_{p,u,t}/b)}. \tag{3}$$

A positive dummy coefficient for province p in urban/rural area u at time t implies that the budget share for food for households in this specific province is higher than that of identical households in the base. As the budget share for food is decreasing in income, the coefficient for nominal income b is negative. Hence, if the provincial dummy is positive the price level exceeds unity, which implies that the price level of this province exceeds that of the base.

Based on these price-level estimates, we calculate province-, urban/rural- and year-specific prices. To illustrate, for Sichuan province we have four price-level estimates: rural Sichuan, 1995 and 2002, and urban Sichuan, 1995 and 2002. The identification gives comparable cost of living only up to a normalization, and we normalize so that the cost of living for all China in 1995 is equal to one.[10]

[8] A premise for the exercise is that prices for food and non-food themselves cannot alone give us the correct price index. As we discuss in the appendix, we do consider the prices for food and non-food to be only rough controls that takes us as far as we can in controlling for relative prices in the estimation of the demand system. However, in order for our structural model to give unbiased measures of overall price levels, we need to assume that to the extent that county specific food and non-food prices are biased, the bias for food is identical to that of non-food, and this bias is the same across counties within provinces. This is equivalent to the identifying assumption made by Hamilton (2001) in his original paper.

[9] Note that preferences are non-homothetic which in turn means that cost of living is income specific, as the baskets of goods that households consume will be income dependent. As such, the price level expressed here represents the cost of living for one household income level (see A for a more detailed discussion of this).

[10] The cost of living for all China in 1995 is given by a population-weighted sum of the price estimates over the total population in 1995: $\overline{P^{1995}} = \frac{\sum_{p=1}^{N} pop^{1995}_{p,u} * p^{1995}_{p,u} + \sum_{p=1}^{N} pop^{1995}_{p,r} * p^{1995}_{p,r}}{\sum_{p=1}^{N} pop_{p,u} + \sum_{p=1}^{N} pop_{p,r}}$. The identifying assumption

We study the development of expenditure inequality and poverty from 1995 to 2002 and report changes between these two years. We use the Gini index to measure inequality, and the Head Count and the Poverty Gap indices to measure poverty. The Head Count index reports the percentage of the sample population with income below the poverty line. The Poverty Gap index, on the other hand, gives weight according to the distance to the poverty line, i.e., it measures not only the percentage of the population that falls below the poverty line, but it is larger the further below the poverty line the poor's income is. The formulas for the Gini, the Head Count and the Poverty Gap indices are given in Appendix D.

We base our poverty estimates on two poverty lines: \$1.25/day[11] and \$2/day, measured in 1995 prices. Appendix D gives details on how these poverty lines are measured in local currency.

3 Data

Household data used in the estimation are provided by the "Chinese Household Income Project" (CHIP), collected in 1995 and 2002 by an independent group of economists in collaboration with the Chinese Academy of Social Sciences. The data consist of an urban and a rural part, and the households were selected from a larger sample collected by the National Bureau of Statistics.[12]

In 1995, 19 provinces were selected to constitute a representative sample of the economic characteristics of China's rural regions, and the same principle was applied when selecting 11 urban provinces. Two more provinces (Xinjiang and Guanxi) were added to the rural survey provinces in 2002 to investigate issues related to ethnic minorities. We have not included these two provinces in the analysis to ensure comparability between 1995 and 2002. Chongqing was established as a (direct-controlled)

is that all variation in the budget share for food across provinces, area and time, that is a residual after having controlled for differences in observable characteristics such as demographics and relative prices, is due to the price level being different. One may be worried about habits shifting over time, and if so, this poses a challenge to the identification strategy. Particularly, if more varieties are made available or made more common to consume in a period of liberalization and growth, we may think that habits are changed, and people are more likely to spend on other items than food. If this is the case, we may find a lower budget share that we interpret as a lower price that is really rather a preference shift. But as our results section indicate, the main difference between our measure and the CPI is for rural areas, where we find a higher price level than the CPI, so this preference shift from food to non-food cannot be driving that main effect. We also believe that changing habits take time. As we are looking at a relatively short time period, we do not believe that it is very likely to be driving our results.

[11] This is often referred to as the \$1 a day poverty line.

[12] The data oversampled urban households in 1995 and oversampled rural households in 2002. To adjust for this, we apply urban and rural population weights specified in Table 1 (China Statistical Yearbook, 2004).

municipality in 1997, prior to that it was a part of Sichuan province.[13] As Chongqing is included in the 2002 data we follow the approach of Khan et al. (2005) and combine Sichuan and Chongqing in 2002. Finally, the 2002 survey data covers the migrant population, which we are unable to include in the estimation as we have no data on this for 1995. We include a map illustrating data coverage, and a discussion of population estimates and classification into rural and urban households in Appendix A.

The survey consists of one part answered by individuals and one part for the household as a whole. As we can see from Table 1 below, the average household size for rural households is larger than the urban average for both years, which is consistent with the one-child policy being less restrictive for rural households.[14] The average household size falls from 3.79 in 1995 to 3.66 in 2002.[15] For a full layout and discussion of the data used in the analysis, see appendix A.

Table 1: Comparison of the surveys

	1995				2002			
	IND	HH	MHH	PW	IND	HH	MHH	PW
Rural	34 739	7 998	4.34	85947	37 969	9 200	4.13	78241
Urban	21 698	6 931	3.13	35174	20 632	6 835	3.02	50212
Total	56 437	14 929	3.79		58 601	16 035	3.66	

[a] IND: individuals, HH: households, MHH: mean household size, PW: population weights.

3.1 Value of self-produced goods

Self-produced goods are particularly important for poor households, and not adjusting for this will lead to an underestimation of both the food consumption and income of these households, which will ultimately affect the rural inflation estimates. In order to include self-produced goods in rural areas in our analysis, we use market value to predict the value of these goods. However, we only have the value of self-produced goods reported for 1995 and not for 2002. In order to still be able to include self-produced goods, we impute the value of self-production for 2002 by running a regression of the value of self-production on provincial dummies, income, food con-

[13]There are three additional municipalities directly under the administration of the central government beside Chongqing; Beijing, Tianjin, and Shanghai. In Chinese: 直辖市.

[14]During the period we study there were exceptions from the one-child rule at province and county levels. For instance, exceptions could apply in rural areas if the first child was a girl (Hesketh and Xing, 2006).

[15]This indicates a continuation of an earlier fall in average household size: in 1988, the average size was 4.32, where the averages for urban and rural households were 3.53 and 5.01, respectively.

sumption, occupational dummies, number of children and number of adults. From the estimated coefficients we predict values for self-production in 2002 based on the household characteristics. We have also tested other ways of imputing self-production, all of which give the same main results as our main estimation. For completeness, we have also conducted an analysis excluding self-production entirely. This only strengthens our results. However, as we believe that self-production is a main component of the poor households' consumption bundle, we find it of outmost importance to include self-production, although not perfectly measured. We want to point out here that although other studies on inequality and poverty in China do not explicitly discuss the valuation of self-production and the challenges related to it, all studies face these challenges although not discussed and dealt with directly.

3.2 Relative Prices

The construction of county level relative prices requires detailed price information on food and non-food for urban and rural households. Because the survey data only includes food prices for rural households, that is, no information on non-food prices, nor food prices in urban areas, we rely on various statistical publications for price data. We combine the rural food prices in the survey data with urban food prices from the China Price Statistical Yearbook (2003), which we in turn combine with non-food prices from the China Price Statistical Yearbook (1992). Although the relative price measure is calculated from a price set that represents only a subset of both food and non-food consumption, this provides us with a proxy for relative prices. It is reassuring that the relative price effect in the estimation is small and, hence, our main estimation results are not sensitive to the inclusion of the relative price control.

Food price indexes are constructed from food prices using four common basic headings, namely, cereals, vegetables, meat and eggs.[16] In the rural areas, we first average the micro price data for food reported by all households within a county, which produces county level prices for the four commodities. In the urban areas, we use price level information for the food items from yearbooks (at the province level, which is the finest we can get). We then use the country product dummy method (Rao, 2005) to aggregate the food prices under the four basic headings into one price for food (in both urban and rural areas).

We have no information on non-food prices from the surveys. To overcome this limitation in the data, we apply information on non-food prices from the Price Sta-

[16]Whenever the basic headings include more than one good in a survey, we use the mean price per kilo over the subcategories as the basic heading price.

tistical Yearbook of China (1992). This book incorporates a table of item prices for 29 cities, which are assumed to be representative of the remaining urban part of the province.

The same yearbook also includes a conversion table that expresses how farm products can be transformed into industry products. The conversion table can be interpreted as a food to non-food ratio for rural areas, and we use this to estimate rural non-food prices at the county level, again using the country product dummy method (Rao, 2005).[17]

Finally, we price adjust the non-food indexes using the consumer price index (base year 1985) for urban and rural areas. The relative price control variable is constructed by combining the food price indexes from the survey and yearbook data with these non-food indexes.

4 Analysis and Findings

4.1 The rural/urban price difference

Before turning to the identification of province specific price levels, we give attention to the rural-urban price gap and the change in this. The urban/rural price gap is identified by using a version of equation 2 and 3 including dummies for time and urban and rural areas. The table with detailed regression results can be found in Appendix B. Table 2 presents the findings for price levels and price changes estimates for 1995 and 2002.[18] We refer to our price estimates as Spatial Price Indices (SPI). Our findings suggest that the rural price level was 65 percent of the urban price level in 1995. Further, we see that the rural price level have risen by 5 percent a year on average, whereas we find no price level increase in the urban areas for the period under study, i.e. the price levels have been converging.

In the last row of Table 2, we present the corresponding percentage increases in the official CPI for rural and urban areas, respectively.[19] We see that our findings suggest that the official CPI underestimates the price increase in the rural areas and

[17]As we have food prices for farm products in our data, this enables us to construct non-food prices. For instance, we have kilograms of wheat to kilograms of soap. Because we know the price of wheat per kilogram, we can use this ratio to approximate the price of soap for rural areas. We do this conversion for wheat, rice, sweet corn and eggs to each non-food item, and the non-food price is based on an average of these converted rates. The non-food to food items are textiles, soap, bicycles, black-and-white TVs and matches.

[18]Note that very similar results on the urban/rural price gap would be obtained if we used a specification with province specific dummies and then aggregated them to urban and rural price levels subsequently.

[19]"China Yearly Macro-Economics Statistics (National)", chinadataonline.org: 09.10.2013.

Table 2: Price levels and changes 1995-2002

	Rural	Urban
SPI-level (1995)	0.79 [0.78, 0.80]	1.22 [1.20, 1.24]
SPI-level (2002)	1.15 [1.12, 1.17]	1.21 [1.20, 1.22]
SPI yearly percentage increase	5.47	-0.09
CPI yearly percentage increase	1.11	1.50

[a] The table displays the differences in SPI in urban and rural areas in the two years under study. These levels are found by estimating Engel curves for food using indicator values for the provinces, for the year 2002 and for rural (regression results in Table 8). The corresponding average yearly growth rate is compared to the average yearly growth rate measured by the CPI in the same period. The numbers in brackets give the confidence intervals. All SPI values are normalized to the all China average in 1995.

overestimates the price increases in urban areas.

Our results for the urban sector is consistent with the findings of Nakamura, Steinsson and Liu (2016) who study the urban areas only and start in 1996. They report that the official CPI overestimates the price increase in urban sector in the period 1996 to 2002, and their findings indicate that the urban price level fell in this period. Further, we can compare our results to that of Brandt and Holz (2006) who find that the rural price level in 1990 was 80 percent of that in urban areas and that price levels in both urban and rural areas almost doubled to 2000. For the time period they study, they also find that the rural price increase is underestimated, but the magnitude of the underestimation is smaller than what we find in the period we study.[20]

4.2 Province specific estimates

Table 3 displays the estimation results for the main specification (per capita) and various related specifications using alternative ways of controlling for household size and composition (see Table 9 in the appendix for the full set of coefficients including those for the province indicators). The first column gives the estimation results for the main specification where per capita household expenditure is used. Column two gives the results for the exact same specification, but using the subsample of households consisting of two adults and one child. Column three gives the results for the specification using total household expenditure instead of per capita expenditure, and column four and five use expenditure adjusted for the EU and OECD equivalence scales, respectively. We can see that all these estimations give very similar results and we will in the following focus on the price level results, and base subsequent inequality and poverty

[20]The fact that they find smaller differences to the CPI estimates may not be surprising as their estimations rely to a large extent on the official CPI calculations.

calculations on the results from the main estimation.

Table 3: Estimation results

	(1) Main	(2) Same (2+1)	(3) No ES	(4) EU ES	(5) OECD ES
Log of expenditure	-0.195***	-0.194***	-0.202***	-0.200***	-0.199***
	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
Children	-0.031***		0.019***	-0.007***	-0.016***
	(0.001)		(0.001)	(0.001)	(0.001)
Adults	-0.032***		0.021***	-0.023***	-0.028***
	(0.001)		(0.001)	(0.001)	(0.001)
Elders	0.013***		0.009***	0.011***	0.012***
	(0.001)		(0.001)	(0.001)	(0.001)
Age HH	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative prices	0.020***	-0.010	0.023***	0.022***	0.021***
	(0.005)	(0.016)	(0.005)	(0.005)	(0.005)
Constant	2.020***	1.953***	2.149***	2.127***	2.091***
	(0.016)	(0.035)	(0.017)	(0.017)	(0.017)
Adjusted R^2	0.607	0.609	0.618	0.615	0.613
Observations	24266	5567	24266	24266	24266

[a] Robust standard errors in parenthesis, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The table displays the estimation results for our main specification and the robustness checks relating to household composition and size. The first column displays the results for our main specification (all households, per capita). Column two gives the results for the robustness analysis on the subsamples of households with 2 adults and 1 child. The third column displays results when no equivalence scaling is used, column four when the EU equivalence scaling is used and five for the specification using the OECD equivalence scale. The EU and the OECD equivalence scale are defined as $1+0.5+0.3(children)$ and $1+0.7+0.5(children)$, respectively. Urban 95 Beijing was used as the base. Table 9 in the appendix includes the full set of coefficients including those for the province indicators.

Figure 1 shows the province specific growth in SPI and CPI respectively. We can see that the price growth varies across the provinces. Some experienced negative price growth, whereas others experienced quite substantial price increases. For example, rural Beijing experienced negative price growth whereas rural Jilin experienced that the price level almost doubled in the 7 year period under study, corresponding to an annual inflation of 10 percent. So what characterize the areas with negative or small price growth from those with positive price growth? It turns out that the coastal regions, which is sometimes referred to as the "growth engines" of China, play a role in explaining the difference. Table 4 shows the correlations between province specific growth in SPI and being a coastal and urban province. The first column shows the raw correlation between being a coastal province and growth in the price level. We see that this correlation is negative and significant at the ten percent level. The results indicate that the coastal regions' price level increased by 20 percent less than the non-coastal

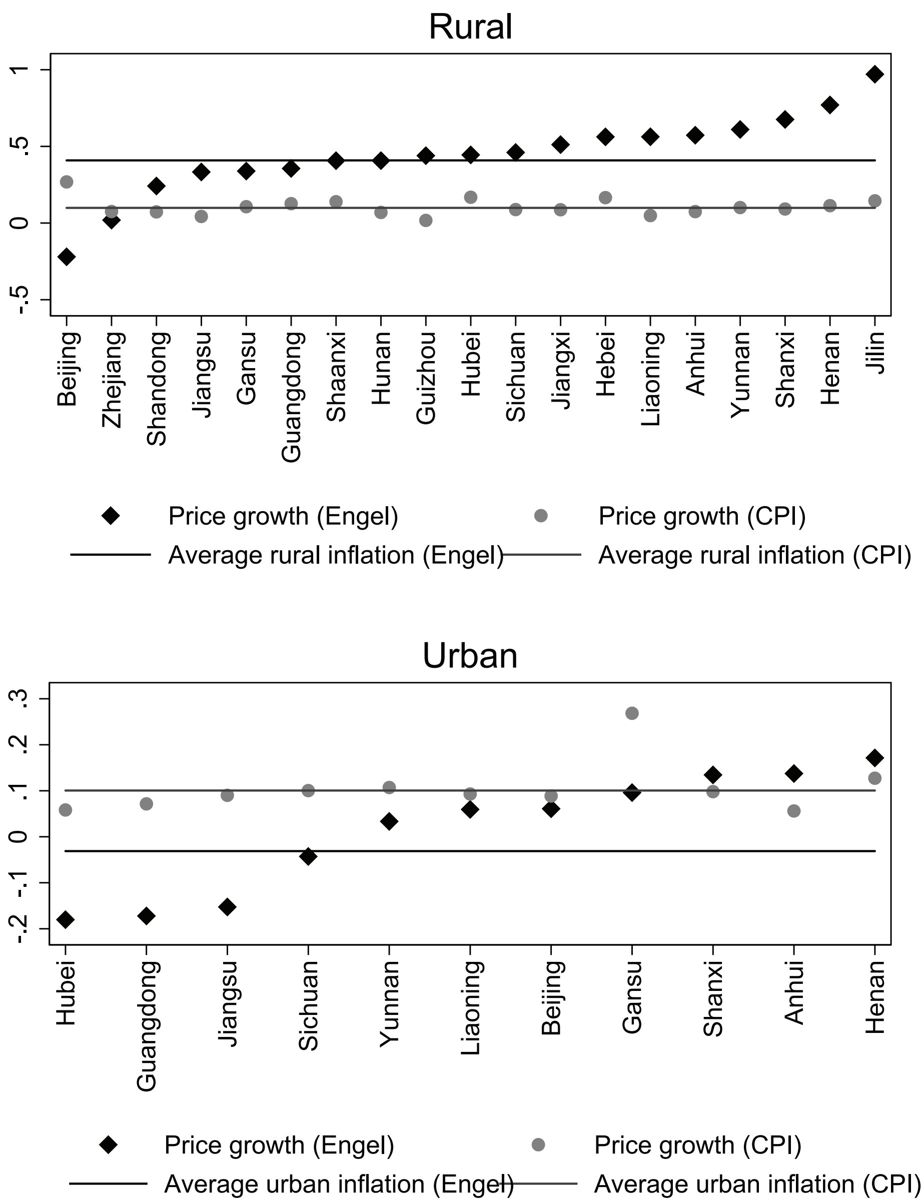

Figure 1: Province specific changes in SPI and CPI

Note: The figures show the province specific growth in SPI and CPI, respectively. The horizontal lines indicates the corresponding national averages.

regions in the whole period under study, indicating that they grew by about 3 percent less annually. Column two shows the same correlation for rural areas only. We see that the negative correlation is larger when looking at only rural provinces and the coefficient is significant at one percent level. The coefficient indicates that the rural coastal regions' price level grew by 30 percent less than the non-coastal provinces in the whole period, corresponding to a 4 percent lower annual growth rate. However, when we look at the urban regions only in column three, the negative coefficient is not significant. When controlling for both whether a province is coastal and whether it is urban we get highly significantly negative effects on the growth of prices for both indicators. The correlations are given in column four of Table 4.

Table 4: Regions regression table (OLS, robust errors)

	SPI change	SPI change	SPI change	SPI change
Coastal	-0.201*	-0.300**	-0.090	-0.300***
	(0.106)	(0.106)	(0.083)	(0.107)
Urban				-0.526***
				(0.072)
Interaction (coastal*urban)				0.209
				(0.134)
Constant	0.367***	0.572***	0.046	0.572***
	(0.073)	(0.055)	(0.047)	(0.056)
R^2	0.108	0.344	0.123	0.648
Observations	30	19	11	30

[a] The table shows the correlations between province specific growth in SPI and being a coastal and urban province. The areas that we define as the coastal areas are Beijing, Guangdong, Hebei, Jiangsu, Jilin, Liaoning, Shandong, Zhejiang.The first column shows the correlation between being a coastal province and growth in the price level. The second column shows the same correlation for rural areas only. The third column shows the same correlation for urban areas only. The fourth column shows the relationships when controlling for urban and coastal indicators jointly.

4.3 Inequality and Poverty

Table 5 presents changes in the Head Count and the Poverty Gap indices for the Engel-adjusted income measure (SPI) and the consumer-price-adjusted income measure (CPI). Appendix D goes through the poverty and inequality measures used in this section.

Investigating changes in poverty, the overall picture is that the CPI-adjusted measure overstates the size of the poverty reduction compared with the SPI-adjusted incomes. Looking only at the Poverty Head Count index, we see that CPI-adjusted incomes overestimate the reduction in rural poverty, while they underestimate the reduction in urban poverty.

The Poverty Gap index reflects the severity of poverty, and provides a similar pattern to the Head Count estimates. As for the Head Count, the Poverty Gap index indicates that the largest poverty reduction occurs among the poorest, although it should be noted that the SPI measure implies that the poorest urban residents are getting poorer.

The results for inequality are given in Table 6. The SPI measures indicate that there has been an increase of 24 percent in inequality measured by the Gini index in rural areas. The CPI-adjusted measures also indicate an increase, but substantially smaller than what the SPI measures indicate. In urban areas the CPI-adjusted measures show a substantial decrease in inequality whereas the SPI measures reveal a more moderate decrease. At the national level, the CPI-adjusted measures indicate a substantial decrease in inequality whereas the SPI measures show no change in inequality[21].

We can also compare the poverty counts to that of the World Bank, although the World Bank methodology is different from ours in several respects, not only in the prices are adjusted for.[22] Figure 2 summarizes the national poverty and inequality changes implied by the Engel curve approach, the official CPI, and the corresponding poverty numbers from the World Bank (see also Ravallion and Chen (2007) and Chen and Ravallion (2008)). The figure illustrates that the measures based on the official CPI and the World Bank on poverty and inequality fall below those based on the SPI measures. However, the World Bank predictions are closer to our predictions than the official CPI-adjusted measures.

[21] Our gini coefficients compare reasonably well to other gini estimates based on expenditure data (Uni-wider, 2008) , but they are slighly lower than gini coefficents based on income data.

[22] The micro data underlying the World Bank calculations have not been made available to us, and hence we are unable to decompose the difference between our results and the World Bank numbers into that stemming from different ways of measuring income and that stemming from different price adjustments.

Table 5: Poverty levels and changes 1995-2002 (percent).

	Poverty line			Poverty Gap		
	$1 a day			$1 a day		
	Rural	Urban	All	Rural	Urban	All
SPI-adjusted (1995)	49.3	4.0	36.1	11.8	0.6	8.5
SPI-adjusted (2002)	34.9	2.0	22.0	8.6	0.3	5.3
CPI-adjusted (1995)	66.4	3.3	48.1	19.2	0.6	13.8
CPI-adjusted (2002)	25.7	1.8	16.4	4.9	0.2	3.1
Percent change SPI-adjusted	-29.1	-50.6	-39.0	-27.0	-51.6	-37.3
Percent change CPI-adjusted	-61.3	-45.5	-66.0	-74.7	-57.3	-77.9
	$2 a day			$2 a day		
	Rural	Urban	All	Rural	Urban	All
SPI-adjusted (1995)	84.7	23.2	66.9	33.9	5.1	25.5
SPI-adjusted (2002)	70.5	16.1	49.3	26.0	3.2	17.1
CPI-adjusted (1995)	90.1	16.9	68.8	42.5	3.9	31.3
CPI-adjusted (2002)	66.4	14.3	46.0	21.0	2.8	13.9
Percent change SPI-adjusted	-16.8	-30.6	-26.3	-23.4	-38.0	-33.2
Percent change CPI-adjusted	-26.3	-15.4	-33.2	-50.5	-27.2	-55.5

[a] This table displays the estimated poverty levels in 1995 and 2002, and the corresponding changes. The SPI-adjusted measure is household consumption adjusted for the Engel-based prices (SPI). The CPI-adjusted measure is household consumption adjusted for inflation using the consumer price index (CPI). The first three columns in the upper part of the table report the results from the 1$/ day headcount measure measure, the first three columns in the lower part of the table report the results from the 2$/ day headcount measure. The three last columns in the upper part of the table report the results from the 1$/ day poverty gap measure, and the three last columns in the lower part of the table report the results from the 2$/ day poverty gap measure.

Table 6: Gini index

	Rural	Urban	All
SPI-adjusted (1995)	25.5	28.4	34.4
SPI-adjusted (2002)	31.5	26.2	34.5
Percent change SPI-adjusted	23.7	-7.8	0.1
Percent change CPI-adjusted	7.7	-17.5	-22.4

[a] This table displays the estimated gini coefficients for 1995 and 2002, and the corresponding changes. The SPI-adjusted measure is household consumption adjusted for the Engel-based prices (SPI). The CPI-adjusted measure is household consumption adjusted for inflation using the consumer price index (CPI).

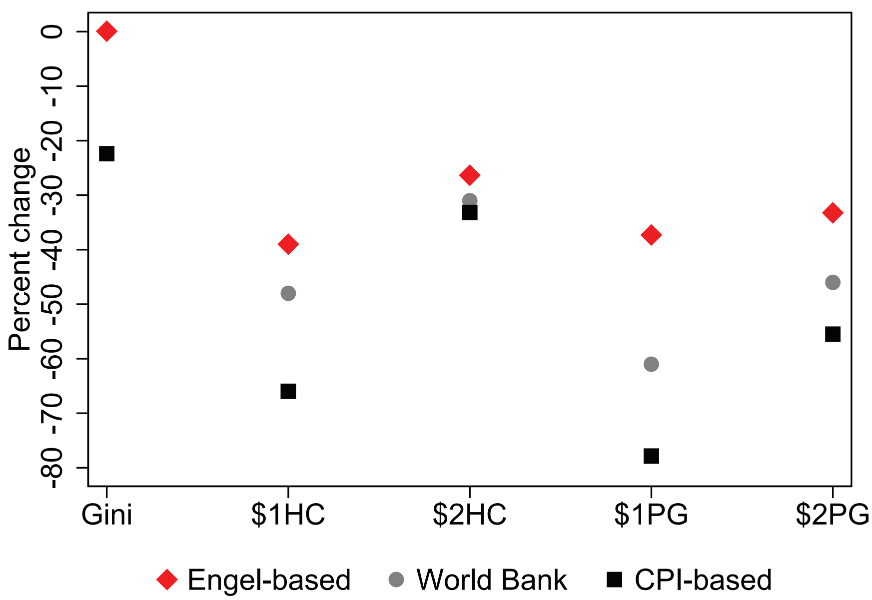

Figure 2: Changes in inequality and poverty from 1995 to 2002

Note: The figure displays a summary of the main national findings on poverty and inequality. HC is the headcount measure, PG is the poverty gap measure. Engel-based means household consumption adjusted for the Engel-based prices, CPI-based means household consumption adjusted for inflation using the consumer price index.

4.4 Discussion

The fact that we find no significant price increase in the urban areas in a time with economic growth may seem surprising. However, there were factors present during that time that may explain the small price increases, and the convergence between prices in urban and rural, as well as coastal and inland, areas, in this period.

First, the liberalization reforms, involving **freer trade and price movements within China**, were likely to have led to price convergence. The implementation of price reform in 1992, tax reform in 1994 and the start of privatization of state-owed enterprises (SOEs) in the mid-1990s improved the integration of the national market (Prasad, 2004). Previously, local protectionism and internal trade barriers resulted in a fragmented national economy and restrained regional competition. The rise of a common national market and the subsequent intensification of regional competition were likely to have contributed to price equalization.

Second, policies were introduced to **increase China's integration and competitiveness in the global economy**. China was in the 1990s opening up to international trade and preparing for WTO membership, e.g. by reducing tariff rates from 24 to 11 percent between 1996 and 2003. The coastal and urban areas, which came to be more exposed to international competition and had longer experience with economic reforms, were likely to have seem slower price growths due to these developments.

In addition, large reforms of the SOEs aimed at improving efficiency were conducted from the late 1990s and onwards. Throughout this period, the role of SOEs in the local economies became less important for coastal areas than for inland areas. SOE share of all enterprises and of output (gross provincial product, as well as industrial output) decreased more extensively, and a smaller share of employed individuals worked in SOEs in the coastal provinces. As the sluggish SOEs were, to a larger extend, being replaced by more dynamic private firms, more competitive domestic environment in addition to greater international exposure, may have induced more constrained price growths in the coastal areas.

Third, the urban and coastal areas had **access to low-cost "excess supply" labor** from the rural areas, something that helped keeping costs of production low. There was an ongoing stream of low-cost labor from the rural areas to the cities in this period, keeping wages in the manufacturing sector low. Migrant labor accounted for 70 to 80 percent of the labor force in the major export centres in the beginning of the 2000s (Chan, 2013). In Figure 7 we can see that in the period 1995-2000, the inflow of people to the coastal regions was between 1.2 and 34.3 percent for the coastal provinces, while populous inland provinces experienced a net decline. The same pattern appears for the period 2000–2005. Access to low-cost labor may explain why we do not observe what is sometimes referred to as the "Balassa-Samuelson" or (the dynamic) "Penn" effect (Balassa, 1964; Samuelson, 1994), namely that a growing economy experiences higher price growth than one with a lower growth rate.

Fourth, the finding that **urban richer consumers experienced a more favorable price development than the poorer rural population** is consistent with urban and coastal consumers having easier access to imported goods, goods of which prices decreased in the period under study. The richer urban part of the population may also be able to buy larger quantities of goods and buy on sale from outlets, i.e., "the outlet-effect", and as more outlets are established in the cities and the urban population are getting richer in this period, this may lead to more favorable prices for those residing in urban areas.[23]

4.5 Robustness of findings and functional form assumptions

Our robustness analysis provide support for our main findings of price convergence, a more moderate poverty reduction, and more moderate reduction in inequality. Our robustness analysis includes using different imputations of housing (Alt 1) and self-production (Alt 2), grouping variables at the county level (Alt 3), using household income as an instrument for expenditure (Alt 4), and estimating the more flexible Quadratic Almost Ideal Demand System (QUAIDS) (Alt 5).

Table 7 displays the estimation results for all these robustness checks, as well as for the main specification.

Table 7: Estimation results for robustness checks

[23] A more recent study of prices in Chinese cities (Feenstra et al., 2017) find that the cost of living tends to be lower in larger cities in China. They attribute this to cities attracting more competition, and hence providing lower markups and prices in bigger cities.

	Main	Alt1	Alt2	Alt3	Alt4	Alt5
Log of expenditure	-0.195***	-0.216***	-0.206***	-0.171***	-0.157***	-0.545***
	(0.002)	(0.001)	(0.001)	(0.012)	(0.003)	(0.023)
Log of expenditure squared						0.021***
						(0.001)
Children	-0.031***	-0.037***	-0.046***	0.007	-0.024***	-0.034***
	(0.001)	(0.001)	(0.001)	(0.012)	(0.001)	(0.001)
Adults	-0.032***	-0.036***	-0.049***	-0.040***	-0.027***	-0.033***
	(0.001)	(0.001)	(0.001)	(0.010)	(0.001)	(0.001)
Elders	0.013***	0.014***	0.012***	0.016	0.014***	0.012***

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	Main	Alt1	Alt2	Alt3	Alt4	Alt5
	(0.001)	(0.001)	(0.001)	(0.018)	(0.001)	(0.001)
Age HH	0.001***	0.002***	0.001***	0.004***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Relative prices	0.020***	0.024***	0.023***	0.027	0.009	0.052***
	(0.005)	(0.006)	(0.005)	(0.021)	(0.006)	(0.005)
Constant	2.020***	2.207***	2.167***	1.658***	1.673***	3.450***
	(0.016)	(0.016)	(0.015)	(0.129)	(0.031)	(0.099)
Adjusted R^2	0.607	0.668	0.621	0.833	0.579	0.609
Observations	24266	24267	27859	366	22805	24266

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

[a] Estimation results for all our specifications. The first column displays the results for our main specification (all households, per capita consumption values). Column two gives the results for the robustness check including the reported expenditure on housing instead of the imputed values suggested by the survey providers. The third column displays results for the specification using median self-production to predict self-production in 2002. The fourth column presents the result for the estimation based on groups, and the fifth column those for the IV estimation. The last column gives results for the QUAIDS specification. Note that the first five columns gives the dummy coefficients for the provinces whereas the last column gives the price estimates. Urban 95 Beijing was used as the base.

[b] Note that we have occupational information only for about 24000 households and hence this is the sample size for the main estimation as well as the robustness check with the alternative valuation of housing and the QUAIDS specification. In the estimation where we use median self-production to predict self-production in 2002 we loose some observations due to missing demographics (mainly age information for household head). When income is used as an instrument for total consumption we loose about 1500 observations due to missing information about income. The analysis based on grouping uses the county as the observation and hence the sample size is reduced to 366 in this estimation. All results are from robust OLS regressions.

[C] Table 10 in the appendix includes the full set of results.

First, we use the households' reported expenditure for housing as our measure of housing consumption instead of the measurement method suggested by the survey providers that we use in our main estimation (Khan et al., 1998, 1999, 2005) (Alt 1). The estimation results for this specification are given in column two of Table 7. The poverty and inequality results are summarized in the middle panel of Figure 3. We find a decrease in inequality also with the Engel method, but substantially smaller than that found by using the official CPIs. We also find a more moderate poverty reduction than both the CPIs and the World Bank reveal for all measures of poverty that we examine.

Second, we try different versions of including self-production. Instead of imputing self-production from variables collected in the two survey years, we have tested using the median (Alt 2) and mean value of self-production in 1995 to predict self-production in 2002, and this gives results very similar to the ones we have in the main analysis. For completeness, we have also looked at the results when excluding self-production entirely, and this strengthens our results in the sense that we find even higher price increases for rural areas, and increased inequality and no poverty reduction in the period under study. However, as we know that self-production accounts for a substantial fraction of the consumption for the rural households, we find it problematic to exclude it completely, although many other studies are forced to do so as reliable data on self-production are rare. We show the estimation results for using the median value of self-production in 1995 to predict self-production in 2002 in column three of Table 7. Also this robustness check shows a reduction in inequality, which is smaller than that suggested by official CPIs, and a general picture of a more moderate poverty reduction than both the official statistics and the World Bank suggest. However, for this robustness check there is an exception for the $2 a day measure, where our measure as well as the World Bank measure indicate slightly higher poverty reduction than official estimates.

In order to deal with potential measurement error in the reported expenditure levels, we conduct both an analysis based on averaging all variables at county level (Alt 3), and an analysis using income as an instrument for total expenditure (Alt 4). Both of these techniques are quite commonly used to address issues related to measurement error when estimating demand systems. The estimation results are reported in column four and five of Table 7 and the subsequent poverty and inequality changes for all China are given in Figure 3. As we can see, our main results are again confirmed by the robustness checks.

In addition to these robustness checks, we use the Quadratic Almost Ideal Demand system (QUIADS) in the estimation (Alt 5). The QUAIDS system, can be written as:

$$\begin{aligned} m_{h,p,u,t} &= a + b_1(\ln y_{h,p,u,t} - \ln P_{p,u,t}) + b_2(\ln y_{h,p,u,t} - \ln P_{p,u,t})^2 \\ &\quad + \gamma(\ln P^f_{c,u,t} - \ln P^n_{c,u,t}) + \theta X_{h,p,u,t} + \varepsilon_{h,p,u,t}. \end{aligned} \tag{4}$$

We identify the overall price component, $P_{p,u,t}$, using non-linear iteration and state- and time-specific dummy variables.

As we can see from figure 3, we find an increase in inequality with this specification. Further, we find a more moderate poverty reduction than the official measures reveal.

In sum, all our robustness checks confirm our main findings. There was a more moderate poverty reduction than indicated by both the World Bank and the official CPI, and the substantial reduction in inequality indicated by the official CPIs is over-estimated.

5 Concluding Remarks

The economic performance of China in the last decades has been enormous. Not only have the growth rates been tremendous, but the reported poverty reduction has also been remarkably high. However, there is significant uncertainty related to these numbers. For example, the World Bank shrunk China's GDP by 40 percent in November 2007, and since then there has been a debate about the level of Chinese GDP in comparison to other countries' GDP (see e.g. Feenstra et al (2013) and World Bank (2008)). Further, the accuracy of official CPI estimates for urban areas have lately been challenged and subsequently there has been uncertainty about urban GDP levels and growth (The Economist, 2013; Nakamura, Steinsson and Liu, 2016). The debates related to these numbers are often politically charged. If the performance turns out to be lower than what earlier suggested, local politicians may face less support than they currently have, and furthermore, if the poverty reduction is lower than what is indicated by the World Bank, a whole world of governments, international organizations and civil society groups would be judged as less efficient in reducing extreme poverty than earlier thought.

In this paper, we identify cost-of-living indices for urban and rural regions in China by applying a simple but empirically robust economic regularity, the Engel's law, to household data. New poverty and inequality estimates are constructed based on the identified cost-of-living. We compare the changes in prices over time implied by our cost-of-living index to those of the CPI and we compare our poverty and inequality findings to those based on the official CPIs and the World Bank estimates.

We find that prices have increased more in rural, and less in urban areas than the official CPIs suggest. We also find that prices have increased more in the inland rural areas than in any other areas. The coastal areas are often referred to as the "growth engines" in the Chinese recent growth experience. However, we see no changes in prices for urban coastal areas in the period we study. Our findings reveal no significant change in inequality and a substantially more moderate poverty reduction than indicated by measures based on the official CPIs. Our measures also indicate that the World Bank numbers overestimate the decline in poverty. Our findings are robust to a battery of robustness checks.

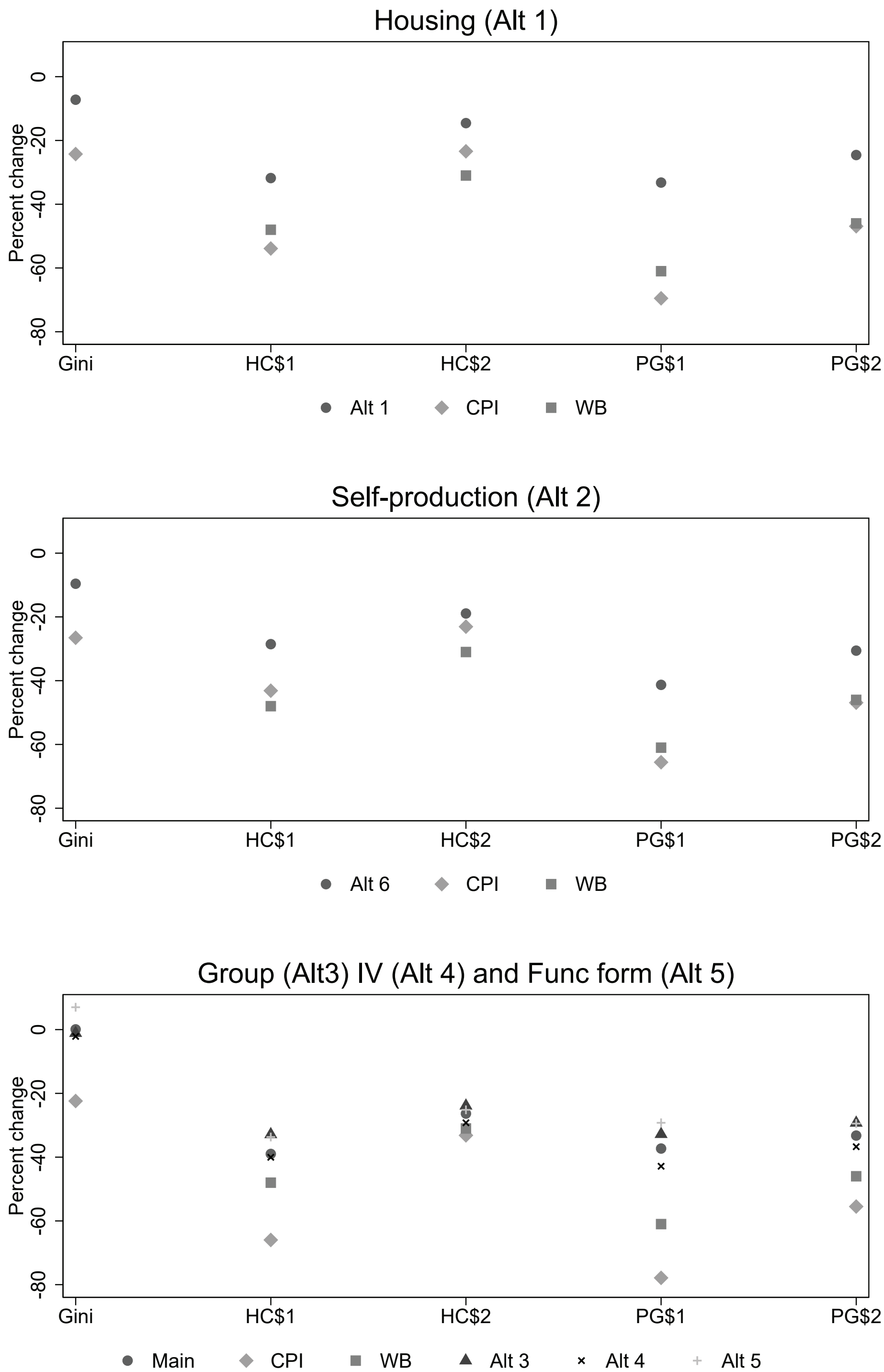

Figure 3: Changes in inequality and poverty

Note: The figure displays a summary of the main national findings on poverty and inequality for the main estimation and for all robustness tests. The upper diagram displays the results for the robustness check using alternative valuation of housing (Alt 1). The middle diagram displays the results for using the alternative imputation of self-production (Alt 2). The lower diagram displays the results for the main estimation as well as the ones based on group averages (Alt 3), the IV (Alt 4), and the QUAIDS (Alt 5). Note that in the lower diagram the results are directly comparable to the main estimation because the expenditure aggregate used to calculate poverty and inequality is the same in all specifications.

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A Micro data, survey Provinces and population estimates

Figure 4 illustrates data coverage of the analysis in this paper:

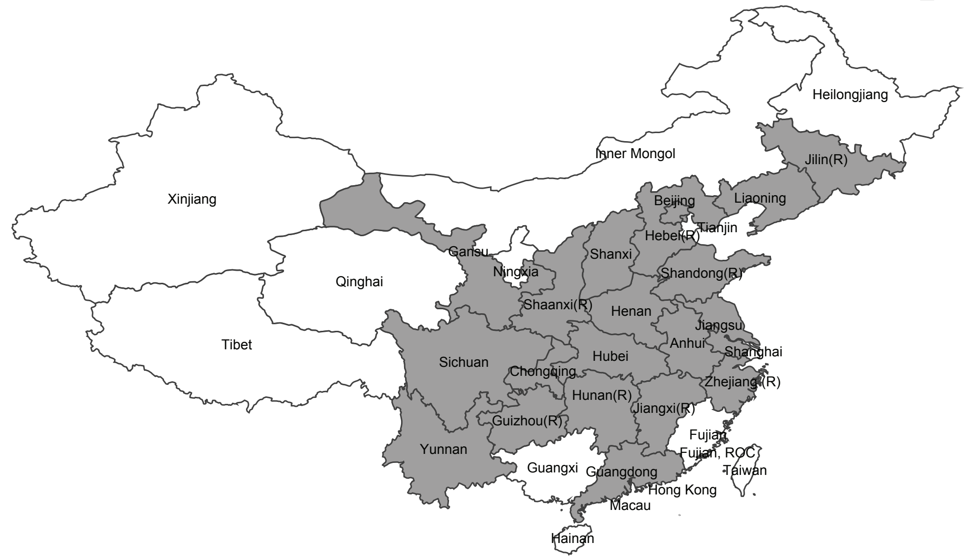

Figure 4: Map over survey data covered both in 1995 and 2002

From 1995 to 2002 the urbanization rate increased from roughly 30 to 40%. In actual numbers, this meant that the official rural population decreased from 860 million to 780 million people, while the urban population increased from 350 to 500 million people.[24] There are several sources to the increase in urban population besides changes due to birth and death rates - people moving to the city and becoming registered citizens, and changes in classification of rural and urban areas. The National Bureau of Statistics China (NBS) changed their methodology for measuring the rural/urban population from 1995 to 2000.[25] Chan and Hu (2003) show that 22% of the urban population growth in the 90s was due to areas being reclassified from rural to urban, 55% to migration and the rest from natural changes in the city population. This could possibly have an effect on our estimates. In the CHIP-data households are classified as

[24]See table 4.1 in China Statistical Yearbook (2007).

[25]The original household registration system, the *Hukou system*, was established in 1958. It classified all of China into rural and urban areas, and was established to hinder massive migration from the countryside to the cities. An individual would be given a permanent household registration where their parents were registered (rural or urban). Obtaining an urban hukou would be hard for rural citizens, but could for instance be achieved through getting a college degree. See Chan and Hu (2003) for more on this system in the 90s. From the Hukou-based system, a more complex census-based methodology was introduced in 2000. See Yixing and Ma (2003) for a report on the 2000 census and urbanization, and Sicular et al. (2007) on migrants.

rural/urban households according to the standards of the National Bureau of Statistics. This is the standard used by most studies, as the data to keep classifications constant are not available. The CHIP data do not have a panel structure, so there are no obvious way to keep the classification constant (see Sicular et al. (2007)). The rural areas most likely to be reclassified as urban are those with the highest growth, and hence, it should be expected that reclassification in this sense should lead to exaggerated rural-urban income differences. Benjamin et al. (2007) are able to investigate this using panel data, and they do find a relatively more stable ratio of urban to rural incomes. If this factor is of importance in our estimation, we would thus expect it to exaggerate the differences between rural and urban areas. But is should be noted that it is not very likely that the NBS would sample from rural areas that could be expected to change status in the near future, which would reduce the possible impact from this for the analysis in this paper.

A.1 Implementation and Variables

Income versus Consumption

We use the value of consumption, i.e., the sum of market expenditure, self-production, and income in-kind to identify income, as is standard in demand system estimation (see, e.g., Neary (2004) and Banks et al. (1997)). We also use the value of consumption in the measurement of poverty and inequality, as we consider consumption to be a better measure of well-being than income for two reasons. First, income can be erratic, especially in agricultural societies. Self-employment can involve several sources of income, which can lead to large variations in annual income. Because consumption is smoother over the period of a year, it is more reliable in the sense that it reflects actual behavior. Second, there are no obvious reasons to underreport consumption as compared with income. With income data, the respondents might underreport income if they suspect that these data could become available to the tax authorities. Hence, we base our poverty calculations on consumption (see, e.g., Deaton and Zaidi (2002) for a discussion of whether consumption or income should be used to measure well-being).

Controls

Age of household head, number of adults, number of children and number of elders are included as demographic control variables.[26] From Table 1, we can see

[26] In the rural data set for 1995, all but 328 (352 in 2002) heads of households are male, while 2289 (2220 in 2002) urban heads of household are female.

that the average number of members in a household included in the analysis is 3.1 (largest 8) for urban households and 4.3 (largest 10) for rural households for 1995. The variable for number of adults was constructed by subtracting number of children from total members of household. Children are defined as being individuals younger than 16. Elders are defined by the official retirement age in China, which is 60 for men and 55 for women. To deal with outliers, we drop the top and bottom one percent of the observations of total expenditure and food expenditure (within urban/rural provinces on an annual basis). Furthermore, if there are any other observations where age of head of household is either 0 or missing, expenditure on food is equal to zero or incomes are negative, these households are dropped.

Housing

In the main estimation, we follow the approach used by Khan et al. (1993, 2005) in constructing the housing aggregate. For rural areas, this approach use rental value for housing which is set to 8 percent of the current market value of the house. Eight percent interest on housing debt is subtracted from this. The urban housing cost are based on the rental value for owner-occupied housing, plus housing subsidies. The urban rental value for housing is equal to 12 times monthly market rent, minus 8 percent interest on housing debt. Subsidies are calculated by subtracting actual market rent from monthly market rent.

There are potentially large measurement problems related to housing consumption in this study as well as other studies (see, e.g., Deaton and Zaidi (2002) for a discussion). In a robustness check we do not construct such a variable, we rather use the households' reported expenditure on housing as a proxy for housing consumption. This robustness check confirms our main results.

Income specific cost of living

Regarding relative prices, we also want to point to a theoretical concern discussed by Almås, Beatty and Crossley (2018), hereafter ABC (see also Beatty and Crossley (2012)). When preference are non-homothetic, and relative prices vary, cost of living is income specific. In other words, households at different income levels face different cost of living. In the AIDS system, the cost function is given by:

$$\ln c_{p,u,t} = \ln P_{p,u,t} + u b_{p,u,t}, \tag{5}$$

where $b_{p,u,t}$ is a price index homogenous of degree zero in prices ($b_{p,u,t} = (\frac{p^f_{p,u,t}}{p^n_{p,u,t}})^\beta$, where β is the coefficient for real income in the estimated demand system) and u is level of utility. By focusing on the price index $P_{p,u,t}$'s from Equation 1, we focus on the cost of living for one particular income level. In a related paper on the measurement of inflation and growth in China, Nakamura et al (2016) discuss this issue by using a result from Feenstra and Reinsdorf (2000): an exact price index for the Almost Ideal Demand System can be evaluated using a Divisia index and data on expenditure shares and prices at two comparison points, and at their geometric mean. Nakamura et al (2016) calculate inflation rates for different income groups in the Chinese income distribution by calculating Divisia indexes as suggested by Feenstra and Reinsdorf (2000). ABC shows that this is not a complete solution to the issue. But as Almås, Kjelsrud and Somanathan (2017) shows in a study on poverty in India, performance checks indicate that indeed the Engel method performs very well in a setting where the relevant group is poor. This is comforting, as the focus of this paper is on *poverty* in China.

For further details on income specific cost of living and the Engel method, we refer interested readers to the ABC working paper.

Equivalence scaling

In order to avoid inaccuracies arising from the use of an equivalence scale (or the lack of such), we conduct a robustness check on a subsample of household with identical composition and size. We select the households with two adults and one child. The results from this robustness check confirm our main results.

In our main estimation we include all households, use per capita consumption values, and control for number of children, adults and elderly. We further investigate whether our results would be any different if we took into account household scale effects by using equivalence scaling: We use both the scale referred to as the EU equivalence scale and the that referred to as the OECD equivalence scale. The EU equivalence scale gives the value 1 to a household with a single individual, an additional value 0.5 to each additional adult and a value 0.3 to each additional child. The OECD equivalence scale gives the value 1 to a household with a single individual, an additional value 0.7 to each additional adult and a value of 0.5 to each additional child. We also show results for no adjustment of household size, i.e., we take one household as one observation in the estimation of the demand system.

In addition to testing different equivalence scales, we have also run a robustness check where we use an alternative control for elderly households (see Almås and

Johnsen (2013) for a discussion of this robustness test and see Song et al. (2015) for a more general discussion of Chinese demographic developments related to this). The results indicate that our findings are robust to all alternative specification. Hence, we conclude that our main results are not driven by inaccuracies stemming from the use of equivalence scales.

Potential measurement error in reported expenditure

In order to deal with potential measurement error in households' reported expenditure levels, to further validate our imputations of self-production and the valuation of housing, we conduct both an analysis based on grouped data at the county level and an analysis using income as an instrument for total expenditure. When grouping, we divide households into groups based on county and year. When using income as an instrument, we use the reported income (without including self-production and housing) to instrument for total expenditure. This addresses potential endogeneity issues for the budget share for food and expenditure. Neither of these robustness checks change the main results. We have also tested using group means for log expenditure at the county level as an instrument for log expenditure, and again, all results are robust to using this instrument.

B Estimation of rural/urban price gap

This appendix displays the detailed regression results for the analysis on the urban/rural price gap.

Table 8: Regression results for "Price levels and changes 1995-2002".

	Regression including dummy variables for year, urban/rural and provinces
Log of expenditure	-0.163***
	(0.002)
Rural	-0.070***
	(0.003)
Interaction (Rural x 2002)	0.060***
	(0.002)
Interaction (Urban x 2002)	0.001
	(0.002)
Hebei	-0.090***
	(0.004)
Shanxi	-0.083***
	(0.004)
Liaoning	0.005
	(0.004)
Jilin	-0.027***
	(0.005)
Jiangsu	0.026***
	(0.004)
Zhejiang	0.013***
	(0.005)
Anhui	0.015***
	(0.004)
Jiangxi	0.050***
	(0.004)
Shandong	-0.005
	(0.004)
Henan	-0.048***
	(0.004)
Hubei	0.032***
	(0.004)
Hunan	0.043***
	(0.004)
Guangdong	0.068***
	(0.004)
Sichuan	0.049***
	(0.004)
Guizhou	0.011**
	(0.005)
Yunnan	0.036***
	(0.004)
Shaanxi	-0.101***
	(0.005)
Gansu	-0.019***
	(0.004)
Constant	1.726***
	(0.014)
N	24266

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, robust standard errors in parentheses

C Tables

Table 9: Estimation results

	Main	Same (2+1)	No ES	EU ES	OECD ES
Log of expenditure	-0.195***	-0.194***	-0.202***	-0.200***	-0.199***
	(0.002)	(0.003)	(0.001)	(0.001)	(0.001)
Children	-0.031***		0.019***	-0.007***	-0.016***
	(0.001)		(0.001)	(0.001)	(0.001)
Adults	-0.032***		0.021***	-0.023***	-0.028***
	(0.001)		(0.001)	(0.001)	(0.001)
Elders	0.013***		0.009***	0.011***	0.012***
	(0.001)		(0.001)	(0.001)	(0.001)
Age HH	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Relative prices	0.020***	-0.010	0.023***	0.022***	0.021***
	(0.005)	(0.016)	(0.005)	(0.005)	(0.005)
Rural 95 Beijing	-0.071***	-0.080***	-0.074***	-0.074***	-0.073***
	(0.010)	(0.020)	(0.011)	(0.010)	(0.010)
Rural 95 Hebei	-0.178***	-0.201***	-0.189***	-0.187***	-0.184***
	(0.006)	(0.019)	(0.006)	(0.006)	(0.006)
Rural 95 Shanxi	-0.215***	-0.285***	-0.227***	-0.225***	-0.222***
	(0.008)	(0.035)	(0.008)	(0.008)	(0.008)
Rural 95 Liaoning	-0.052***	-0.040***	-0.059***	-0.058***	-0.056***
	(0.007)	(0.015)	(0.007)	(0.007)	(0.007)
Rural 95 Jilin	-0.074***	-0.082***	-0.082***	-0.081***	-0.079***
	(0.007)	(0.014)	(0.007)	(0.007)	(0.007)
Rural 95 Jiangsu	-0.067***	-0.053***	-0.075***	-0.073***	-0.071***
	(0.006)	(0.013)	(0.006)	(0.006)	(0.006)
Rural 95 Zhejiang	-0.052***	-0.011	-0.057***	-0.056***	-0.055***
	(0.006)	(0.013)	(0.006)	(0.006)	(0.006)
Rural 95 Anhui	-0.069***	-0.049***	-0.080***	-0.078***	-0.075***
	(0.006)	(0.014)	(0.005)	(0.005)	(0.006)
Rural 95 Jiangxi	-0.010*	0.038**	-0.024***	-0.020***	-0.017***
	(0.006)	(0.018)	(0.006)	(0.006)	(0.006)
Rural 95 Shandong	-0.080***	-0.076***	-0.088***	-0.087***	-0.085***
	(0.006)	(0.013)	(0.006)	(0.006)	(0.006)
Rural 95 Henan	-0.149***	-0.145***	-0.160***	-0.158***	-0.155***
	(0.006)	(0.013)	(0.005)	(0.005)	(0.005)
Rural 95 Hubei	-0.044***	-0.062***	-0.054***	-0.053***	-0.050***

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	Main	Same (2+1)	No ES	EU ES	OECD ES
	(0.006)	(0.014)	(0.006)	(0.006)	(0.006)
Rural 95 Hunan	-0.026***	-0.015	-0.035***	-0.034***	-0.032***
	(0.005)	(0.011)	(0.005)	(0.005)	(0.005)
Rural 95 Guangdong	0.004	0.024	-0.007	-0.004	-0.001
	(0.006)	(0.020)	(0.006)	(0.006)	(0.006)
Rural 95 Sichuan	-0.016***	-0.003	-0.025***	-0.023***	-0.021***
	(0.005)	(0.011)	(0.005)	(0.005)	(0.005)
Rural 95 Guizhou	-0.079***	-0.103***	-0.097***	-0.092***	-0.088***
	(0.007)	(0.021)	(0.007)	(0.007)	(0.007)
Rural 95 Yunnan	0.019***	0.038	0.006	0.010	0.013**
	(0.006)	(0.023)	(0.006)	(0.006)	(0.006)
Rural 95 Shaanxi	-0.174***	-0.202***	-0.188***	-0.185***	-0.181***
	(0.007)	(0.022)	(0.007)	(0.007)	(0.007)
Rural 95 Gansu	-0.040***	-0.081***	-0.057***	-0.053***	-0.049***
	(0.006)	(0.018)	(0.006)	(0.006)	(0.006)
Urban 95 Shanxi	-0.093***	-0.100***	-0.101***	-0.098***	-0.096***
	(0.005)	(0.008)	(0.005)	(0.005)	(0.005)
Urban 95 Liaoning	-0.025***	-0.028***	-0.028***	-0.027***	-0.026***
	(0.005)	(0.008)	(0.005)	(0.005)	(0.005)
Urban 95 Jiangsu	0.031***	0.012	0.027***	0.028***	0.029***
	(0.005)	(0.009)	(0.005)	(0.005)	(0.005)
Urban 95 Anhui	-0.024***	-0.031***	-0.031***	-0.028***	-0.027***
	(0.006)	(0.010)	(0.006)	(0.006)	(0.006)
Urban 95 Henan	-0.072***	-0.089***	-0.078***	-0.076***	-0.075***
	(0.006)	(0.009)	(0.005)	(0.005)	(0.005)
Urban 95 Hubei	0.033***	0.019**	0.028***	0.030***	0.031***
	(0.006)	(0.009)	(0.006)	(0.006)	(0.006)
Urban 95 Guangdong	0.095***	0.112***	0.094***	0.095***	0.095***
	(0.006)	(0.012)	(0.006)	(0.006)	(0.006)
Urban 95 Sichuan	0.006	0.008	-0.003	0.000	0.002
	(0.005)	(0.010)	(0.005)	(0.005)	(0.005)
Urban 95 Yunnan	-0.007	-0.006	-0.013**	-0.011**	-0.009*
	(0.005)	(0.008)	(0.005)	(0.005)	(0.005)
Urban 95 Gansu	-0.070***	-0.078***	-0.076***	-0.074***	-0.073***
	(0.007)	(0.010)	(0.006)	(0.006)	(0.006)
Rural 02 Beijing	-0.120***	-0.136***	-0.123***	-0.123***	-0.122***
	(0.009)	(0.018)	(0.009)	(0.009)	(0.009)
Rural 02 Hebei	-0.090***	-0.141***	-0.097***	-0.096***	-0.094***
	(0.007)	(0.019)	(0.007)	(0.007)	(0.007)

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	Main	Same (2+1)	No ES	EU ES	OECD ES
Rural 02 Shanxi	-0.122***	-0.179***	-0.129***	-0.129***	-0.127***
	(0.008)	(0.021)	(0.008)	(0.008)	(0.008)
Rural 02 Liaoning	0.004	-0.025	-0.001	-0.001	0.001
	(0.008)	(0.016)	(0.008)	(0.008)	(0.008)
Rural 02 Jilin	-0.071***	-0.077***	-0.075***	-0.075***	-0.074***
	(0.006)	(0.013)	(0.006)	(0.006)	(0.006)
Rural 02 Jiangsu	0.007	-0.009	0.003	0.004	0.004
	(0.006)	(0.013)	(0.006)	(0.006)	(0.006)
Rural 02 Zhejiang	-0.009*	-0.002	-0.010*	-0.011**	-0.011*
	(0.006)	(0.010)	(0.005)	(0.005)	(0.005)
Rural 02 Anhui	0.012*	0.005	0.005	0.006	0.008
	(0.006)	(0.012)	(0.006)	(0.006)	(0.006)
Rural 02 Jiangxi	0.057***	0.061***	0.052***	0.052***	0.053***
	(0.006)	(0.017)	(0.006)	(0.006)	(0.006)
Rural 02 Shandong	-0.023***	-0.022	-0.027***	-0.027***	-0.026***
	(0.007)	(0.015)	(0.006)	(0.006)	(0.006)
Rural 02 Henan	-0.048***	-0.045**	-0.054***	-0.053***	-0.052***
	(0.007)	(0.021)	(0.007)	(0.007)	(0.007)
Rural 02 Hubei	0.044***	0.045***	0.037***	0.038***	0.040***
	(0.007)	(0.014)	(0.007)	(0.007)	(0.007)
Rural 02 Hunan	0.034***	0.033**	0.030***	0.029***	0.030***
	(0.006)	(0.014)	(0.006)	(0.006)	(0.006)
Rural 02 Guangdong	0.075***	0.031	0.072***	0.072***	0.073***
	(0.007)	(0.038)	(0.007)	(0.007)	(0.007)
Rural 02 Sichuan	0.072***	0.070***	0.066***	0.067***	0.068***
	(0.006)	(0.012)	(0.006)	(0.006)	(0.006)
Rural 02 Guizhou	0.033***	-0.001	0.022***	0.024***	0.027***
	(0.007)	(0.020)	(0.006)	(0.006)	(0.006)
Rural 02 Yunnan	0.151***	0.151***	0.144***	0.145***	0.147***
	(0.009)	(0.033)	(0.009)	(0.009)	(0.009)
Rural 02 Shaanxi	-0.107***	-0.120***	-0.113***	-0.113***	-0.111***
	(0.008)	(0.020)	(0.007)	(0.007)	(0.007)
Rural 02 Gansu	0.031***	0.024	0.022***	0.024***	0.026***
	(0.008)	(0.024)	(0.008)	(0.008)	(0.008)
Urban 02 Beijing	0.018***	0.028***	0.016***	0.016***	0.017***
	(0.005)	(0.010)	(0.005)	(0.005)	(0.005)
Urban 02 Shanxi	-0.062***	-0.060***	-0.068***	-0.066***	-0.065***
	(0.005)	(0.009)	(0.005)	(0.005)	(0.005)
Urban 02 Liaoning	-0.013***	-0.007	-0.017***	-0.017***	-0.016***

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	Main	Same (2+1)	No ES	EU ES	OECD ES
	(0.005)	(0.009)	(0.005)	(0.005)	(0.005)
Urban 02 Jiangsu	-0.001	-0.019**	-0.007	-0.005	-0.004
	(0.005)	(0.008)	(0.005)	(0.005)	(0.005)
Urban 02 Anhui	0.001	0.003	-0.005	-0.004	-0.002
	(0.006)	(0.009)	(0.005)	(0.005)	(0.005)
Urban 02 Henan	-0.047***	-0.044***	-0.053***	-0.051***	-0.049***
	(0.005)	(0.008)	(0.005)	(0.005)	(0.005)
Urban 02 Hubei	-0.004	0.005	-0.009*	-0.007	-0.006
	(0.005)	(0.008)	(0.005)	(0.005)	(0.005)
Urban 02 Guangdong	0.056***	0.090***	0.051***	0.052***	0.053***
	(0.006)	(0.012)	(0.006)	(0.006)	(0.006)
Urban 02 Sichuan	-0.003	0.007	-0.010**	-0.008	-0.006
	(0.005)	(0.010)	(0.005)	(0.005)	(0.005)
Urban 02 Yunnan	0.005	0.009	-0.003	0.000	0.002
	(0.005)	(0.009)	(0.005)	(0.005)	(0.005)
Urban 02 Gansu	-0.063***	-0.043***	-0.067***	-0.066***	-0.065***
	(0.006)	(0.010)	(0.006)	(0.006)	(0.006)
Constant	2.020***	1.953***	2.149***	2.127***	2.091***
	(0.016)	(0.035)	(0.017)	(0.017)	(0.017)
Adjusted R^2	0.607	0.609	0.618	0.615	0.613
Observations	24266	5567	24266	24266	24266

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

[a] Robust standard errors in parenthesis, * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The table displays the estimation results for our main specification and the robustness checks relating to household composition and size. The first column displays the results for our main specification (all households, per capita). Column two gives the results for the robustness analysis on the subsamples of households with 2 adults and 1 child. The third column displays results when no equivalence scaling is used, column four when the EU equivalence scaling is used and five for the specification using the OECD equivalence scale. The EU and the OECD equivalence scale are defined as $1+0.5+0.3(children)$ and $1+0.7+0.5(children)$, respectively. Urban 95 Beijing was used as the base.

Table 10: Estimation results for robustness checks

	Main	Alt1	Alt2	Alt3	Alt4	Alt5
Log of expenditure	-0.195***	-0.216***	-0.206***	-0.171***	-0.157***	-0.545***
	(0.002)	(0.001)	(0.001)	(0.012)	(0.003)	(0.023)
Log of expenditure squared						0.021***
						(0.001)
Children	-0.031***	-0.037***	-0.046***	0.007	-0.024***	-0.034***
	(0.001)	(0.001)	(0.001)	(0.012)	(0.001)	(0.001)
Adults	-0.032***	-0.036***	-0.049***	-0.040***	-0.027***	-0.033***
	(0.001)	(0.001)	(0.001)	(0.010)	(0.001)	(0.001)
Elders	0.013***	0.014***	0.012***	0.016	0.014***	0.012***
	(0.001)	(0.001)	(0.001)	(0.018)	(0.001)	(0.001)
Age HH	0.001***	0.002***	0.001***	0.004***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)
Relative prices	0.020***	0.024***	0.023***	0.027	0.009	0.052***
	(0.005)	(0.006)	(0.005)	(0.021)	(0.006)	(0.005)
Rural 95 Beijing	-0.071***	-0.046***	0.007	-0.040***	-0.042***	0.714***
	(0.010)	(0.011)	(0.009)	(0.011)	(0.010)	(0.032)
Rural 95 Hebei	-0.178***	-0.144***	-0.111***	-0.146***	-0.116***	0.429***
	(0.006)	(0.006)	(0.005)	(0.022)	(0.008)	(0.011)
Rural 95 Shanxi	-0.215***	-0.207***	-0.094***	-0.173***	-0.145***	0.356***
	(0.008)	(0.008)	(0.006)	(0.032)	(0.010)	(0.011)
Rural 95 Liaoning	-0.052***	-0.035***	-0.069***	-0.011	-0.007	0.774***
	(0.007)	(0.007)	(0.007)	(0.018)	(0.008)	(0.021)
Rural 95 Jilin	-0.074***	-0.050***	-0.044***	-0.032	-0.022***	0.709***
	(0.007)	(0.007)	(0.007)	(0.021)	(0.008)	(0.020)
Rural 95 Jiangsu	-0.067***	-0.033***	-0.092***	-0.032**	-0.029***	0.738***
	(0.006)	(0.006)	(0.006)	(0.015)	(0.007)	(0.019)
Rural 95 Zhejiang	-0.052***	-0.018***	-0.038***	-0.029	-0.019***	0.770***
	(0.006)	(0.007)	(0.006)	(0.021)	(0.007)	(0.019)
Rural 95 Anhui	-0.069***	-0.056***	-0.095***	-0.034*	-0.011	0.698***
	(0.006)	(0.006)	(0.006)	(0.019)	(0.007)	(0.017)
Rural 95 Jiangxi	-0.010*	-0.014**	-0.065***	0.024	0.039***	0.910***
	(0.006)	(0.006)	(0.006)	(0.022)	(0.007)	(0.023)
Rural 95 Shandong	-0.080***	-0.060***	-0.067***	-0.037*	-0.027***	0.687***
	(0.006)	(0.006)	(0.006)	(0.022)	(0.007)	(0.016)
Rural 95 Henan	-0.149***	-0.132***	-0.132***	-0.110***	-0.089***	0.494***
	(0.006)	(0.006)	(0.005)	(0.020)	(0.007)	(0.012)
Rural 95 Hubei	-0.044***	-0.041***	-0.117***	-0.014	-0.002	0.811***

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	Main	Alt1	Alt2	Alt3	Alt4	Alt5
	(0.006)	(0.006)	(0.006)	(0.018)	(0.007)	(0.021)
Rural 95 Hunan	-0.026***	-0.037***	-0.059***	0.006	0.027***	0.839***
	(0.005)	(0.005)	(0.006)	(0.018)	(0.007)	(0.019)
Rural 95 Guangdong	0.004	0.052***	-0.006	0.012	0.035***	1.024***
	(0.006)	(0.007)	(0.006)	(0.023)	(0.007)	(0.024)
Rural 95 Sichuan	-0.016***	-0.022***	-0.083***	0.035	0.041***	0.903***
	(0.005)	(0.005)	(0.006)	(0.024)	(0.007)	(0.021)
Rural 95 Guizhou	-0.079***	-0.096***	-0.094***	-0.055**	-0.015*	0.637***
	(0.007)	(0.007)	(0.007)	(0.024)	(0.009)	(0.017)
Rural 95 Yunnan	0.019***	0.029***	-0.059***	0.056**	0.064***	1.059***
	(0.006)	(0.007)	(0.007)	(0.023)	(0.008)	(0.030)
Rural 95 Shaanxi	-0.174***	-0.184***	-0.113***	-0.131***	-0.105***	0.430***
	(0.007)	(0.007)	(0.006)	(0.024)	(0.009)	(0.012)
Rural 95 Gansu	-0.040***	-0.053***	-0.098***	-0.001	0.017**	0.773***
	(0.006)	(0.006)	(0.007)	(0.024)	(0.008)	(0.022)
Urban 95 Shanxi	-0.093***	-0.110***	-0.100***	-0.066***	-0.061***	0.624***
	(0.005)	(0.005)	(0.005)	(0.016)	(0.006)	(0.014)
Urban 95 Liaoning	-0.025***	-0.033***	-0.029***	-0.028	-0.007	0.959
	(0.005)	(0.005)	(0.005)	(0.023)	(0.005)	(.)
Urban 95 Jiangsu	0.031***	0.024***	0.028***	0.033***	0.043***	1.219***
	(0.005)	(0.005)	(0.005)	(0.012)	(0.006)	(0.027)
Urban 95 Anhui	-0.024***	-0.039***	-0.033***	-0.015	0.007	0.841***
	(0.006)	(0.006)	(0.006)	(0.016)	(0.007)	(0.020)
Urban 95 Henan	-0.072***	-0.088***	-0.078***	-0.051***	-0.042***	0.693***
	(0.006)	(0.005)	(0.006)	(0.015)	(0.006)	(0.015)
Urban 95 Hubei	0.033***	0.021***	0.027***	0.017	0.055***	1.161***
	(0.006)	(0.006)	(0.006)	(0.023)	(0.006)	(0.023)
Urban 95 Guangdong	0.095***	0.099***	0.099***	0.083***	0.091***	2.037
	(0.006)	(0.006)	(0.006)	(0.015)	(0.006)	(.)
Urban 95 Sichuan	0.006	-0.004	-0.003	0.019	0.030***	0.980***
	(0.005)	(0.005)	(0.005)	(0.014)	(0.006)	(0.020)
Urban 95 Yunnan	-0.007	-0.018***	-0.013**	0.014	0.016***	0.970***
	(0.005)	(0.005)	(0.005)	(0.010)	(0.006)	(0.021)
Urban 95 Gansu	-0.070***	-0.088***	-0.077***	-0.057***	-0.036***	0.685***
	(0.007)	(0.006)	(0.006)	(0.018)	(0.007)	(0.017)
Rural 02 Beijing	-0.120***	-0.094***	-0.032***	-0.084***	-0.098***	0.562***
	(0.009)	(0.012)	(0.007)	(0.020)	(0.009)	(0.027)
Rural 02 Hebei	-0.090***	-0.057***	-0.034***	-0.055**	-0.051***	0.708***
	(0.007)	(0.007)	(0.006)	(0.023)	(0.008)	(0.024)

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	Main	Alt1	Alt2	Alt3	Alt4	Alt5
Rural 02 Shanxi	-0.122***	-0.100***	-0.034***	-0.091***	-0.084***	0.613***
	(0.008)	(0.008)	(0.006)	(0.027)	(0.009)	(0.021)
Rural 02 Liaoning	0.004	0.021***	0.007	0.034*	0.033***	1.107***
	(0.008)	(0.008)	(0.006)	(0.020)	(0.009)	(0.038)
Rural 02 Jilin	-0.071***	-0.059***	-0.032***	-0.029*	-0.034***	0.769***
	(0.006)	(0.007)	(0.005)	(0.017)	(0.007)	(0.026)
Rural 02 Jiangsu	0.007	0.041***	0.003	0.036*	0.027***	1.132***
	(0.006)	(0.006)	(0.006)	(0.020)	(0.007)	(0.035)
Rural 02 Zhejiang	-0.009*	0.024***	-0.001	0.006	0.006	0.967***
	(0.006)	(0.006)	(0.005)	(0.015)	(0.006)	(0.026)
Rural 02 Anhui	0.012*	0.035***	0.004	0.041**	0.052***	1.072***
	(0.006)	(0.006)	(0.005)	(0.020)	(0.007)	(0.031)
Rural 02 Jiangxi	0.057***	0.072***	0.037***	0.082***	0.087***	1.341***
	(0.006)	(0.006)	(0.005)	(0.014)	(0.007)	(0.038)
Rural 02 Shandong	-0.023***	0.001	-0.000	0.013	0.009	0.982***
	(0.007)	(0.007)	(0.006)	(0.023)	(0.007)	(0.030)
Rural 02 Henan	-0.048***	-0.026***	-0.023***	0.000	-0.010	0.855***
	(0.007)	(0.008)	(0.006)	(0.037)	(0.008)	(0.026)
Rural 02 Hubei	0.044***	0.067***	0.007	0.078***	0.075***	1.281***
	(0.007)	(0.007)	(0.006)	(0.022)	(0.007)	(0.041)
Rural 02 Hunan	0.034***	0.057***	0.023***	0.061***	0.060***	1.228***
	(0.006)	(0.006)	(0.005)	(0.015)	(0.007)	(0.035)
Rural 02 Guangdong	0.075***	0.110***	0.090***	0.084***	0.091***	1.562***
	(0.007)	(0.007)	(0.006)	(0.023)	(0.007)	(0.048)
Rural 02 Sichuan	0.072***	0.091***	0.048***	0.113***	0.107***	1.194***
	(0.006)	(0.006)	(0.005)	(0.017)	(0.007)	(0.048)
Rural 02 Guizhou	0.033***	0.038***	0.040***	0.056***	0.062***	1.460***
	(0.007)	(0.007)	(0.006)	(0.020)	(0.008)	(0.040)
Rural 02 Yunnan	0.151***	0.149***	0.125***	0.169***	0.180***	1.163***
	(0.009)	(0.009)	(0.007)	(0.023)	(0.011)	(0.035)
Rural 02 Shaanxi	-0.107***	-0.086***	-0.059***	-0.076***	-0.069***	1.982***
	(0.008)	(0.008)	(0.006)	(0.025)	(0.009)	(0.083)
Rural 02 Gansu	0.031***	0.045***	0.021***	0.083***	0.072***	0.650***
	(0.008)	(0.009)	(0.007)	(0.021)	(0.010)	(0.023)
Urban 02 Beijing	0.018***	0.030***	0.018***	0.021**	0.016***	1.024***
	(0.005)	(0.005)	(0.005)	(0.009)	(0.006)	(0.030)
Urban 02 Shanxi	-0.062***	-0.065***	-0.067***	-0.049***	-0.041***	0.734***
	(0.005)	(0.005)	(0.005)	(0.010)	(0.006)	(0.020)
Urban 02 Liaoning	-0.013***	-0.003	-0.018***	0.003	0.001	0.932***

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	Main	Alt1	Alt2	Alt3	Alt4	Alt5
	(0.005)	(0.005)	(0.005)	(0.009)	(0.005)	(0.020)
Urban 02 Jiangsu	-0.001	0.014***	-0.006	0.003	0.014**	1.003***
	(0.005)	(0.005)	(0.005)	(0.011)	(0.006)	(0.022)
Urban 02 Anhui	0.001	0.004	-0.007	0.014	0.025***	0.997***
	(0.006)	(0.006)	(0.005)	(0.010)	(0.006)	(0.024)
Urban 02 Henan	-0.047***	-0.044***	-0.052***	-0.043***	-0.024***	0.781***
	(0.005)	(0.005)	(0.005)	(0.012)	(0.005)	(0.018)
Urban 02 Hubei	-0.004	-0.001	-0.009*	0.015	0.014***	0.971***
	(0.005)	(0.005)	(0.005)	(0.011)	(0.005)	(0.021)
Urban 02 Guangdong	0.056***	0.073***	0.052***	0.068***	0.070***	0.721***
	(0.006)	(0.007)	(0.006)	(0.014)	(0.007)	(0.019)
Urban 02 Sichuan	-0.003	0.003	-0.010**	0.009	0.019***	0.928***
	(0.005)	(0.005)	(0.005)	(0.012)	(0.006)	(0.020)
Urban 02 Yunnan	0.005	0.008	-0.004	0.019**	0.027***	0.998***
	(0.005)	(0.005)	(0.005)	(0.008)	(0.006)	(0.022)
Urban 02 Gansu	-0.063***	-0.049***	-0.068***	-0.054***	-0.044***	0.683***
	(0.006)	(0.006)	(0.006)	(0.008)	(0.006)	(0.020)
Constant	2.020***	2.207***	2.167***	1.658***	1.673***	3.450***
	(0.016)	(0.016)	(0.015)	(0.129)	(0.031)	(0.099)
Adjusted R^2	0.607	0.668	0.613	0.833	0.579	0.609
Observations	24266	24267	27859	366	22805	24266

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

[a] Estimation results for all our specifications. The first column displays the results for our main specification (all households, per capita consumption values). Column two gives the results for the robustness check including the reported expenditure on housing instead of the imputed values suggested by the survey providers. The third column displays results for the specification using median self-production to predict self-production in 2002. The fourth column presents the result for the estimation based on groups, and the fifth column those for the IV estimation. The last column gives results for the QUAIDS specification. Note that the first five columns gives the dummy coefficients for the provinces whereas the last column gives the price estimates. Urban 95 Beijing was used as the base.

[b] Note that we have occupational information only for about 24000 households and hence this is the sample size for the main estimation as well as the robustness check with the alternative valuation of housing and the QUAIDS specification. In the estimation where we use median self-production to predict self-production in 2002 we loose some observations due to missing demographics (mainly age information for household head). When income is used as an instrument for total consumption we loose about 1500 observations due to missing information about income. The analysis based on grouping uses the county as the observation and hence the sample size is reduced to 366 in this estimation. All results are from robust OLS regressions.

D Inequality and Poverty Measures

D.1 The Gini Index

The Gini index is the most commonly used inequality measure. The formula for the Gini index is as follows:

$$G = \frac{1}{2n(n-1)\mu}\sum_i\sum_j \left|x_i - x_j\right|, \tag{6}$$

where x_s is the relevant income measure for person s.

D.2 The Head Count and the Poverty Gap Index

The Head Count index measures the number of people falling below a given poverty line, m. This can be expressed as:

$$HC = \frac{1}{N}\sum_{i=1}^{N} I(x_i < m), \tag{7}$$

where I is the indicator function that takes a value of 1 if the bracketed expression is true and 0 otherwise. N is the total population.

The Poverty Gap index, on the other hand, also takes into account how poor those below the poverty line are. It measures how much it would cost to eliminate poverty and is measured by:

$$PG = \frac{1}{N}\sum_{i=1}^{N} \frac{m - x_i}{m} I(x_i < m). \tag{8}$$

D.3 Poverty Lines

The respective poverty lines of \$1 and \$2 a day are converted to Chinese currency (Yuan) using Purchasing Power Parity (PPP) exchange rates. We use the PPPs provided by the International Comparison Program (ICP)/ World Bank in the 2005 round (World Bank, 2008). What is referred to as the \$1 a day World Bank poverty line was considered to be equal to \$1.25 in 1995. Hence, we use \$1.25 and \$2 as our poverty lines. The lines are somewhat arbitrary and, hence, we find it useful to look at both these lines. The implied 1995 PPP conversion rate of the 2005 PPP can be found by deflating the PPP conversion rate by inflation in China and the US, using the published CPIs for both countries, respectively. The PPP conversion factor for China equals 3.45

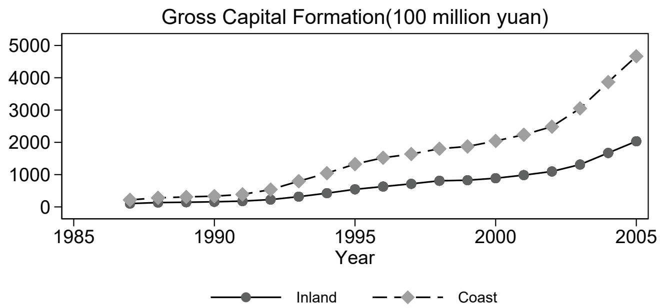
in 2005 (World Bank, 2008). The yearly poverty line in Yuan corresponding to \$1.25 a day is equal to 1726 Yuan a year:

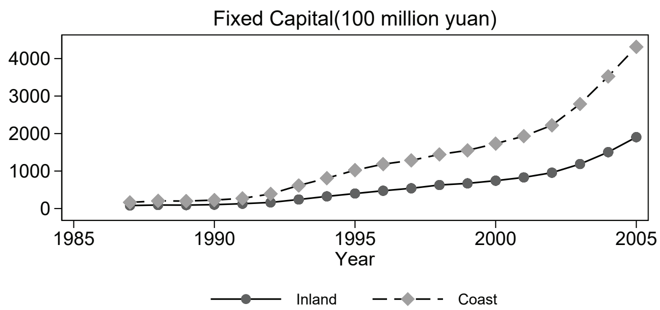
$$1.25*365*\frac{PPP_{CHN}^{1995}}{PPP_{US}^{1995}} = 1.25*365*\frac{PPP_{CHN}^{2005}}{PPP_{US}^{2005}}*\frac{\frac{CPI_{CHN}^{1995}}{CPI_{CHN}^{2005}}}{\frac{CPI_{US}^{1995}}{CPI_{USD}^{2005}}} = 1.25*365*3.45*\frac{\frac{396.9}{464.0}}{\frac{78}{100}} = 1726. \tag{9}$$

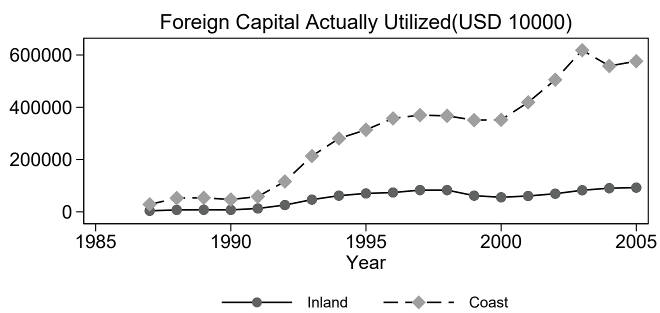
The corresponding \$2 a day line is equal to 2761 Yuan.

E Background

Capital: In Figure 5 we illustrate how capital and investments differ by coast and inland. All measures show that capital and investments are concentrated in the coastal areas.







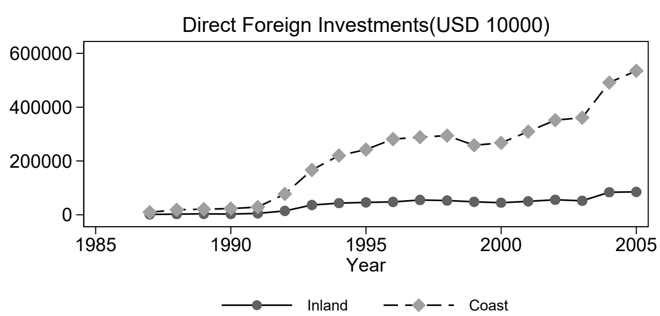


Figure 5: Capital and investment.

Note: The figure displays gross capital formation, fixed capital, foreign capital actually utilized, and direct foreign investments. Source: China Statistical Yearbook, provided by Chinadataonline.org

Labor market productivity: In this period, labor market productivity is increasing due to increasing educational levels, amongst others. In Figure 6 we can see that in the coastal regions student enrollment in institutions of higher education is higher than inland enrollment in the period 1987–2004. We see the same pattern for the percentage of school aged children enrolled in school, and in the percentage of primary school graduates entering secondary school. The gap is narrowing, especially after 2000, but this should not matter for our results.

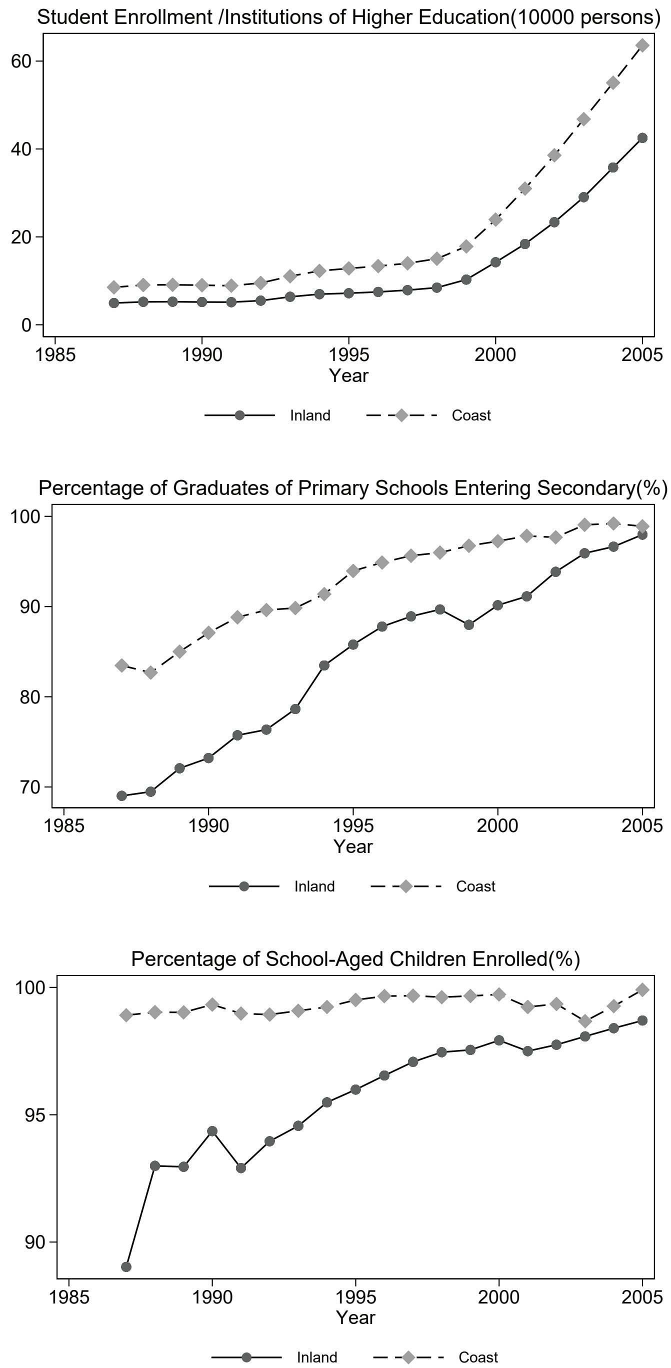


Figure 6: Enrollment at different levels of education.

Note: The figure displays the percentage of students enrolled in primary school, the percentage of students which enter secondary school from primary school, and the number of students enrolled in higher education. The results are displayed for coastal and inland provinces separately. Source: China Statistical Yearbook, provided by Chinadataonline.org

Migration: During this period, migration in China is already large, and increasing. Migrants are defined as individuals with rural Hukou, which go to nearby towns or to big coastal cities. As labor mobility at this stage is restricted, there are large differences in employment and wage opportunities between the rural inland areas and urban areas, and the coastal areas (Chan, 2013). Figure 7 is taken from Chan (2013), and it is based on census data. We see that the coastal regions experience a net gain in population from migration, while the population rich inland provinces experience a decline. This holds for both periods.

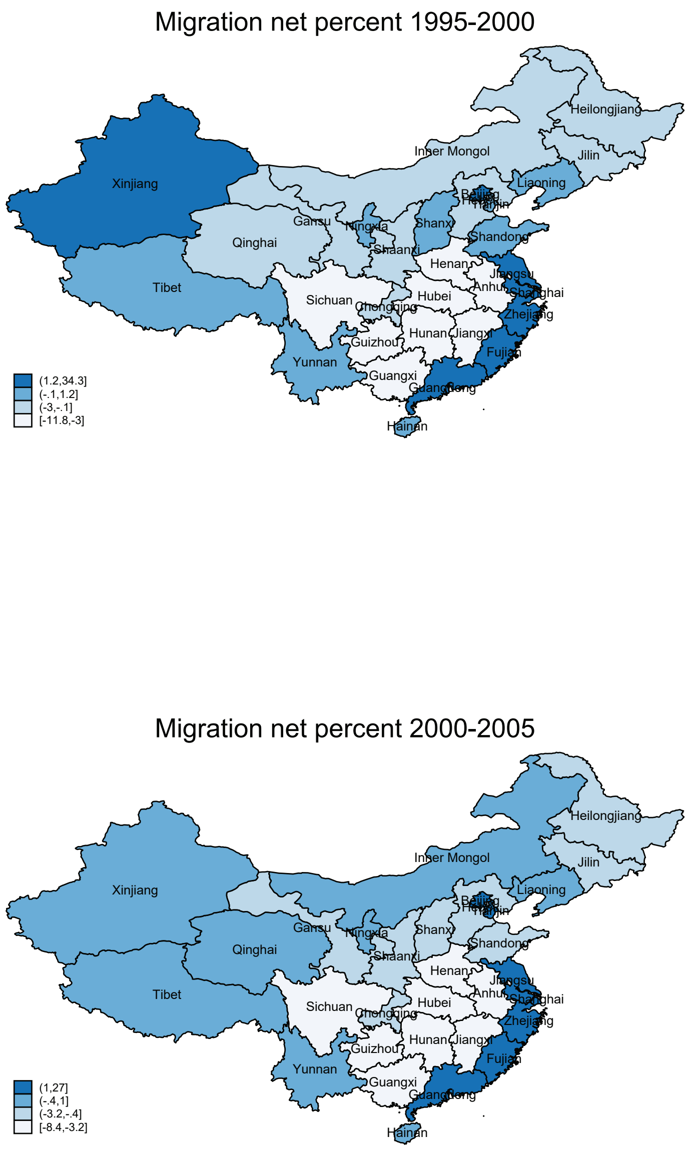


Figure 7: Interprovincial migration in China 1995–2005

Note: The figure displays migration between provinces in two consecutive five-year periods, 1995–2000 and 2000-2005. Source: Chan, Kam Wing. 2013. China: internal migration. The encyclopedia of global human migration.

Imports: Most prices were liberalized in 1993, and China was opening up to trade and preparing for WTO accession by reducing tariff rates from 1996 to 2003 (23.6% to 11%). As a result, we would expect prices for traded goods to decrease. We see in Table 11 that the import share of total trade for coastal provinces is higher in both 1995 and 2002.

Table 11: Import share of trade 1995-2002.

	(1)	(2)	(3)
Coast	0.11**	0.10**	-0.13
	(0.05)	(0.04)	(0.14)
Observations	29	30	29
R-squared	0.15	0.21	0.03
Year	1995	2002	1995-2002
SE	robust	robust	robust
Mean	0.351	0.420	0.305

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

We see in Table 12 that the import share of gross provincial product for coastal provinces is higher in both 1995 and 2002, and that the share is increasing for coastal provinces.

Table 12: Import and share of gross provincial product 1995-2002.

	(1)	(2)	(3)
Coast	0.02**	0.03***	0.69**
	(0.01)	(0.01)	(0.31)
Observations	29	30	29
R-squared	0.25	0.35	0.19
Year	1995	2002	1995-2002
SE	robust	robust	robust
Mean	0.0127	0.0163	0.250

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

State-owned enterprises: During this period state-owned enterprises (SOEs) were privatized, and in particular, small and medium sized enterprises. This is reflected in the numbers from the Statistical Yearbook of China. In 1995, the total number of SOEs inland (coast) was equal to 62 449 (52 693) in 1995, and was reduced to 19 404 (13 202) in 2002.

Regression Table 13 indicates that in 1995, SOEs actually constituted a relatively larger share of all enterprises in coastal areas, see (1). In 2002, on the other hand, column (2) indicates that the SOE share of enterprises is significantly lower in coastal areas. In (3), we see that this difference between inland and coastal areas is increasing.

Table 13: State-owned enterprises: Share of enterprises 1995-2002.

	(1)	(2)	(3)
Coast	0.02*	-0.20***	-14.83***
	(0.01)	(0.07)	(2.70)
Observations	30	30	30
R-squared	0.12	0.22	0.45
Year	1995	2002	1995-2002
SE	robust	robust	robust
Mean	0.0282	0.323	14.55

Robust standard errors in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regression Table 14 indicates that the value of SOE output as share of provincial GDP was not different between inland and coastal areas in 1995. In 2002, however, the value of SOE output as a share of GDP is significantly lower for coastal provinces.

Table 14: State-owned enterprises: Share of gross provincial product 1995-2002.

	(1)	(2)	(3)
Coast	0.01	-0.11**	-0.20***
	(0.07)	(0.04)	(0.07)
Observations	30	30	30
R-squared	0.00	0.15	0.19
Year	1995	2002	1995-2002
SE	robust	robust	robust
Mean	0.506	0.220	-0.561

Robust standard errors in parentheses.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

Regression Table 15 shows a similar results, namely that the value of SOE output as share of industry output was lower in coastal areas in both 1995 and in 2002, and that this difference increased significantly in this period.

54.6 (52.8) million people were employed in SOEs inland (coast). In 2002, 36.4 (31.5) million people worked in SOEs in the inland (coast) areas. The total permanent population of the inland (coastal) provinces summed to 720.6 (481.1) million people in 1995, and 731.3 (512.8) million in 2002. Regression Table 4 shows that the share of employed individuals who work in SOEs are significantly lower in coastal areas in

Table 15: State-owned enterprises: Share of industrial output 1995-2002.

	(1)	(2)	(3)
Coast	-0.12*	-0.27***	-0.49***
	(0.06)	(0.06)	(0.12)
Observations	30	30	30
R-squared	0.12	0.34	0.29
Year	1995	2002	1995-2002
Mean	0.412	0.328	-0.208

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

both years.

Table 16: State-owned enterprises: Share of employed working in SOEs 1995-2002.

	(1)	(2)	(3)
Coast	-0.10***	-0.12***	-0.04
	(0.03)	(0.04)	(0.03)
Observations	30	30	30
R-squared	0.33	0.26	0.06
Year	1995	2002	1995-2002
SE	robust	robust	robust
Mean	0.767	0.689	-0.105

Robust standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

The coastal provinces experienced large economic growth, and the results above taken together implies that the role of SOEs were significantly reduced in the economies of the coastal areas, compared to the inland. According to Brandt et al. (2012), SOEs were replaced by more dynamic private firms. This gives some support to our suggested explanation that higher productivity in the coastal areas could lead to lower price increases.