The Price of Growth: Consumption Insurance in China 1989-2009*

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Abstract

Growth entails taking risks. This implies that the welfare gains of growth hinge on the ability of households to insure consumption against the risks associated with growth. Here, we exploit a novel and unique opportunity to empirically study this question using as laboratory an economy, China, that has witnessed enormous and sustained economic growth and for which we build a long panel of household-level consumption and income for the most recent two decades. We find that consumption insurance is disrupted along the growth process with a transmission of permanent income shocks to consumption that triples from 1989 to 2009. Our evidence suggests that the shortage of available options to store wealth limits the use of household savings for precautionary reasons. Our results have implications for the welfare assessment of growth across time and space. Across time, the loss of insurance implies that rural households would actually prefer to live in the growth-risk-insurance environment of the pre- rather than post-WTO years, despite higher rural growth in the 2000s. Across space, while the welfare gains of rural-to-urban

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migration drop by more than two-thirds due to consumption insurance losses in pre-WTO years, these gains remain high in the post-WTO years after a change in the composition of public transfers that substantially improves insurance in urban areas.

1 Introduction

Countries that take off and begin to rapidly raise their standards of living are potentially subject to increasing income risks—i.e., unanticipated changes in income—that reflect the new sets of projects and opportunities generating growth (e.g. Greenwood and Jovanovic (1990), Greenwood et al. (2010), Cole et al. (2015)). In this context, the ultimate purpose of growth, welfare improvement, hinges not only on growth per se but also on the ability of households to insure their consumption against the increasing risks associated with growth. We investigate this question measuring the transmission of income inequality to consumption inequality for a country and a period of fast economic transformation, China from 1989 to 2009—a growth experience that has raised income per capita by a factor of 6 in twenty years, i.e., 7.5 times the speed of the first industrial revolution.[1] To the best of our knowledge ours is the first study that empirically explores the joint dynamics between consumption insurance and economic growth. To do so we recover unique panel data on household-level consumption and income for a developing country that has successfully undergone sustained growth over a long span of years, i.e., an ideal scenario to study the relationship between growth, risk and insurance and assess its welfare implications.

The phenomenal growth experience of China has spurred much academic research (see Zhu (2012), Storesletten and Zilibotti (2014) and Yao (2014)).[2] However, it is hard to imagine that all households enjoy the same consumption path—then welfare—along the growth process. In particular, if household income risk increases with growth, the evolution of the ability to insure consumption against these risks is crucial to determine ex-ante households' welfare. This raises the following questions. First, how much does household income risk change during the process of economic growth? Second, how much does the ability to hedge against these risks change along this growth process? Further, in the context of China, with a differential system of public transfers that strongly depends on the area of residency, how much do income risks and consumption insurance differ between rural and urban areas? These are the questions that we quantitatively answer here.

Our main finding is that economic growth is associated with more income risk and a loss of consumption insurance. We obtain these results in several steps. First, to be able to quantify income risks and insurance, one requires a panel of household consumption and income, a data requirement that is demanding even for the U.S., see Heathcote et al. (2010a) and Carroll et al. (2014). In the case of China, the data limitations are also important.[3] Our first contribution is

[1] Precisely, it took the U.K. from 1820 to 1970 to raise income per capita by that factor, see Bolt and van Zanden (2013).

[2] We provide a more detailed account of the Chinese growth model in section 2.

[3] See a comprehensive discussion on data constraints for China in Ligon (2007). The panel on household

the construction of a panel of household consumption and income in rural and urban China from 1989 to 2009. We build these measures from the China Health and Nutrition Survey (CHNS), a publicly available data source widely used for nutritional and medical research on China.[4] We use a novel approach to construct food consumption from the Nutrition Survey, a core component of the CHNS that accurately records in detail the daily diet of all members in a household. Together with the local food price data from the Community Survey of the CHNS, we construct the value of diet, i.e., food consumption, for each household. With food consumption, the major component of nondurable consumption, and other pieces of nondurable consumption, services and semi-durables in hand, we consistently capture about 60-70% of a typical rural household's consumption basket and 50-60% of a typical urban household's consumption basket. Here, note that having food as our major consumption component helps reduce potential measurement error (Attanasio et al. (2014)) and sets our results on the insurance loss as a lower bound (Aguiar and Hurst (2014)). In terms of income, we use raw data from each household member to construct a measure of household income, consistent and harmonized across waves. Importantly, we separately recover the full set of public and private transfers received by all household members.

Second, the large set of potential insurance mechanisms that households can use in practice suggests that there might not be a single mechanism that explains the entire amount of risk sharing that we observe in an economy, but rather a combination of such mechanisms. Under these conditions, in our exercise we opt for following the premise in Deaton (1997) that calls for direct approaches to quantifying the overall amount of risk sharing, without requiring the specification of particular mechanisms (i.e., endowments, technologies or market arrangements). In this spirit we apply the proposed method in Blundell et al. (2008) to directly quantify how much of permanent and transitory shocks pass through to consumption.[5] Since we are interested in the relationship that risk and insurance have with growth, we allow for both the income risk, i.e., the variance of residual (or within) income inequality, and the consumption insurance parameters, i.e., the pass-through coefficients, to change over time.

We find that income risk has significantly increased by a factor of 1.72 and 2.99, respectively, in rural and urban China from 1989 to 2009, and has remained the major component behind income inequality throughout the entire sample period.[6] Further, a decomposition of income

consumption and income that we construct in this exercise contributes to circumvent these data limitations.

[4]The CHNS is an on-going project between the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. We discuss CHNS in great deail in section 3.

[5]An alternative approach for studying risk sharing is to ascribe consumption behavior to a specific mechanism that structurally predicts distinct consumption responses to changes in income (see a survey discussion in Heathcote et al. (2009)).

[6]The positive relationship between growth and risk can be generated from the choice of risky projects that

risks between permanent and transitory components reveals that a large part of the increase in residual inequality is driven by the permanent component, which is harder to insure and hence more costly in terms of welfare. Furthermore, at the same time that income risk rises with growth, we find that the ability to insure consumption has substantially deteriorated with growth. Precisely, while slightly more than 10% of permanent shocks are passed to consumption in the 1990s, close to 30% of permanent shocks are transmitted to consumption in the 2000s in both rural and urban areas. That is, the transmission of permanent income shocks to consumption has increased by a factor of almost 3 in the last decade, a significant worsening in the ability to insure consumption. This result that China is growing at the cost of risks and at the expense of insurance further holds across space between communities with high income growth versus communities with low income growth. We find that high-growth communities experience both more risks and a larger deterioration in the ability to insure consumption over time.

In an economy with high and increasing savings rates, it is interesting to further explore what is it that generates the overall loss in insurance that we have estimated. Perhaps surprisingly, we find that household savings in China do not help insure consumption. This result is borne out from estimating the degree of partial insurance for subsamples of households that have differential average savings rates, either in levels or growth rates. In either case, we find that households associated with high levels or fast increases in household savings are also the ones that experience a substantial worsening in consumption insurance. That is, the drive of household saving in China must go beyond the precautionary motive. Indeed, we provide evidence that savings in the form of investment in houses—that represent almost three-fourths of the total household wealth portfolio—and for retirement via investments in children reduce the ability to insure current consumption. These results are reminiscent of the findings by Kaplan et al. (2014), who show households, even with sizable net worth, would hold little cash reserves and bear consumption fluctuations to gain from holding illiquid assets with high returns. Our results suggest that this type of hand-to-mouth households may naturally arise in a fast growing developing economy.

Third, we use a unified framework for growth, risk and insurance similarly to Lucas (1987) in order to assess the welfare costs of growing with less insurance. We find these costs are large. In particular, rural households would actually prefer living under the growth-risk-insurance environment in the pre-WTO era to living in the post-WTO era, despite more growth in the post-WTO years. This suggests that currently the rural population is especially vulnerable to risks, where the social insurance provision (e.g. welfare programs, work subsidies and health insurance) has slowed down or disappeared. The case of urban households is different. We find that in the

are more likely to yield higher income growth, see Aghion et al. (2010). Alternatively, it is the presence of risky income that generates overaccumulation of capital, hence higher income levels, for precautionary reasons, see Krusell and Smith (1998).

2000s urban households have benefited from a new composition of public transfers—i.e., a direct form of social insurance policy—that substantially helped them cope with the transmission of transitory risk to consumption after WTO. The new composition of public transfers, that essentially implies a shift from food coupons and work subsidies to pension income, is a phenomenon more prominent in urban areas and decreases the comovement between household earnings and public transfers providing an extra cushion for consumption against shocks.[7] Indeed, we find that without public transfers urban households would also choose the pre-WTO growth-risk-insurance environment.

Finally, economic growth is related to the process of structural transformation (Gollin et al., 2002, 2004) that inevitably involves migration decisions. Reconducting our analysis across rural and urban areas we explore how much risk and insurance affect the incentives to migrate along the growth process. We find that rural-to-urban migration entails consumption insurance losses that drop the welfare gains of migration by a large 71% before the 2000s. However, an increase in the amount of consumption insurance against transitory risk in urban areas in the 2000s substantially mitigates the insurance losses and its effects on the incentives to migrate. This analysis is related to an emerging literature on development that emphasizes the importance of risk and insurance for migration decisions, see Bryan et al. (2014), Morten (2013), and Munshi and Rosenzweig (2014).[8] In our case, from a macroeconomic perspective, we take advantage of a long panel of consumption and income for an economy that displays substantial growth to investigate the evolution of the welfare gains from migration along the process of economic growth. We find these gains largely increase with growth due to a change in the composition of public transfers that improves social insurance in urban areas.

The rest of the paper is organized as follows. Section 2 describes the evolution of institutions of social insurance in urban and rural China since Deng Xiaoping's growth reforms in the 1980s. In section 3, we describe the construction of household consumption and income including our procedure to recover food consumption from dietary information. Further, we establish key facts about the evolution of rural and urban consumption and income inequality during the 20 years of economic reforms in China. In section 4, we estimate the degree of partial insurance in rural and urban China. Theoretical interpretations of the behavior of insurance are discussed in section 5. We conduct a welfare analysis of growth, risk and insurance across time and space in section 6. In section 7 we conduct policy experiments on the current state of affairs of development policy in China that faces trade-offs between targets of growth, risk and insurance. Section 8 concludes.

[7] Fang (2014) provides a detailed description of insurance markets in China that includes pension income as an important component of social insurance policy.

[8] See an earlier discussion in Rosenzweig and Stark (1989) in which migration patterns through marriages across villages can help improve consumption insurance.

2 Institutional Background in China 1989-2009

We begin by describing, in a highly parsimonious way, the growth model that China has taken since 1989. After a brief experimentation with economic liberalism in the 1980s, in particular in the rural areas, the Chinese government embarked on a highly controlled growth process in which resources were mobilized from the subnational governments to the central government, from the rural areas to urban areas and from the non-state to the state industrial sector.[9] It channeled public resources away from the township and village enterprises (TVEs), popular in the 80s, in the rural areas (Huang (2008)) and towards the state-owned enterprises (SOEs) in the cities (Song et al. (2011)). Within the state sector in cities, to concentrate effort in modernizing industries, the government strengthened the large state-owned enterprises by offering cheap loans and tax breaks and privatized a large number of small and effectively bankrupt enterprises to cut down loss, see Hsieh and Song (2014). To facilitate the technological catch up, foreign investors with more advanced technologies (than their Chinese counterparts) were let in, see Reenen and Yueh (2012) and Holmes et al. (2013). Millions of migrant workers, usually rural labor seeking off-farm work bound to their rural origin by the *Hukou* registration system, kept the labor cost low. Overall, this centralized approach has led to capital misallocation (Bai et al. (2006), Dollar and Wei (2007) and Hsieh and Klenow (2009)) and income inequality (Benjamin et al. (2008) and Park (2008)).[10]

How does this development policy shape the income growth and risk environment that rural and urban households face? How does it affect consumption and welfare? Before moving on to precise measures of risks, insurance and welfare later in the paper, we comment briefly next. By 1990, the agriculture output as a share of GDP had fallen from 40% in 1970 to 28%, while its employment share had fallen from 81% in 1970 to 60%.[11] This means off-farm work has been an important source of income for rural households since 1989. In our sample, the agricultural income accounts for less than 50% of the total rural disposable income throughout the sample period (see Table 2 for 2006 for example). Apart from the risks inherent in agricultural production such as weather and input/output price risks, rural households are also, increasingly, subject to labor market and business income risks. If a member of a rural household seeks employment from a local TVE, he may face even higher risks than an urban employer working for an SOE given the deteriorating business environment for TVEs after 1990. On the other hand, the local social safety net is largely missing throughout our sample period. Since the Tax Reform, the county

[9] To do that, the central government "recentralized" the tax revenue vis-à-vis the subnational governments by way of the 1994 Tax Reform, while leaving the expenditure responsibilities largely with the latter, see Bird and Wong (2005).

[10] See also the recent review in Fan et al. (2013)

[11] See Table 13.6 in Huang et al. (2005).

and township governments, supposedly the providers of public education, health care, medical insurance and infrastructure, have been paralyzed by fiscal imbalances. To solve their revenue problem, local governments turned to rural residents for extra budget fees and converted public assets and land to commercial uses, both of which essentially passed the financial burden onto rural households. Since early 2000, extra budgetary fees are cut and the pilot programs of new medical insurance scheme and social security and pension scheme are rolled out. Due to the limited coverage and scope of these pilot programs, the rural households in our sample had highly restricted access to public social insurance from 1989 to 2009.[12]

In contrast, urban households have always enjoyed some public social insurance, though the composition of the social safety net have changed during the period of investigation. Up until mid-1990, urban residents enjoyed a relatively stable state employment in a "work unit." The "work unit" provided a whole spectrum of services to the employees, ranging from housing, maternal care, child care, child education, and training to entertainment and health care, and distributed subsidies for food, commuting, heating (in winter seasons) and so on. The funding of the services and subsidies was partly from the work unit's revenue and partly from the government. Urban households faced relatively low income risks, and consumption was essentially guaranteed in an administrative process. The SOE reforms shook this old model of "enterprises running social programs" (*qi ye ban she hui*). To increase the profitability of the state sector, thousands of small loss-making SOEs were shut down or sold and their employees were laid off,[13] and the remaining SOEs decreased their welfare spending on employees. Urban residents then not only faced higher unemployment and income risks, but also had to foot the bill for housing, child care and education and medical service which had been given to them at low costs before. Meanwhile, the government started to build a social security system that includes unemployment insurance, health insurance (for the working as well as non-working urban residents) disability insurance and provision for retirement pensions.

These institutional features are reflected in the evolution of the household income structure in the CHNS.[14] In particular, we compute the components of public transfers (i.e. food coupons, subsidies from work, subsidies from government and pension income) and the private transfers as a

[12]The New Rural Cooperative Medical Scheme (NRCMS) pilot program was rolled out in 2003 and achieved almost full coverage in rural China in 2010, though the effectiveness of the medical scheme is questionable. See for example, Wagstaff, A., Lindelow, M., Wang, S. and Zhang, S., "Reforming China's Rural Health System", World Bank, *Human Development* (2009). The New Rural Social Security and Pension Scheme pilot program was initiated in 2009. On February 10th, 2014, the State Council announced the move to unify the pension systems for rural and urban residents in a meeting chaired out by Premier Li Keqiang, paving the way for a unified factor market across the urban and rural parts of China.

[13]More than 21 million urban workers were laid off from the SOEs between 1999 and 2005 according to the official statistics released by the National Statistics Bureau.

[14]For data description and sample construction, refer to section 3.

fraction of total household income from the CHNS and document their evolution in Figure 1. The public transfers as a total account for about 10% of household income for the rural households, whereas it account for a much higher 30% for the urban households (i.e. the orange lines in both panels). In comparison, the role of private transfers is limited for both rural and urban households throughout the sample period (i.e. the yellow lines in both panels). Among the urban households, the role of subsidies for food in the form of food coupons and subsidies from the work unit decline visibly (i.e. the purple and blue lines in the urban sample). Meanwhile, the pension income becomes the major component of public transfers over the sample period (i.e. the olive line in the urban sample).

3 Consumption and Income Inequality: Evidence from the China Health and Nutrition Survey 1989-2009

The China Health and Nutrition Survey (CHNS) is an ongoing data project conducted jointly by the Carolina Population Center at the University of North Carolina at Chapel Hill and the National Institute of Nutrition and Food Safety at the Chinese Center for Disease Control and Prevention. It is a panel dataset that tracks about 4000 households in rural and urban areas of China from 1989 to 2011. To the best of our knowledge, this is by far the only publicly available household-level dataset from China that spans a significant period of economic transition.

So far nine waves of CHNS were conducted in 1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011. The sample encompasses nine provinces at different stages of economic development and with different natural endowments: Guangxi, Guizhou, Heilongjiang, Henan, Hubei, Hunan, Jiangsu, Liaoning and Shandong. In each province, a multistage random cluster process was used to draw the sample.[15] Each year there are about 200 primary sampling units (PSUs), one third of which are in the urban area and two thirds in the rural area. Around 20 households were interviewed per PSU. This brings about 4000 households in each year of the survey. In section 3.1, we briefly summarize the method we use to construct our estimation sample of household consumption and income panel. In section 3.2, we document some stylized facts about the consumption and income inequality in rural and urban China from the CHNS.

3.1 Data

To study the degree of consumption insurance of Chinese households, we construct a panel of household consumption and income (with or without transfers) from the CHNS. This is our data

[15] For more details of the the survey design, refer to the Design and Methods at the CHNS website: www.cpc.unc.edu/projects/china.

contribution. In this section we briefly discuss our sample construction and we relegate the step-by-step description of constructing household socio-demographic characteristics, income, transfers and consumption measures to the Appendix A.1, A.2, A.3 and A.4 respectively.

We construct the household food consumption, the major non-durable consumption item, from the unique and highly detailed household-level dietary information from the CHNS. The Nutrition Survey, an integral part of the CHNS, documents the food items that a participating household consumes over a three-day window. The measurement of food consumption combines physical measurement of food items with daily interviews. The result is a highly detailed account of hundreds of types of food consumed on a daily basis, whose precision is suitable for nutrition studies and medical research (Batis et al. (2014)).[16] This survey design minimizes recall and telescoping error and can be considered as close as it gets to a "gold standard" for measuring consumption (see Deaton and Zaidi (2002), Beegle et al. (2010) and Attanasio et al. (2014)).[17] The dietary data was published from 1989 to 2009, which defines the time frame of our sample. In addition to the food quantity data, we obtain the local food prices from the Community Survey. Harmonizing across the different categorizations used in the price and quantity data and across waves, we form the annualized value of the diet of the households. In addition, we also include in the value of diet the consumption of alcohol, tobacco, coffee and tea surveyed in the Household Survey but not in the Nutrition Survey. We externally validate our food consumption measure by showing that we can construct from the CHNS a measure of food expenditure according to the definition used by the China Statistical Yearbooks (CSYBs) and our measure of food expenditure matches well with the official statistics by year, province and urban or rural status.[18]

Besides food, we include in our consumption measure the consumption of utilities, medical service and semidurable supplies, items that are consistently surveyed in all waves. A look into the consumption basket of a typical Chinese household reported in the CSYBs suggests that these consumption items combined capture 60-70% of a rural household's consumption basket and 50-60% of an urban household's consumption basket.[19]

[16] The nutrition survey is very comprehensive collecting consumption information for 636 food items from which nutrition intake information can be extracted. However, unlike Aguiar and Hurst (2005), throughout our exercise we focus on expenditures—also pricing home-produced food consumption—and do not distinguish between food expenditures and consumption. We are currently studying that distinction between expenditures and consumption using information on nutrition intakes in parallel research.

[17] Recently, Attanasio et al. (2014) have used several techniques to overcome measurement error problems. One proposed technique involves the use of consumption categories for which measurement error is known to be less of an issue. Analogous to what we do here, one of such categories includes the use of data from the dietary component of the Consumption Expenditures Surveys.

[18] For details of the external validation exercise, see the paragraphs on "Food Expenditures" in Appendix A.4.1.

[19] Table A-3 in the Appendix summarized the availability of subitems of consumption and income across waves. Table A-4 in the Appendix reports the proportion of the expenditure on items represented in CHNS (i.e. food, durable supplies and health) in the total household expenditure from the CSYBs by year, province and urban

We construct measures of household income and transfers by source from the raw data. The household income measure is the sum of labor market income, agricultural income, business income and capital income, all after tax. The household transfer received consists of a public and a private component. The public transfer consists of the value of food coupons (from 1989 to 1993, with the coupon system abolished in 1993), subsidies from the work unit (such as grocery, haircut and housing subsidies), subsidies from the government (such as utility and one-child subsidies) and pension income.[20] The private transfer consists of cash and in-kind gifts from family and friends. The household disposable income is then the sum of the household income, public transfers and private transfers received.

We focus on households whose heads are ages 25 to 65.[21] All economic variables are transformed to constant 2009 prices of urban Liaoning with the CHNS price deflator and then to the US dollars. We report in USD. To minimize measurement errors (mainly from data entry), we trim the top and bottom 1% of all subitems in the household income, transfer and consumption measures and trim the top and bottom 1% of the household-level aggregate of income, transfer and consumption.[22] Table 1 summarizes some key sample household socio-demographic characteristics and Table 2 gives an overview of the distribution of income and consumption by subitems in the 2006 sample.

From Table 1, our panel with replacement ages slightly from 1989 to 2009, with the average age increasing from 42 in 1989 to 49 in 2009. Households are predominantly headed by a male, especially so in rural areas, and by a Han, especially so in urban areas. The educational attainment of household heads improves over time, with the percentage of household heads with no schooling

status.

[20] It is worth noting that we did not use the imputed household income aggregates supplied by the CHNS, which has some serious data consistency issues, in particular in its nonretirement wage income. For a critique on the readily available household income aggregate, see the last footnote in Appendix A.2.1.

[21] This sample selection criterion is somewhat different from what has been used in the literature. This is to accommodate the fact that the rural households, or about 70% of our sample, do not have a well-defined retirement age. In addition, we purposefully include the self-employed in the sample since most rural observations are of household farms. We exclude individuals with missing income or consumption and observations that report no food consumption.

[22] This level-trimmed sample is the basis for documenting the evaluation of consumption and income inequality over time in section 3.2. Since the estimation relies on the growth rates of residual income and consumption, to arrive at the estimation sample, we further trim based on the growth rates. We first construct the adult-equivalent household consumption and income (with and without transfers) from the level-trimmed data. Then we compute (logged) adult-equivalent household consumption and income residuals by removing, separately for each wave and area of residency, the effects of household characteristics that we consider permanent or pre-determined such as sex, age, education, province, and the pertinence to a minority group. Then we trim the top and bottom 1% of the growth rates of these consumption and income residuals and trim abnormal movements in growth rates for two consecutive waves. We provide full justification of our sample selection and trimming strategy and visualize the effects from each stage of trimming in Appendix B. The level-trimmed sample comprises on average 3541 households per wave and the estimation sample comprises on average 2215 households per wave.

decreasing from 13.6% in 1989 to 4.2% in 2009 and the percentage of urban household heads going beyond middle school (or the 9th grade) increasing from 36.9% in 1989 to 54.3% in 2009. In terms of household structure, the average household size in rural areas increases from 4.31 in 1989 to 4.70 in 2009, while that in urban areas decreases from 4.04 in 1989 to 3.70 in 2009. Consistent with the aging of the panel, the average weak dependency ratio, defined as the number of children (age below 15) over the number of adults (age above 15) decreases sharply from .48 in 1989 to .14 in 2009. The strong dependency ratio, defined as the number of children and old adults (age above 60) over all working-age adults (age between 15 and 60), also decreases from .66 in 1989 to .32 in 2009.

The income gap between rural and urban areas is fairly big, whereas the consumption gap is smaller (see the first panel in Table 2(a) and 2(b)). There is clear evidence of income inequality in rural and urban areas, with the top 20% earners in the rural areas earning 49.9% of disposable income and the top 20% earners in the urban areas earning 38.9% of disposable income (see the second panel in the same tables). Bear in mind that the Chinese rural areas in our sample are at a development stage above the primitive agricultural societies typically studied in the development literature. The rural households in our sample receives income from a variety of sources. On average only 34.1% of household income is from agricultural production, some 42.8% from the labor market and another 16.2% from non-agricultural business. The reliance on agriculture is mostly true for the two bottom quintile of rural households. For the top quintile rural households, the two major sources of income are from the labor market and small business. In the next section, we present the evolution of the income and consumption inequalities for rural and urban China over time.

3.2 Cross-Sectional Facts

In this section, we document in a series of figures the evolution of consumption and income inequality using our constructed measures from CHNS for the period 1989-2009. While earlier studies on China's inequality focus on the distribution of either income or consumption separately, here we will emphasize their joint evolution and dynamics (see Khan and Riskin (1998), Wu and Perloff (2004), Benjamin et al. (2008), Li et al. (2012) for previous studies on income inequality and Liu and Li (2011) for a treatment of consumption inequality).

Income and food consumption growth. In Figure 2, we plot the household per capita net income[23] growth and the household per capita food expenditure growth in the CHNS against

[23]The definition of net income, according to the China Statistical Bureau, is household total income minus taxes and fees paid, household operation expenses, depreciation of fixed assets for production and gifts to other relatives. We subtract from the disposable income measure in the CHNS the value of food coupons and the

those in the CSYB. The top two panels show that the rural and urban household per capita net income growth in the CHNS aligns well with the official statistics. The household per capita net income grows by a factor of 3.4 in rural areas and a factor of 4.2 in urban areas over the 20-year period. These income growth rates are lower than the per capita GDP growth (indicated by the dotted line), a point also present in the China Household Income Project (CHIP) data, see Khan and Riskin (1998). It is important to remember that what matters to counteract the rising income inequality and risks, which we document below, is growth in the household income, not necessarily GDP per capita.

In the lower two panels of Figure 2 is the household per capita food expenditure from the CHNS and the CSYB. These are the food expenditure measures we used in the external validation exercise mentioned in section 3.1, aggregated to the urban and rural level. According to the CHNS, the household per capita food expenditure grows by a factor of 4.1 in rural areas and a factor of 5.8 in urban areas.

Income and consumption inequality. In Figure 3, we show the evolution of the raw (disposable) income and consumption inequality, the evolution of the household structure together with the raw inequality measures adjusted for household composition. As shown in the left panel, the variance of logged disposable income for the full CHNS sample is about .75 in 1989 and increases monotonically throughout the 20 years of our sample to 1.25 in 2009. Income inequality is consistently between 2.5 to 3 times larger than that of consumption that starts about .3 in 1989 and rises to .5 in 2009. In the rural sample the variance of disposable income is .8 in 1989 and also increases to 1.3 in 2009, which is also about 3 times the size of its consumption inequality counterpart. Income inequality in urban areas is smaller than that in rural areas with a variance starting about .35 in 1989 and rising to about 1 in 2009. In the urban areas the variance of consumption is about half that of income. This degree of inequality is somewhat larger than that obtained from the U.S. using the CPS data where the variance of logged household earnings increases from .5 in 1970 to about .8-.85 in 2005, see top-left panel in Figure 8 in Heathcote et al. (2009). Further, from the middle panel, the variance of the household structure (either in terms of the number of adults or the consumption equivalence scales in Krueger and Perri (2006)) is fairly stable over time in urban and rural areas. This implies that the behavior of household consumption and income inequality just described is similar to that of adult-equivalent consumption and income.

The right panel shows the variance of income per worker and adult-equivalent consumption

in-kind gifts to facilitate the comparison. We apply the same deflator to both the CHNS and the CSYB series and normalize the real values in 1989 to 1.

normalized at zero in 1989. Rural and urban samples display similar patterns of inequality with the variance of disposable income increasing by about .7 log points and the variance of consumption by about .3 through the entire sample. This implies that the increase in the variance of income in the last 20 years in China has doubled compared with the increase of its counterpart in the U.S. using CPS data from 1970 to 2005. Regarding consumption, the increase in the variance of adult-equivalent consumption in China (by .3 in 20 years) is about three times that observed in the U.S. for the period 1970-2005 (see top-left panel in Figure 13 in Heathcote et al. (2010b)).[24]

Residual income and consumption inequality. Lastly, we report the variance of logged consumption and income residuals in Figure 4.[25] The left panel decomposes inequality in between-group inequality and residual inequality (within-group inequality). For both rural and urban households, the residual inequality explains most of the evolution of consumption and income inequality, accounting for more than 90% of the overall inequality.[26] In the middle panel, we normalize the residual income and consumption inequality in 1989 to zero. Over time, the residual income inequality rises by almost .6 log points in rural areas and about .7 log points in urban areas. The residual consumption inequalities in rural and urban areas also rise, to about half the size of the residual income inequalities. The fact that the residual income inequality keeps rising indicates that both rural and urban households might be facing substantial permanent income shocks throughout the 20 years. The fact that the residual consumption inequality is positive and rises with residual income inequality implies that there is partial insurance to the Chinese households, in the sense that they can smooth out some of the income shocks but not all. Finally, the right panel shows the covariance of residual income and consumption. The covariance remains relatively constant for the first four waves, but keeps rising in the last four waves of the CHNS.

[24] As a robustness check, we also compute the Gini index to describe inequalities (see Figure C-2 in the Appendix). The Gini of our adult-equivalent disposable income in rural areas increases from .40 in 1989 to .50 in 2009 and that in urban areas increases from .28 in 1989 to .44 in 2009. These numbers are similar to what Khan and Riskin (1998) and Li et al. (2012) find from the 1988 and 1995 CHIP surveys and what Li et al. (2012) find from the 2002 and 2009 CHIP surveys. The Gini of our adult-equivalent consumption in rural areas rises from .25 in 1989 to .35 in 2009, whereas that in urban areas rises from .27 in 1989 to .33 in 2009. That is, consumption inequality is about 2/3 that of income inequality. This is in line with the Gini of the consumption surveyed in the CHIP dataset reported by Liu and Li (2011). For a discussion, see the paragraph on "Gini coefficients" in Appendix C.2. In contrat with previous literature, Cai et al. (2010) report, using the Urban Household Income and Expenditure Survey (UHIES), a similar (and for some years even somewhat higher) inequality of consumption compared with income inequality. This is simply due to the fact that Cai et al. (2010) include durables in their definition of household consumption. Indeed, using only nondurable consumption from the Urban Household Survey, a subsample of the larger UHIES, we find that the adult-equivalent consumption inequality is about one-third to one-quarter lower than the adult-equivalent income inequality for the period 1993 to 1997 for which those data are publicly available. We find similar figures when we use the Rural Household Survey for the period 1986 to 2000 for which those data are publicly available.

[25] We explain in section 3.1 the computation of the residuals.

[26] Krueger and Perri (2006) also decompose the rise in U.S. consumption inequality and find that about half of the rise in consumption inequality is due to residual (within-group) inequality.

In 2009, the covariance of residual income and consumption reaches three times as high as the 1997 level in both rural and urban areas of China. This is the first evidence that these Chinese households are experiencing a deterioration in their ability to smooth consumption despite the income growth, which our quantitative exercise will confirm next.[27]

4 Consumption Insurance in Rural and Urban China 1989-2009

In this section, we estimate a partial insurance model using our constructed panel of consumption and income. This exercise recovers the size and time path of the variance of permanent and transitory risk, as well as the ability of Chinese households to insure against each type of risk. We lay down the model and discuss the identification in section 4.1. We present the results in section 4.2. Further cross-sectional evidence is presented in section 4.3.[28]

4.1 Measuring the Degree of Partial Insurance

We estimate the partial insurance model à la Blundell et al. (2008). We regress the (logged) adult-equivalent income and the (logged) adult-equivalent consumption measure on dummies of sex, age, education level, province of residence and ethnic minority separately by urban status and by year, and take the difference of the residuals. For each household, we have the history of the (unexplained) income and consumption growth as inputs to the estimation. Note that these growth rates are not annual but are defined by the time interval between survey years.

The econometrics model is annual and standard. The log (unexplained) annual income y_t is the sum of a permanent component z_t and a transitory component ε_t, that is, $y_t = z_t + \varepsilon_t$. The permanent component z_t follows a random walk, $z_t = z_{t-1} + \zeta_t$. The shocks to the permanent component as well as the transitory shocks are *i.i.d.* across time and households: $\zeta_t \sim i.i.d.(0, \sigma^2_{\zeta_t})$ and $\varepsilon_t \sim i.i.d.(0, \sigma^2_{\varepsilon_t})$.[29]

The measured log (unexplained) annual consumption growth Δc^*_t follows:

$$\Delta c^*_t = \psi_{\zeta,t}\zeta_t + \psi_{\varepsilon,t}\varepsilon_t + \xi_t + u^c_t - u^c_{t-1}, \tag{1}$$

[27] In Figure C-3 in Appendix C.2, we show this is not the behavior that we observe for the U.S. for which the covariance between residual consumption and income is fairly flat from 1972 to 1992.

[28] As a preliminary exercise, we also conducted a full set of complete market tests a la Mace (1991) and Townsend (1994) with various measures of consumption and income assuming CRRA and exponential utility. See the Appendix H.

[29] The assumption of *i.i.d.* transitory shocks is motivated by the fact that we observe that the income data points are at least two years apart. Unless the transitory shocks are very persistent, we are not able to identify their durability from this dataset.

where the preference shock ξ_t is distributed as $i.i.d.(0, \sigma^2_{\xi_t})$ and the measurement errors in consumption $u^c_t \sim i.i.d.(0, \sigma^2_{u^c_t})$. The loading factors $\psi_{\zeta,t}$ and $\psi_{\epsilon,t}$ measure the degree of transmission of the two types of income shocks to consumption. They are interpreted as the insurance parameters against the permanent and transitory income shocks respectively. The higher the loading factor or the transmission, the lower the insurance. Perhaps, the most relevant aspect is to note that we allow for the variance of the income shocks and the partial insurance parameters to change with time. Specifically, we allow the parameters to differ between pre- and post 2000, as the model requires at least four panel observations for estimation. This nonstationary property of our model provides the flexibility to fit the data from the rapidly growing economy of China, and allows us to study the joint dynamics between economic growth, risk and insurance.

Note that even though the model is cast in terms of annual income and consumption, the data points we have from the CHNS are not annual. To limit the number of parameters to be estimated, we restrict the loading factors ψ_ζ and ψ_ε to be constant in the two subperiods, 1989-1997 and 1998-2009. The dividing line is motivated by the observation from the movement of the covariance of the residual consumption and income in Figure 4.[30] In reality, the subperiod of 1989 to 1997 is one in which households still enjoyed relatively stable state employment and benefits, whereas the subperiod of 1998 to 2009 saw the SOE reforms and the entry to the WTO, which changed fundamentally the economic lives of billions of Chinese. We derive in Appendix D the identification of this annual model with a panel data set that has unevenly spaced survey dates and lay down the estimation procedure. The bottom line is as long as the sum of the variances of the permanent shocks is identified as a block, neither the identification nor the interpretation of the insurance parameters is affected by the unevenly spaced data. The model is estimated by the Diagonally Weighted Minimum Distance Estimator. In the subsequent tables of the estimation results, we report the sum of the variances of permanent shocks in between survey dates and the variance of transitory shocks in the survey year, the loading factors in the two sub-periods, the taste parameter and the measurement erros in consumption. Asymptotic standard errors are in the parantheses.[31,32]

[30] The covariance is virtually flat up to the 1997 wave but trends upward to three times as high as the pre-1997 level by 2009.

[31] As a robustness check, we simulate our estimated benchmark model for 5,000 rural and urban households separately for 21 periods (i.e. 1989-2009) and verify that the variance covariance structure in the simulated data matches well that in our estimation sample. The estimates of the key moments from the simulated and original data with the standard errors are reported in Table E-1 in the Appendix. The estimates of the entire auto-covariance structure of income and consumption growth by survey year are reported in Tables E-2 to E-5 in the Appendix.

[32] In this paper, we choose to adopt the restricted income profiles, an industry standard in the consumption literature (e.g., Blundell et al. (2008) and Heathcote et al. (2014)), to measure income risk. Importantly, we further allow the level of income risk and the degree of insurance to vary with time, i.e., with growth. An alternative modeling choice is the heterogeneous income profiles with learning over own income growth pioneered

4.2 Estimation Results and the Role of Public and Private Transfers

First, we estimate the partial insurance model using our benchmark measures of consumption and income (i.e. earnings with both public and private transfers). Our results are in Table 3 under the "Disposable Income" heading. Our main finding is that the ability to insure consumption against income risks has declined in both rural and urban areas at the same time that income risks themselves have increased along the growth path.

In terms of income risks, the rural sample consistently faces higher levels of risks, both permanent and transitory, than the urban sample. Over time, both permanent and transitory risks have increased from before to after 1997, with the increase particularly strong in urban areas. More specifically, for rural (urban) households, the annualized variance of permanent shocks has increased from .0887 (.0501) before 1997 to .1170 (.0886) after 1997, implying a 32% (77%) increase, while the annualized variance of transitory shocks has increased from .3990 (.2091) before 1997 to .4504 (.2698) after 1997, implying an 12% (29%) increase.[33]

In terms of insurance, both the rural and urban samples experience a worsening of insurance against the permanent risks from before 1997 to after 1997. The loading factor ψ_ζ, which captures the percentage of permanent risks that is transmitted to consumption, increases from .1207 to .2968 for the rural sample and from .0766 to .2200 for the urban sample. This implies a 146% and 187% increase, respectively, in the loading factor for the rural and urban samples. As to the insurance against the transitory shocks, the rural households achieve virtually perfect insurance throughout the sample period, whereas the urban households' ability to insure has improved from a ψ_ε of .2116 to .0608, as various in-kind transfers phased out in the first subperiod.

Second, to investigate the roles played by various transfers, we also estimate the model with three alternative measures of income: earnings with private transfers, earnings with public transfers and earnings only. The results are contained in the rest of Table 3. For the rural residents, regardless of which income measure we use, the measured degree of transmission of permanent shocks shows similar deterioration over time, and the measured degree of transmission of transitory shocks is virtually nil throughout the sample period. The robustness of this result is not surprising given the little significance transfers have in accounting for household disposable income in rural China.[34]

by Guvenen (2007) and Guvenen and Smith (2014). The consumption insurance implications of micro-level evidence of uncertainty of own income growth in a nonstationary setting, i.e., along a growth process, is an interesting and challenging question that we leave for future research.

[33] The reported variance of the permanent risks in Table 3, to be consistent with the standard errors, is the sum of variances in between the survey dates. For example, a variance of .2238 for the rural sample in 1992-93 indicates an annualized variance of .1119 for the years of 1992 and 1993.

[34] From 1989 to 2009, the percentage of rural households that have reported a positive amount of public transfer

In contrast, for the urban residents, the estimated degree of transmission of income shocks differs for various income measures. An inspection of the insurance parameters across specifications suggests that the deterioration in the insurance against the permanent shocks and the lack of perfect insurance against the transitory shocks before 1997 are closely related to the inclusion of public transfers in the income measure in urban areas. In the next two paragraphs, we provide the rationale for the two discrepancies.

As we discuss in section 2, the public transfers have been a significant component of income for urban residents throughout the sample period, but the nature of the public transfers has changed over time. Public transfers in the early 90s, especially the subsidies from the work unit, are essentially a part of earnings. Households whose wage income is higher are also likely to receive a higher subsidy from their work unit, whether it be food coupons or subsidies for daily supplies or service. As the government function evolves, public transfers increasingly play the role of social insurance, such as unemployment insurance, pension and medical insurance, as well as welfare assistance. As a result, the public transfers received become less and less correlated with earnings or even negatively correlated with earnings for the urban households over the sample period (see Table F-1 in Appendix C.2). In terms of our estimation results, compare the estimates of the size the permanent shocks under "Earnings + Private Transf." with that under "Disposable Income" for the urban sample. The inclusion of public transfers reduces the income inequality significantly in later waves, which implies, for a given consumption series, a higher loading factor after 1997 (i.e. compare .0704 with .2200).

To understand the lack of perfect insurance against transitory shocks in urban China before 1997, note first that this result holds only in the two specifications that involve public transfers. Recall public transfers in the early 1990s are akin to in-kind transfers, and hence cannot be effectively saved for future consumption. Specifically, food coupons can only be applied to the purchase of designated food items and are valid for one year and utility subsidies must be deducted directly from the utility bill.[35] As a result, consumption covaries positively and significantly with public transfers in the early 1990s (see Table F-1 in Appendix C.2). To put our intuition to the test, we construct a measure of consumption that excludes the value of food coupons and the subsidy for utility as well as a measure of income that includes the earnings and the cash public transfers only, i.e. the welfare assistance and pension income, and we reestimate the model. Now the urban residents achieve almost perfect insurance against transitory shocks in the pre-1997

decreased from 33% to 23%. The same figures for the urban residents are 94% and 60%. In terms of size, as a share of the aggregate income, the public transfers in the rural areas averages at about 10% while that in the urban areas averages at 30%, over the sample period (Figure 1). The private transfers as a share of aggregate income is only 2% in both rural and urban areas.

[35] This essentially imposes a savings constraint for households entitled to large public transfers in the 90s.

period and a similar insurance level in the post-1997 period, with a $\psi_{\varepsilon,pre97}$ of .0709 (s.e. .0587) and a $\psi_{\varepsilon,post97}$ of .1042 (s.e. .0505). For the complete set of estimates, see Table F-2 in the Appendix.

In terms of the role of private transfers in urban China, we find they increase the ability to insure against permanent shocks without affecting the insurance of transitory shocks. Notice how the inclusion of private transfers siginificantly increases the estimated variances of permanent shocks, by comparing the "Earnings + Private Transf." column to the "Earnings Only" column. This suggests that private transfers tend to exacerbate the income volatility. To be compatible with a given consumption behavior, the transmission from income shocks which include private transfers has to be lower, which produces this observation.

To summarize, Chinese households can partially insure against permanent shocks, a finding consistent with the results in Attanasio and Davis (1996), Blundell et al. (2008), Kaplan and Violante (2010) and Heathcote et al. (2014) for the U.S., and they can almost fully insure against transitory shocks once the saving contraint implied by the in-kind transfers is removed. What sets our results apart from previous studies is that we show the ability to insure permanent income shocks worsens considerably with economic growth in China. In particular, since our consumption measure has as its major component the food consumption, our estimate of the deterioration in consumption insurance would be a lower bound of the loss of the ability to insure. To put it differently, if we observe a compromise in insuring food consumption in an environment where food consumption becomes increasingly a necessity, we would expect the consumption of other non-durable items to respond even more to income shocks.[36] In the remainder of this section,

[36]To put our estimates in perspective, Blundell et al. (2008) (BPP) obtain for the U.S. from 1979 to 1992 a loading factor of .6423 for the permanent shocks and .0533 for the transitory shocks using family net income and nondurable consumption. The insurance against permanent shocks in the China therefore appears to be higher than that in the US. There are several reasons for this difference. First, the major component of our consumption measure for China is food consumption whereas theirs is an imputed consumption measure of all nondurables. Using food consumption tends to imply a lower degree of transmission of income risks to consumption. In fact, BPP find the transmission of permanent income risks declines to .29 in 1992 when only food consumption is considered. To the extent that the nondurable budget elasticity of food consumption tends to decline over time, the deterioration of insurance that we estimate would be a lower bound of the worsening of the ability to insure. Along this line of argument, Aguiar and Hurst (2014) find food consumption inequality (in particular, home-produced food) is flat over the life cycle and attribute increases in inequality of lifecycle expenditures to other categories of nondurable consumption. Second, BPP consider family net income and consumption (controlling for household structure in their computations of respective residuals), whereas we use adult-equivalent income and consumption measures. When only male earning is considered, they find a loading factor of permanent risks of .2245. Last, our sample restriction differs from theirs. Their sample consists of stable households that involve a continuously married couple headed by the husband, whereas we do not impose such restrictions. This implies we capture not only income risks originating from changes in the labor market or worker attributes but also from the changes in household composition. As long as these unstable households' income behaves differentially more than their consumption relative to stable households, we tend to get a lower estimate for insurance parameters by including them in the estimation sample.

we explore the relationship between growth, risk and insurance cross-sectionally for communities with different growth rates.

4.3 Further Insights from Cross-Sectional Evidence

In this section we partition our household-level sample by the average community growth rate in rural areas. A community in the rural area is a participating village in a rural county. We compute at the community level the average household income and then the annualized growth rate of the average household income. Then we group communities depending on whether a community's annualized income growth is above or below median among all rural communities. We label the group of communities with above (or below) median annual income growth the fast- (or slow-) growth communities. In our sample, the median annual growth rate of the low-growth rural sample is 3.26%, while the median annual growth rate of the high-growth sample is 8.15%. We estimate the partial insurance model for the fast- and slow-growth communities separately. This allows us to explore further the relationship between growth, risk and insurance in a cross-sectional sense between communities.

Our estimation results are in Table 4. First, we find that for slow-growth communities the variance of permanent shocks increases by about 30% from pre- to post-1997, while this increase is larger, about 38%, for fast-growth communities. That is, the evidence that higher growth tends to be associated with higher risk is present not only across time, but also across space (i.e., communities) in China. Second, we find that slow-growth communities experienced some deterioration in the degree of insurance to permanent shocks with $\psi_{\zeta,pre97}$ =.0307 and $\psi_{\zeta,post97}$ =.2220, whereas the fast-growth communities experienced lower degrees of insurance with similar if not more deterioration over time, i.e. from $\psi_{\zeta,pre97}$ =.1630 to $\psi_{\zeta,post97}$ =.3954. Both fast- and slow-growth communities achieved almost complete insurance against transitory schocks in both subperiods.

The results in this section suggest that communities that display higher growth are associated with increasing risks and a substantial worsening of the ability to insure, which conforms to our benchmark estimation results. Whether the welfare gains from growth are able to offset the welfare costs of higher risk and lower ability to insure for Chinese households is a question that we investigate in section 6. Before studying welfare, we investigate potential mechanisms behind our benchmark estimation results in the next section.

5 Theoretical Interpretations of Insurance Behavior

Here, we explore possible reasons for the insurance loss that we have estimated for China during the period 1989-2009. To do so we focus on savings, housing wealth and investments in children.

5.1 Savings

In a country known for its high household savings rates, it is natural to ask whether savings help fend off household risks.[37] The idea is that precautionary motives based on preferences/prudence (see Kimball (1990) and Carroll and Kimball (1996))[38] or on institutions that impede borrowing (see Deaton (1991), Aiyagari (1994), Rios-Rull (1995), Huggett (1996), Carroll and Kimball (2001)) raise savings in response to more income risk.[39] However, whether the resulting increase in savings in Chinese households has actually helped insure consumption against income risk is an open question that we tackle next.

To conduct this analysis we divide our households between high- and low-savings groups (respectively, above and below the median savings rate) and evaluate differentials in the ability to insure consumption.[40] Our results are in Table 5(a). The main finding is that savings do not improve the ability to insure. For both low and high savings groups the ability to insure against permanent shocks worsens with time between pre- and post-1997 years.[41] In rural areas,

[37] While savings constraints can be present in developing contexts (see Dupas and Robinson (2013), Kaboski et al. (2014), and deMagalhaes and Santaeulàlia-Llopis (2015)), the high savings rates in China in principle suggests the absence of such constraints. However, as we discuss in this section, Chinese households might be limited in the savings portfolio they can choose from which has consequences for consumption insurance and welfare. This way, the limitation to diversify a wealth portfolio can be considered a saving constraint in itself that can be present in growing economies where the financial instruments available to households do not catch up with economic growth.

[38] See also Carroll (1997) for an argument that favors a buffer-stock model in which impatience, rather than prudence, is a better depiction of the traditional version of the life cycle/permanent income hypothesis.

[39] This way, the economic environment that we have documented in the previous section for China, characterized by an increase in unanticipated income changes in both rural and urban areas, could help explain the rise of household savings in China. For example, Meng (2003) discusses an increase in savings associated with the increased predicted risk of unemployment and the increased past income uncertainty during the state-owned enterprise (SOE) reforms in the late 1990s. Chamon et al. (2013) find an increase in the savings rates of young urban households that they attribute to an increase in labor income uncertainty; see also Yu and Zhu (2013) for a discussion of an increase in uncertainty in household income using CHNS imputed income data. More recently, He et al. (2013) study the SOE reforms in the late 1990s in urban China, finding a subsequent increase in financial wealth accumulation.

[40] The household savings rate is the proportion of savings in disposable income, where savings is the difference between disposable income and consumption. We find that in our rural sample the household savings rate on average grows from 10.1% in 1989 to 24.2% in 2009 and that in the urban sample grows from 20.8% in 1989 to 31.7% in 2009. Similarly, using the Rural and Urban Household Surveys, Chamon and Prasad (2010) report these rates grow from 15.9% in 1992 to 21.1% in 2006 for rural areas and from 17.5% in 1992 to 26.0% in 2006 for urban areas.

[41] For brevity we focus on the estimated values of our insurance parameters. See Table G-2 for further results.

the insurance against permanent shocks worsens from a ψ_ζ of .2214 to .2374 for low savings households and, more accutely, from .0613 to .3873 for high savings households. This worsening in insurance is somewhat parallel across savings groups in urban areas where ψ_ζ increases from .0925 to .1957 and from .1243 to .2476 for the low and high savings groups respectively. Stratifying the sample by the growth in household savings rate from pre- to post-1997 yields similar insights. In rural (urban) areas households with low savings growth worsen their ability to insure from .1488 to .2338 (from .0377 to.1597), while high savings growth implies a much larger worsening from .0282 to .5587 (from a nonsignficant -.0648 to .3812).

Overall, the fact that the consumption insurance for the high-savings groups is more damaged over time suggests that savings in China are likely to be explained by motives beyond precautionary. Next, we explore housing wealth and investments in children as alternative reasons to save.

5.2 Housing Wealth

The CHNS surveys home ownership and the value of residential units in all waves.[42] Home ownership in China is high. The percentage of rural households who own their home has increased from 91.6% in 1989 to 96.3% in 2009.[43] The percentage of home ownership in the urban areas has increased rapidly, from 45.7% in 1989 to 89.2% in 2009,[44] which is in sharp contrast to the home ownership rate in the U.S. that stands at 65% in the fourth quarter of 2013.[45] Further, the wealth portfolio of Chinese households largely consists of housing, i.e., savings are channeled to housing wealth. Using the China Household Finance Survey (CHFS) we find that housing wealth (net of debt) accounts for 73.2% of total net worth on average in 2011, 82.1% in rural areas and 68.1% in urban areas.[46,47] In other terms, the CHFS ratio of housing wealth to financial wealth

[42] For a discussion of data construction, see section A.4.3.

[43] To the extent that the rural households, who most likely build and hence own their houses on the land granted to them by the village, need to pay up front for the building materials, tools and other durables, their home-related expenditure shows up in household savings in the same way the home purchase of an urban household does.

[44] There are a number of reasons behind the high home ownership rate in China: some bought their first home at a below-market price from the "work unit" during the large scale housing reform starting in 1994, see Wang (2011); rapid housing price appreciation makes houses and apartments a store of value as well as an attractive asset for investment, especially when there is a lack of financial assets available to households; and finally home ownership signals desirability in a competitive marriage market, see Wei and Zhang (2011).

[45] "Residential Vacancies and Homeownership in the Fourth Quarter 2013", *U.S. Census Bureau News*, retrieved from http://www.census.gov/housing/hvs/files/qtr413/q413press.pdf on April 23, 2014.

[46] These shares are about 3 times larger than those obtained for the U.S., see Díaz-Giménez et al. (2011). They find the share of housing wealth net of debts (i.e., home equity) to total wealth is 24.3%, as computed from their Table 7 in based on the 2007 Survery of Consumer Finances (SCF).

[47] The CHFS, a cross-sectional survey administrated by the Southwestern University of Finance and Economics, is a household-level survey that investigates in more detail the structure of household finance in China. The released data is representative at the provincial level. The first wave of the survey, completed in 2011, sampled about 8,000 houeholds in 2,585 counties and cities in urban and rural parts of China. According to staff reports from CHFS, the percentage of home ownership in their rural sample was 92.60% and in their urban sample

is 7.55 in 2011 and 6.57 in 2013.[48] Furthermore, using a third data source, CHIP,[49] we find that this ratio of housing wealth to financial wealth is 11.17 and 5.34, respectively, for rural and urban areas in 1995 and 8.67 and 5.39, respectively, for rural and urban areas in 2002.[50]

In sum, it is clear that most household savings are unambiguously allocated to housing. In this scenario, one would expect that the ability to insure consumption potentially deteriorates with savings. The reasons are that houses are relatively illiquid assets that are less likely to be used for precautionary reasons and even less so if one takes into account an upward trend of housing prices after the large-scale housing reform in 1994, see Wang (2011),[51] or the large returns from housing wealth in the marriage market, see Wei and Zhang (2011) and Du and Wei (2013).[52] These forces can restrain households from selling houses to insure consumption.

To investigate this mechanism, we group households according to the value of their privately owned residential unit. Specifically, we compute for each household the average of the reported value of the privately owned and occupied housing unit (if any) over different waves. Then we group those households whose average value of owner-occupied housing is above (or below) median and define them as the high (or low) housing value group.[53] Last, we apply our partial insurance model to each of these groups separately. Our results are in the first four columns of Table 5(b). In rural areas we find a deterioration in the ability to insure against permanent risk unrelated to housing wealth; households with low housing values increase their loading factor ψ_ζ from .1213 to .3071 between pre- and post-1997 while households with high housing values increase their loading factor from .1373 to .3313. However, in urban areas, households with low housing values do not show a deterioration in the ability to insure against permanent shocks

was 85.39% in 2011. The numbers are close to what we found in the 2009 wave of the CHNS. More recently, CHFS staff has reported that financial assets account for 8.3% and 10.1% of total wealth in 2011 and 2013, respectively, while housing wealth accounts for 62.7% of total wealth in 2011 and 66.4% in 2013, see http://econweb.tamu.edu/gan/April-2014-English.pdf—these figures for housing wealth are slightly lower than our computations because we report the average of the ratios housing wealth/total wealth (trimming the top and bottom 1% of numerator and denominator) while CHFS staff reports the ratio of respective aggregates of housing and total wealth. Further, this share increases with wealth, for example, in Shanghai the proportion of housing wealth to total wealth is 76.5%, and in Beijing it is 83.8%. To avoid potential outliers in the CHFS, we also explore the median (in wealth) household in China and find that it has 85.5% of its total wealth in housing.

[48] See the CHFS staff report: http://econweb.tamu.edu/gan/April-2014-English.pdf.

[49] We introduced the CHIP survey in section 3.

[50] We trim the top and bottom 2.5% of these ratios.

[51] See also Wang and Wen (2012) who examine the effect of rising housing prices on savings rates under a realistic mortgage downpayment structure.

[52] Wei and Zhang (2011) show how heightened competition in the marriage market brought by sex-imbalances can lead to increased savings for status goods. In that sense housing wealth can be related to the One Child Policy if this policy is behind the differential sex-ratio at birth in China, see Li et al. (2011) and Leung (2013).

[53] We do not have information about investment in houses that are not owner-occupied. To the extent that the total investment in housing positively correlates with the value of owner-occupied housing, we take the value of one's own home as a proxy for total housing investments. For robustness, we also do the exercise by grouping the households by the area of the owner-occupied housing unit instead of the value. The results are similar.

from a loading factor of .0850 to .0837, while households with high housing values display a clear deteriation from values close to complete insurance before 1997 to a loading factor of .3980 after 1997. That is, in terms of housing wealth, our results in urban areas are consistent with the notion that a wealth portfolio with large housing wealth substantially impedes the ability to insure.[54] This is, however, not the case in rural households for which we need to find an alternative explanation for insurance deterioration over time.

5.3 Investment in Children

The notion of life-cycle savings, in its original form and in an exposition for China by Modigliani and Cao (2004), is that households save for retirement. Then, in the absence of a well-functioning pension system as is the case in China, changes in households' age structure after the One-Child Policy will increase household savings, see Banerjee et al. (2014). The idea is that households with fewer children postpone consumption (save more) to make up for fewer future income providers when old age arrives. In this section, we exploit the quantity-quality trade-off—see a discussion for China in Rosenzweig and Zhang (2009)—and entertain the notion that investment in children in its intensive form (e.g. education expenditures) is one such form of life-cycle savings.[55,56]

To measure investments in children we compute the education-expenditure-to-saving ratio and group those households whose ratio is above (or below) the median as high (or low) investment households.[57] We do this for 2006, the only year in which education expenditures are surveyed in the CHNS. Note that our measure of savings is the difference between the household disposable income and our benchmark consumption, where the latter does not include education expenditures due to its availability limitations. Our idea is that households that spend a higher fraction of their savings on educating their children will have less of a buffer against income shocks.

Our partial insurance estimates are in the fifth to eighth columns in Table 5(b). Households

[54] One should expect that financial market reforms that ease alternative forms of savings potentially reduce portfolios based on housing wealth and, hence, improve the ability to insure consumption. In other words, it is natural to think that a social insurance policy can take the form of a financial market reform, see Storesletten and Zilibotti (2014).

[55] Using CHIP data we find that education expenditures as a share of household income has increased from 8.15% and 5.75%, respectively, for rural and urban areas in 1995 to 13.35% and 8.95%, respectively, for rural and urban areas in 2002. That is, investment in children has risen over time. Using CHNS data we find that this ratio is 12.2% and 9.94%, respectively, for rural and urban areas in 2006, the only year for which CHNS reports expenditures in education. Further, using CHIP we also find that the education-expenditure-to-savings ratio has increased from 18.82% and 15.24% in 1995 to 21.11% and 26.97% in 2002, in rural and urban areas respectively.

[56] See Qian (2009) for a dicussion on the potential complementarities between quantity and quality derived from family size changes genereated by relaxations in the One-Child Policy.

[57] We also repeated this exercise using the expenditure on child care, available from 1989 to 2006. Here we qualify a household with high investment in child care a household whose expenditure to saving ratio is above median in any given survey year. Our insights are somewhat similar to our findings with expenditures on education.

whose investments in children are low do not present a deterioration in the ability to insure over time, while those whose investment in children is high experience a clear deterioration. That is, life-cycle savings (through investments in children) tend to crowd-out potential precautionary uses of savings. This is particularly the case against permanent risks; there are no particular trends in the ability to insure against transitory risks. In the rural areas, while ψ_ζ shows no significant change over time for households with low investments in children, this loading factor increases signficantly from .1331 in the pre-1997 years to .5260 in the post-1997 years for households with high investments in children. The case of urban households is very similar with loading factors that are not significantly different from zero for households with low investments in children while for households with high investments we find a substantial decrease in the abilty to insure permanent risk from a loading factor that is nonsignificantly different from zero (i.e., perfect insurance) in the pre-1997 years to a loading factor of .5124 in the post-1997 years.

To summarize, our results suggest that in a country like China where the financial market is underdeveloped and households have limited options for storing wealth, a high savings rate does not necessarily indicate better insurance. One needs to look deeper at where the savings go in order to discuss consumption insurance. Our evidence suggests that savings in China are highly used for lifetime investments (e.g. houses and retirement) rather than for precautionary reasons. To the extent that the alternative investments (in housing or children) entail transaction costs when cashing out and feature a high rate of return in growing China, these Chinese households may behave as hand-to-mouth households who choose to bear the loss of consumption insurance in exchange for higher future levels of consumption (Kaplan et al. (2014)).

6 Welfare Effects of Growth, Risk and Insurance in China 1989-2009

How much is the potential welfare gain from growth relative to the welfare cost of increasing income risk and reducing the ability to insure consumption against this risk? To answer this question we compute consumption equivalent variations as in Lucas (1987). That is, we compute the percentage change in annual consumption g across all periods and possible states of the world that a household in a reference environment A requires to be ex-ante indifferent between A and a counterfactual environment B. The reference environment A is defined by our data estimates for growth, γ, amount of permanent and transitory risk, $\{\sigma_\zeta, \sigma_\varepsilon\}$, and estimated degree of partial insurance against permanent and transitory risk, $\{\psi_\zeta, \psi_\varepsilon\}$, with an alternative environment B defined as one in which at least one of the elements in $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$ changes.[58] This way, the set of potential counterfactuals we can compute extends to all possible combinations between

[58] For notational convenience we drop time subscripts, but note that risk and insurance parameters are not constant over time.

two sets of $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$. Next, we conduct a set of experiments to quantify the welfare effects of growth, risk and insurance.[59]

6.1 From Lucas to China

Our first exercise in section 6.1.1 consists of weighing the welfare gains from growth and the welfare costs of risks, following the spirit in Lucas (1987). In a second exercise in section 6.1.2, we quantify the role of insurance for aggregate welfare.

6.1.1 The Welfare Effects of Growing with Risk

In the first set of three columns of Table 6 we show the welfare gains from growth as the consumption reductions (in percentages) that make our households indifferent between their reference scenario with growth, $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$, and one in which there is no growth,$\{0, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$. The first column refers to rural China, the second column to urban China, and further, for comparison purposes, we also conduct the same exercise for the U.S., which we show in the third column. For China we use our benchmark estimates from section 4.2 and for the U.S.[60] Removing growth in rural and urban China[61] amounts to taking out -37.77% of a rural resident's annual consumption and -43.42% of an urban resident's annual consumption. Note that this gain is independent of the degree of aversion to risk. As it is expected with smaller growth, these gains are smaller for the U.S., about -18.22%.[62]

The welfare cost of risks is reported in the second set of three columns of Table 6 by the amount of annual consumption (in percentages) that households growing with risk would need to be compensated with in order to be indifferent between their reference scenario, $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$, and one in which the economy grows with no risk, $\{\gamma, 0, 0, \psi_\zeta, \psi_\varepsilon\}$. Note that we achieve this counterfactual by shutting down both permanent and transitory risks entirely, an extreme stabilization policy.[63] We assume a CRRA utility function and conduct this exercise for three

[59] The methodology of welfare assessments is standard, and hence relegated to Appendix I.1. In brief, we start by computing from the initial income level and the household income growth rate an optimal deterministic consumption plan in a savings model. Then we simulate the partial insurance model to obtain fluctuations in consumption around the aforementioned deterministic consumption plan. The addition of the deterministic and the stochastic components is the final consumption path which we evaluate with a time-separable CRRA utility function. The ensuing experiments entail changing the income growth rate, the variances of the permanent or transitory income shocks or the risk transmission parameters in an alternative scenario, evaluating welfare under the alternative scenario and solving for consumption equivalent variations in the alternative which match the welfare level of the reference scenario.

[60] For the US, we use the partial insurance estimates in Blundell et al. (2008).

[61] Respectively, a growth rate of 4.9% and 6% in earnings, and 4.8% and 5.7% in disposable income.

[62] The U.S. gains from growth are associated with a growth rate of household earnings and disposable income equal to 2.87% and 2.96% respectively.

[63] Note that the consumption is still random because of the taste shock.

alternative coefficients of relative risk aversion, $\eta = \{1,2,4\}$. For $\eta = 1$, the welfare cost of risks is 1.69% of annual consumption for Chinese rural areas and 3.99% for Chinese urban areas, while this figure is 3.30% for the U.S. For $\eta = 2$, the magnitude of the welfare cost of risks increases by a factor of more than 2 to 4.06% and 8.94%, respectively, for Chinese rural and urban areas and to 6.70% for the U.S. With $\eta = 4$, one needs to increase Chinese rural residents' annual consumption by 14.58% and Chinese urban residents' annual consumption by 27.68% to keep up with the welfare of a world without income risks, and this figure is 15.99% for the U.S.[64] That is, the welfare cost of risks is twice as much in urban areas as it is in rural areas and unambigiously large in China in absolute terms, roughly 1/7 (2/7) of rural (ruban) annual consumption.

Next, we ask how would an agent in our reference scenario assess living in a world with neither growth nor risks, i.e., a stagnant life from cradle to grave. This is an extreme in which we interpret that all risks are generated by the growth process—i.e., giving up risks also implies giving up growth. The results are in the third set of three columns of Table 6. The welfare cost for rural Chinese residents is -28.70% of their annual consumption and -27.76% for urban Chinese residents with $\eta = 4$. Hence, conditional on the ability to insure, it is the case that for the overall period of 1989 to 2009 Chinese households still prefer to grow with risk rather than not growing at all. This is also the case for U.S. households, which with $\eta = 4$ also prefer to grow with risk.[65]

Finally, we can study permanent and transitory risks separately, see Table 7. Since the rural residents can (almost) perfectly insure against transitory risks, the welfare cost of total income risks is basically the same as the welfare cost of permanent income risks alone versus a negligible cost of transitory shocks, whereas for the urban residents the cost of permanent income risks accounts for about 20% of the welfare cost of the total income risks. That is, the welfare cost of risks in urban areas comes mostly—about 80%—from the high response of consumption to transitory risks. Specifically, for $\eta = 1$ the welfare cost of transitory risk is 3.15% of annual consumption; for $\eta = 2$ it is 6.71% and for $\eta = 4$ it is 19.65%.

[64] This nonlinearity in the coefficient of risk aversion is also present in Storesletten et al. (2001).

[65] We have reconducted this welfare assessment with earnings (i.e. income without transfers). In that case we find that the welfare cost of risks in rural China is similar to that obtained using disposable income, which is consistent with our income variance and partial insurance estimates being similar across definitions of income in section 4.2. However, in urban China we find that the welfare cost of risks drops to less than one half of those with disposable income: to 1.65% of annual consumption with $\eta = 1$, 3.95% for $\eta = 2$ and 9.99% for $\eta = 4$. This is due to the fact that public transfers (i.e., food coupons, subsidies from work units and welfare programs from the government) dropped substantially over time in urban areas, which generates a substantial loss of insurance as we have discussed in section 4.2. In rural areas public transfers were already low in the early 1990s to start with. We further discuss the implications of transfers for insurance below when we compare the pre- and post-WTO scenarios and the rural-to-urban counterfactuals.

6.1.2 The Welfare Effects of Insurance Technologies

So far we have fixed the ability to insure across our counterfactuals. Here, to assess the welfare impact of insurance alone, we compare our reference environment against a set of counterfactuals with alternative insurance technologies. These counterfactuals gradually cover the entire spectrum from full insurance to autarky (without storing technology).

First, we consider counterfactuals that improve insurance. Our first case is the extreme counterfactual environment that sets the insurance parameters to zero, an aggresive policy that provides full insurance. The results are in the first set of two columns in Table 8. For our households to remain indifferent across environments we would have to increase rural annual consumption in our reference environment by 1.69% with $\eta = 1$ and 14.58% with $\eta = 4$, and urban annual consumption by 3.99% and 27.68%, respectively. That is, completing markets substantially increases China's welfare and more so in urban than in rural areas.[66] We also consider a less aggressive counterfactual in which we double the current level of consumption insurance against both permament and transitory shocks—this is a movement toward market completion, but not in full. We label this counterfactual as a high-insurance environment, and it is defined by halving both insurance parameters, see the second set of two columns in Table 8. Improving insurance this way implies a welfare gain of 1.34% with $\eta = 1$ and 10.93% with $\eta = 4$ of annual consumption for rural households and 3.04% with $\eta = 1$ and 19.67% with $\eta = 4$ of annual consumption for urban households.

Second, we consider counterfactuals that deteriorate insurance. Our first case is a low-insurance environment in which we double both permanent and transitory insurance parameters, i.e., income shocks transmit twice as much to consumption as in our reference environment. Given a loss in insurance in the counterfactual environment, our risk-averse agents will prefer to live in our reference enviornment. But how much consumption would we have to give up in our reference environment to remain indifferent across reference and counterfactual environments? The answer is a lot. Specifically, annual consumption in our reference environment would have to decrease by -5.49% and -40.94%, respectively, with $\eta = 1$ and $\eta = 4$ in rural areas and by -11.50% and -48.32%, respectively, in urban areas, see the third set of two columns in Table 8. Our second insurance-worsening scenario assumes that we move from the reference environment to an environment that satisfies the permanent income hypothesis in its traditional formulation. This implies that transitory shocks are fully insured (i.e., $\psi_\varepsilon = 0$) while all permanent shocks transmit onto consumption (i.e., $\psi_\zeta = 1$). Our results are in the fourth set of two columns in

[66] Note that this counterfactual of completing markets yields identical results to the counterfactual of entirely removing risk in the previous section.

Table 8. The welfare loss associated with imposing PIH on Chinese households is enormous. With $\eta = 1$ our households in the reference environment need to be compensated by -40.07% of annual consumption in rural areas and by -23.52% in urban areas, and this loss is -96.98% in rural areas and -89.56% in urban areas for $\eta = 4$. Our last case, autarky, implies setting both permanent and transitory insurance parameters to one, see the last set of two columns in Table 8. In this counterfactual environment all income shocks go onto consumption. The welfare loss is -93.72% and -75.75% for $\eta = 1$ in rural and urban areas, respectively, and basically -100% for $\eta = 4$ in both rural and urban areas.[67]

Overall, decreasing the ability to insure in the Chinese economy, given its growth and its risks, has substantial damaging welfare consequences. Next, we study the implications of consumption insurance losses for the welfare gains of growth across time in section 6.2 and across space in section 6.3.

6.2 Welfare Across Time: Pre- Versus Post-WTO

The entrance to the WTO is associated with a process that induced faster growth but that at the same time has increased permanent risks and worsened the ability to insure against them for rural and urban Chinese households (see our results in section 4.2). Here we quantify the cumulative effects of post-WTO growth, risk and insurance on welfare.

First, what is the welfare gain from post-WTO growth? To answer this question we take our pre-WTO environment as the reference, i.e., $\{\gamma^{pre}, \sigma^{pre}, \psi^{pre}\}$, against the counterfactual that increases the growth rate to post-WTO levels while keeping the risk and insurance at the pre-WTO levels, that is, $\{\gamma^{post}, \sigma^{pre}, \psi^{pre}\}$.[68] For rural households the average pre-WTO growth in disposable income is 4.43% and the post-WTO growth is 5.20%, while for urban households these figures are 4.96% and 6.71%. We find the welfare gains from post-WTO growth in rural households are 1.89% of annual consumption, and 4.54% for urban households, see column "Growth" in panel (a) of Table 9. Note that these gains do not depend on η.

Second, what is the welfare effect of growing with the income growth and risk of the post-WTO era? Here we weigh the pre-WTO reference environment against the counterfactual that introduces both post-WTO growth and risk $\{\gamma^{post}, \sigma^{post}, \psi^{pre}\}$. As agents dislike risky consump-

[67] Alternatively, we can reassess the welfare effects of growing with risk under alternative insurance technologies. That is, rather than comparing our reference environment against counterfactuals with different insurance technologies, we can define alternative reference environments that differ in their insurance technology and reassess the welfare cost of risks under each of these newly defined reference environments. See a discussion of these results in Appendix I.2.

[68] Where we compactly write $\sigma = \{\sigma_\zeta, \sigma_\varepsilon\}$ and $\psi = \{\psi_\zeta, \psi_\varepsilon\}$. That is, here we consider simultaneous changes in permanent and transitory components of risk and insurance.

tion paths, the introduction of more risk reduces welfare gains from growth. The question is, how much? We find the welfare gains from growth fall from 1.89% to 1.02% in rural areas and from 4.54% to 3.50% in urban areas for $\eta = 4$, see column "Risk" in panel (a) of Table 9—these effects are less so for lower values of η. That is, albeit with risk, households prefer to grow.

Third, what are the welfare effects of the worsening in the ability to insure consumption in the post-WTO era? We now add the actual post-WTO insurance technology to our welfare analysis, $\{\gamma^{post}, \sigma^{post}, \psi^{pre}\}$, see the results in column "Insurance Technology" in panel (a) of Table 9. We find sharp differences between rural and urban areas. In urban areas the welfare gains are now 5.50% with $\eta = 4$, that is, larger than the 3.50% gains obtained with the pre-WTO insurance technology. This is due to the fact that, given the same composition of permanent and transitory risk,[69] the improvement in the insurance technology against transitory shocks (by a factor of 3) in urban areas more than offsets the loss in the insurance technology against permanent shocks (also by a factor of 3). Instead, in rural areas the worsening of the insurance technology against permanent shocks in the post-WTO era implies that welfare gains from growth for $\eta = 2$ drop to a nonsiginficant .12% with a 95% confidence interval of [-.00%, .27%] and, more strikingly, the post-WTO era implies a significant welfare loss for rural households for $\eta = 4$ of -4.85% with a 95% confidence interval of [-5.78%,-3.93%].[70] That is, the loss of insurance in rural areas is so large that it more than offsets any gain from post-WTO growth. Rural households would prefer to re-live the growth-risk-insurance environment of the pre-WTO era.

Next, to understand the role of transfers, we study the previous three questions using earnings, which do not incorporate transfers, see panel (b) of Table 9. For the case of rural households, the welfare gains of growing with earnings risk are about 1.71% with $\eta = 2$ and 1.58% with $\eta = 4$ while the introduction of the post-WTO insurance technology dampens welfare gains to .37% with a 95% confidence interval of [.27%, .50%] for $\eta = 2$ and implies a significant welfare loss of -3.48% with a 95% confidence interval of [-4.19%,-2.58%] for $\eta = 4$. That is, for rural households we get similar insights from using disposable income or earnings. However, for the case of urban households the ability to insure against permanent risk improves by 70% and that against transitory risks worsens by a factor of 2. The implications for urban welfare keeping pre-WTO insurance technology are that growing with the risk of post-WTO years implies a welfare gain of .30% with $\eta = 2$ and a welfare loss of -.47% with $\eta = 4$. This is also partly due to lower gains from growth, .71%, associated with an increase in the growth rate of earnings of only .27% from pre to post WTO.[71] Further, the introduction of the post-WTO urban insurance technology

[69] Recall that the (annualized) variance of permanent income shocks is about half of that of transitory shocks.

[70] The confidence intervals are computed from 100 bootstrap simulations with resampling and 85% of the original sample.

[71] For urban households, the annual earnings growth in the pre-WTO era is 5.91% and that in the post-WTO

implies that for $\eta = 4$ the welfare loss for urban households is a significant -1.47% with a 95% confidence interval of [-1.74%, -1.21%].

The overall results are clear. First, post-WTO growth, risk and insurance implies a welfare loss for rural households generated by the post-WTO worsening in the ability to insure against permanent risks that more than offsets the welfare gains from post-WTO growth. Second, urban households also face welfare losses from post-WTO growth-risk-insurance parameters under our measure of earnings, although the introduction of transfers largely increases their welfare by improving their ability to hedge against transitory risk after WTO.

6.3 Welfare Across Space: Migrating from Rural to Urban Areas

Here, we directly compare the welfare of rural and urban areas to explore the incentives of rural-to-urban migration by embedding the rural households with, one by one, the properties of the urban households, i.e., consumption level, growth, risk and insurance. To explore how the evolution of public transfers—i.e., direct changes in social insurance—affect the incentives to migrate, we separately explore the welfare gains of migrating from rural to urban areas before and after the China entrance in WTO. As described in section 4.2, while rural and urban households share similar ability to insure against permanent income shocks, urban areas show a substantial worse ability to insure transitory shocks than rural areas for the years before the 2000s, although this is largely mitigated through the changes in the composition of public transfers in the 2000s.

First, what are the welfare effects of urban growth on rural households? We take as reference environment our rural estimates, i.e., $\{\gamma^r, \sigma^r, \psi^r\}$, against the counterfactual that introduces urban growth, i.e., $\{\gamma^u, \sigma^r, \psi^r\}$, and we do this separately for before and after WTO. Before WTO, rural disposable income growth is on average 4.43% and urban growth is 4.96%. The welfare gains from urban growth on rural households is 2.98% of annual consumption under the initial level of rural consumption, c_0^r, see the first "Growth" column in panel (a.1) of Table 10.[72] After WTO, rural growth is on average 5.20% and urban growth is 6.71%, i.e., a larger rural-urban gap than before WTO, which implies larger welfare gains from urban growth on rural households, 6.24% of annual consumption under c_0^r, see the first "Growth" column in panel (a.2) of Table 10. Additionally providing rural households with the initial level of urban consumption, c_0^u, boosts the welfare gains to 9.68% before WTO and to 14.53% after WTO.

era is 6.18%. The growth in disposable income for these urban households, however, increases more, from 4.96% before to 6.71% after WTO.

[72] To isolate the effects of growth, risk and insurance from consumption-level effects, we conduct this exercise separately for the initial level in rural areas c_0^r and the initial level in urban areas c_0^u in 1989, where c_0^u/c_0^r =1.06, as is revealed in the data.

Second, what are the welfare effects of urban growth and risk on rural households? This is the case where rural households inherit not only urban growth but also its risk. That is, our counterfactual is now $\{\gamma^u, \sigma^u, \psi^r\}$. Urban permanent and transitory risks are both about 60% of those of rural areas (see section 4.2). If the rural insurance technology is preserved, then this decrease in risk associated with urban households should increase our counterfactual rural welfare. Indeed, ignoring level effects, rural households gain 3.28% of annual consumption for $\eta = 1$ and 4.00% for $\eta = 4$ before WTO, see the first "Risk" column in panel (a.1) of Table 10, and 7.56% of annual consumption for $\eta = 1$ and 12.18% for $\eta = 4$ after WTO, see the first "Risk" column in panel (a.2) of Table 10. Under c_0^u these effects go up to 9.99% with $\eta = 1$ and 10.76% with $\eta = 4$ before WTO and 15.95% with $\eta = 1$ and 20.93% with $\eta = 4$ after WTO.

Third, what are the welfare effects of urban growth, risk and insurance on rural households? We now add the urban insurance technology to our counterfactual, i.e., $\{\gamma^u, \sigma^r, \psi^r\}$, see the results in the columns "Insurance Technology" in panel (a.1) and (a.2) in Table 10. Without level effects, i.e., under c_0^r, the loss in insurance against transitory shocks for rural households from embedding them with urban insurance technology implies that the welfare gains from urban growth and risk go down from 3.28% with a 95% confidence interval of [3.21%, 3.35%] to .93% with a 95% confidence interval of [.53%, 1.34%] for $\eta = 1$ and from 4.00% with a 95% confidence interval of [3.63%,4.41%] to -3.13% with a 95% confidence interval of [-5.81%,-0.51%] for $\eta = 4$ before WTO. That is, the introduction of a much worse urban insurance technology (mainly against transitory shocks) on rural households entirely eliminates the welfare gains from migation in the years before WTO. If we consider that moving from rural to urban areas also implies an adjustement in the level of consumption of average urban consumption, c_0^u, then there are still welfare gains from migration but these gains drop by more than two-thirds from 10.76% with a 95% confidence interval of [10.37%,11.20%] to 3.16% with a 95% confidence interval of [0.31%,5.96%] due to the loss of consumption insurance associated with rural-to-urban migration.

In the years after WTO, urban insurance technology against transitory shocks improves approaching the degree of insurance in rural areas, mainly due to public transfers (see section 4.2). This improvement in urban insurance implies that the welfare gains from rural-to-urban migration after WTO increase with respect to the pre-WTO era. In the post-WTO era we find that the loss of consumption insurance from rural-to-urban migration implies that the welfare gains from migration barely drop from 15.95% to 13.33% with $\eta = 1$ and from 20.93% to 19.05% with $\eta = 4$ under c_0^u. Similar qualitative results are attained under c_0^r.

Finally, to explore the effects of public transfers on the incentives to migrate we compute the welfare gains under our measure of earnings. Focusing on capturing urban level effects under c_0^u, the welfare gains from the extra growth generated by moving a rural household to an urban

area before WTO, i.e., 14.70%, are larger than those attained with disposable income, see panel (b.1) in Table 10. This is explained by the larger gap of earnings growth between rural and urban households, 4.58% and 5.91% respectively, as compared to the gap of disposable income growth of 4.43% and 4.49%. The further introduction of urban risk on rural households increases welfare gains to 16.68% and the introduction of urban insurance technology decreases these welfare gains to 15.86% if $\eta = 4$. These changes are not significantly differnt from each other at a 95% confidence level. Similar qualitative results are attained after WTO with larger welfare gains, see panel (b.2) in Table 10.

To summarize, our results imply that the ability to insure consumption is quantitatively important for migration decisions and that this ability can be substantially affected by social insurance policy through public transfers. In the years before the 2000s, the worse ability to insure consumption in urban areas compared with rural areas significantly drops the welfare gains of rural-to-urban migration by (10.76-3.16)/10.76=71%, i.e., by more than two-thirds. However, in the 2000s, improvements in the ability to insure transitory risk in urban areas (compared with rural areas) due to changes in the composition of public transfers imply that the welfare gains merely drop by a nonsignificant (20.93-19.05)/20.93=8% after factoring in the loss in consumption insurance associated with that migration choice.[73,74]

7 Policy Experiments: From Deng Xiaoping to Xi Jinping

As China rebalances towards a consumption-based economy and relies increasingly on domestic demand, the GDP growth-targeting, which has for a long time dominated the policy agenda since Deng Xiaoping's growth reforms, is giving way to Xi Jinping's integrated approach to policy making that includes concerns on economic inequality.[75] In this direction, household income growth is recognized, for ther first time, alongside the GDP growth as the political target of the Communist Party of China.[76] Further, Premier Li Keqiang has repeatedly emphasized a

[73]Note that for these computations we are using panel (a) in Table 10 for under $\eta = 4$ and c_0^u.

[74]As we discussed in our introduction, there is an emerging development literature that also explores the importance of consumption insurance for migration decisions (e.g., Bryan et al. (2014), Morten (2013), Munshi and Rosenzweig (2014)). For example, Munshi and Rosenzweig (2014) finds that improvements in risk-sharing by 50% can double the migration rates in India. If we reconduct our assessment on the welfare gains of migration simultaneously for our entire 1989-2009 sample as a whole, i.e., without exploring welfare separately for the pre- and post-WTO years, then we obtain that consumption insurance losses drop the welfare gains of rural-to-urban migration by about one-half, a similar figure to that in Morten (2013) for temporary migration in village India.

[75]Xi Jinping is the current General Secretary of the Communist Party of China, the President of the People's Republic of China, and the Chairman of the Central Military Commission.

[76]Hu Jintao's (former General Secretary of the Communist Party, President of the People's Republic and Chairman of the Central Military Commission) report at the 18th National Party Congress stated that "On the basis of making China's development much more balanced, coordinated and sustainable, we should double its 2010 GDP and per capita income for both urban and rural residents."

"reasonable interval of growth which sustains stable employment and stable price levels," which some policy analysts view as preventive measures against social unrest.[77] Our view is that these political statements represent a search for a combination of growth-enhancing, risk stabilization and social insurance policies that preserve welfare. We next use our framework as a device to quantitatively assess the welfare implications of these three policies jointly—unlike previous literature that almost invariably studies them in isolation (see the discussion in Lucas (2003)).[78]

Specifically, we ask: what are the permissible levels of risks and insurance under a specific income growth rate scenario for the period from 2011 to 2020 that keep the rural and urban residents as happy as in a world where the status quo persists? The status quo is our reference environment, i.e., our estimates of income growth (i.e., γ), risks (i.e., σ_ε and σ_ζ) and degree of consumption insurance (i.e., ψ_ε and ψ_ζ) of the period 2001 to 2009 in our sample. We consider two additional counterfactual growth scenarios: γ less .50 percentage points, motivated by the widespread expectation that in the near term the GDP growth in China will drop,[79] and 7.20%, a rate that approximately delivers the medium-run objective of doubling the 2010 income by 2020.

Our results are in Figure 5. In each panel, all pairs of the variance of income shocks (in percentage deviations from reference estimates, vertical axis) and the level of insurance (horizontal axis) preserve the same status-quo welfare. Then, each plotted curve shows the pairs that preserve this welfare for a specific growth scenario. First, note that these curves are downward sloping, which shows a negative trade-off between risk stabilization and social insurance policies in terms of preserving welfare.[80] Second, the difference across curves show the trade-off between growth and risk and between growth and insurance. For example, a growth-enhancing reform that shifts curves to the right implies this economy tolerates more risk or requires less insurance to preserve welfare. That is, a right shift implies a positive trade-off between growth and risk and a negative trade-off between growth and insurance. Next, we explore these trade-offs quantitatively.

Let's focus first on permanent shocks in rural areas (see top-left panel in Figure 5) and its reference environment, that is, the point in which the curve associated with reference growth γ—i.e., the black solid curve—crosses reference insurance (i.e., $\psi_\zeta = .2968$) and reference risk

[77] See Premier Li Keqiang's government work report at the National People's Congress in March 2014. He also commented along these lines in his recent visit to the UK on July 2nd, 2014, spurring a wide range of speculation about the upper and lower bound of the acceptable growth rates.

[78] A notable exception is Heathcote et al. (2014) that studies the joint effect of these three policies for the U.S.

[79] According to the polling results of 50 economists in leading financial firms regarding the near-term economic outlook of China by *Economic Consensus*, the median of the projected GDP growth rate of China in 2015 is 7.00%, which implies a .50% decrease from the growth target set for 2014.

[80] This is not necessarily the case for developed economies. For example, Krueger and Perri (2006) find that an increase in income inequality can increase welfare by decreasing the probability of default and hence increasing that amount of credit in equilibrium for the U.S. This suggests that the relationship between risk and insurance is likely to depend on the aggregate stage of economic development.

(i.e., where percentage deviations from σ_ζ are zero). Our results suggest that given γ, the rural economy would be able to sustain reference welfare with twice as much risk if social insurance policy improved the transmission of permanent income shocks to consumption to $\psi_\zeta = .2098$, i.e. by $1/3$ its reference value. Instead, if social insurance deteriorates and ψ_ζ increases by $1/3$ to .4, the rural economy would require a risk stabilization policy that reduces the variance of income risks to 45% of its reference value in order to preserve welfare. Further, if growth reforms do not succeed and income grows at γ minus .50%—i.e., a shift to the left, the blue dashed curve —then, for the reference amount of risk, the rural areas would require an improvement in their social insurance policy that decreases ψ_ζ to .2891, i.e., by .2891/.2968-1=-2.59%. Or, alternatively, for the reference amount of insurance, the rural areas would require a successful risk stabilization policy that reduces permanent risk by 5.06%. Instead, if growth-enhancing reforms succeed in achieving a rural annual growth rate of 7.2%—i.e., a shift to the right, the red dotted curve—then, keeping the reference permanent risk, rural areas could tolerate a social insurance policy that increases ψ_ζ to .3255, or keeping the reference amount of insurance, rural areas could tolerate a more relaxed risk stabilization policy that increases reference risk by 20.32%. We also explore polices related to transitory risk (see the top-right panel in Figure 5). The level of insurance against transitory shocks is so high in rural areas that welfare is very inelastic with respect to risk: While keeping reference growth, transitory risk can double without having to further improve much the insurance parameter to preserve welfare. A successful growth-enhancing policy of 7.2% allows for a substantial worsening in insurance that increases ψ_ε by a factor of 7.

Finally, urban areas show a similar scenario in terms permanent risk to that of rural areas (see the bottom-right panel in Figure 5). Growing at γ minus .50% implies urban areas require, ceteris paribus, either an improvement in social insurance from .2200 to .2029, i.e. by -7.78%, or alternatively, an increase in income stabilization to -14.98% of reference permanent risk. Instead, a boost in growth to 7.2% implies that urban areas can tolerate a more relaxed social insurance policy that increases ψ_ζ to .2357 (if we were to keep the same amount of permanent risk), or a more relaxed risk stabilization policy that increases permanent risk by 14.82% of its reference value (if we were to keep the same amount of insurance). Similar to rural areas, we find transitory risk is more inelastic with respect to welfare, though somewhat less so than in rural areas.

8 Conclusion

The process of economic growth is associated with a disruption of consumption insurance. We obtain these results exploiting a rare opportunity to study the transmission of income inequality to consumption inequality for an economy that for a long period has experienced phenomenal growth and for which we can build a panel of household-level consumption and income, China 1989-

2009. Our analysis suggests that large housing wealth holdings and other lifetime investments that crowd-out households' precautionary savings help explain the consumption insurance losses.

Our findings have important welfare implications for growth across time and space. First, rural households would prefer to re-live the pre-WTO growth-risk-insurance environment rather than its post-WTO counterpart, despite enjoying more rural growth in the post-WTO years. The reason is that in rural areas the welfare losses associated with the deterioration of insurance in the post-WTO years more than offset the welfare gains from post-WTO growth. Neither private nor public transfers help mitigate this insurance loss in rural areas. The case of urban households is different. We find urban households benefit from public transfers that substantially help them cope with the transmission of transitory risk to consumption after WTO. Indeed, without these public transfers, urban households would also choose the pre-WTO growth-risk-insurance environment. Second, although rural households would (on average) prefer to live in urban areas, the incentives to do so drop by more than two-thirds in the pre-WTO years after factoring in the worse ability to insure consumption in urban areas compared with rural areas before the 2000s. However, as we show, the incentives to migrate can be substantially affected by social insurance policy. In particular, we find improvements in the ability to insure transitory risk in urban areas in the 2000s, due to changes in the composition of public transfers, that largely reduce the consumption insurance loss associated with rural-to-urban migration.

Ultimately, our results suggest that there is value in assessing welfare across countries taking into account not only income per capita levels (or growth) but also individual risk and consumption insurance, and we call for such cross-country welfare evaluations. In doing so, it is natural to consider cross-country differences in the availability of consumption insurance mechanisms (e.g. self-insurance, limited commitment, limited information, etc.) and their degree of success within countries; see a first argument along these lines in Kocherlakota and Pistaferri (2008). As we have showed for China, this is particularly relevant for poor countries that start to take off from stagnation and that, hence, are potentially subject to large income shocks at the household level. Ours is not the first call for aggregate welfare mesaures that go beyond growth. Recently, Jones and Klenow (2010) have suggested welfare measures that include dimensions of economic inequality within countries. Instead, our exercise focuses on the penalization that the curvature of the utility function imposes on unanticipated changes in income that cannot be insured, hence smoothed. In this context, our study is more related to the work in Heathcote et al. (2008, 2014) in which insurance improvements also increase welfare for the U.S. However, in our framework, unlike in Heathcote et al. (2008, 2014), output (growth) is exogenously given and we simply detrend it as in Lucas (1987). This leads to our last statement.

As we look ahead, promising next frameworks are those where growth can be structurally

shaped by risk and insurance and vice versa, an argument that is not confined to China but extends to other developing countries. At present, the concepts of growth, risk and insurance are almost invariably studied in isolation with economic growth being usually explored at the aggregate/sectoral level (see the review in Herrendorf et al. (2014)) while risk and insurance are usually explored at the household/family or village level (see Karlan and Morduch (2010)). As per our findings on the last two decades of successful Chinese economic growth, we believe that shifting the current paradigm to unified frameworks that jointly determine growth, risk and insurance can be an important avenue for the positive and normative analysis of poor economies.

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Table 1: Sample Characteristics: A Cross-Sectional Snapshot, CHNS 1989-2009

	1989			2009		
	Total	Rural	Urban	Total	Rural	Urban
Age	42.0	40.6	44.8	49.0	49.0	49.2
Gender of Head(%)						
Male	83.6	88.0	74.8	85.8	88.5	79.5
Female	16.4	12.0	25.2	14.2	11.5	20.5
Education of Head (%)						
No schooling	13.5	13.6	13.3	3.4	4.2	1.5
1-9th Grade	63.2	69.9	49.8	65.0	74.3	44.2
Above 9th Grade	23.3	16.5	36.9	31.6	21.5	54.3
Household Structure						
Household Size	4.22	4.31	4.04	4.39	4.70	3.70
Weak DR	.48	.55	.35	.14	.15	.11
Strong DR	.66	.70	.57	.32	.32	.31
Province (%)						
Liaoning	12.9	12.7	13.4	11.2	12.1	9.2
Heilongjiang	0	0	0	11.2	10.6	12.5
Jiangsu	11.6	11.9	11.1	11.0	11.3	10.4
Shandong	11.8	11.8	11.8	10.2	10.0	10.6
Henan	12.8	12.7	12.9	11.5	11.3	12.0
Hubei	12.7	12.8	12.6	10.6	10.3	11.4
Hunan	12.7	12.5	13.1	10.7	10.2	11.9
Guangxi	12.9	13.0	12.7	12.1	12.6	11.0
Guizhou	12.6	12.7	12.5	11.4	11.6	11.0
Minority (%)						
Han	86.7	84.5	91.5	86.6	84.5	81.3
NonHan	13.3	15.5	8.5	13.4	15.5	8.7
Num. Obs.	3,331	2,227	1,104	3,665	2,542	1,123

Notes: This table shows the summary statistics of the household head's demographic and education characteristics as well as the household structure in the level-trimmed CHNS sample of all households who satisfy the sample selection criteria (see section 3.1).

Table 2: Income Partition by Rural and Urban Residency, China CHNS 2006: Real 2009 USD

(A) Rural Residency

	Bottom(%)			Quintiles					Top(%)			All
	0-1	1-5	5-10	1st	2nd	3rd	4th	5th	10-5	5-1	1	0-100
						Averages, US$						
Consumption	1437	1435	1258	1383	1602	1796	1971	2676	3060	2937	3456	1847
Income	-99	88	283	346	961	1749	2907	6480	6172	9691	15870	2486
Disp. Income	-155	211	155	270	937	1651	2766	5865	6035	9146	10430	2133
						Shares of Total (%)						
Consumption	.8	3.1	3.2	14.7	17.0	19.1	20.8	28.3	8.1	6.4	1.6	100
Income	.0	.1	.5	2.8	7.7	14.1	23.3	52.0	12.4	15.9	5.6	100
Disp. Income	.0	.4	.3	2.4	8.3	14.8	24.6	49.9	13.5	15.4	.6	100
						Consumption Type (%)						
Food (Diet)	87.4	77.3	80.4	78.9	78.0	76.8	76.0	65.9	59.4	64.0	76.2	74.6
(Above=100)												
▷ Own prod.	7.3	24.6	25.3	26.4	38.4	46.8	40.9	28.0	30.2	15.3	3.8	33.7
▷ Coupons	-	-	-	-	-	-	-	-	-	-	-	-
▷ Gifts	0	.4	.4	.2	.1	.2	.3	1.2	.9	1.7	1.7	.5
▷ Expenditures	92.7	75.0	74.3	73.4	61.5	53.0	58.8	70.8	68.9	83.1	94.6	65.9
Utilities	0	.0	0	.0	.0	.0	.1	.1	.1	.1	.3	.1
Housing Service	0	.1	.0	.1	.3	.3	.5	.5	.2	.5	0	.4
Child Care	0	1.7	1.9	1.4	1.5	1.3	1.5	1.5	1.3	1.4	1.1	1.5
Education	10.6	15.6	14.1	14.2	14.4	15.7	15.8	21.1	27.3	19.4	10.4	16.2
Health Service	.2	1.5	.4	1.5	.7	1.5	1.2	1.7	1.2	2.7	2.0	1.4
Semidurable	1.7	3.8	3.1	3.9	5.0	4.3	5.1	9.1	10.5	12.0	10.1	5.8
	100	100	100	100	100	100	100	100	100	100	100	100
						Income Sources (%)						
Labor	0	0	2.9	4.4	15.7	31.2	41.9	53.2	49.6	50.2	75.2	42.8
Agriculture	63.6	35.1	162.6	115.1	81.6	60.6	42.0	15.3	19.8	5.3	2.1	34.1
Business	0	.5	3.1	4.1	8.0	11.4	16.3	19.6	23.1	22.2	10.7	16.2
Capital	0	6.0	11.4	7.3	4.2	3.5	5.4	13.0	9.2	22.2	13.2	9.0
Net Transfers	36.4	58.5	-80.1	-30.9	-9.5	-6.8	-5.6	-1.2	-1.6	.1	-1.2	-2.1
	100	100	100	100	100	100	100	100	100	100	100	100
						Transfers Received, Portfolio (%)						
Public Trans. Rec.:	-93	85	-13	-38	-146	-74	-87	-434	-207	-338	-168	-575
(Above=100)												
▷ Food Coupons	-	-	-	-	-	-	-	-	-	-	-	-
▷ Sub. Work Unit	0	7	13	9	3	11	26	39	40	47	35	18
▷ Sub. Gov.	0	11	28	19	7	6	2	3	3	1	3	4
▷ Pension	100	81	59	72	90	82	73	58	57	52	62	78
Private Trans. Net	193	15	113	138	246	174	187	534	307	438	268	675
	100	100	100	100	100	100	100	100	100	100	100	100

(B) Urban Residency

	Bottom(%)			Quintiles					Top(%)			All
	0-1	1-5	5-10	1st	2nd	3rd	4th	5th	10-5	5-1	1	0-100
						Averages, US$						
Consumption	1058	1179	1368	1627	1755	1939	1975	2442	2372	2361	3576	1773
Income	43	275	643	696	1694	2696	3900	7490	6799	10663	19113	3290
Disp. Income	499	516	1121	1134	2227	3066	4160	7257	7594	10353	16167	3029
						Shares of Total (%)						
Consumption	.6	2.4	3.5	16.7	18.1	19.9	20.3	25.0	6.1	4.8	1.8	100
Income	.0	.3	.9	4.2	10.3	16.4	23.7	45.3	10.3	12.9	5.8	100
Disp. Income	.2	.6	1.5	6.5	12.9	17.6	24.1	38.9	10.9	10.8	.6	100
						Consumption Type (%)						
Food (Diet)	93.4	75.1	69.9	68.6	72.0	59.6	61.1	60.5	63.1	67.7	54.4	66.8
(Above=100)												
▷ Own prod.	5.7	19.9	45.4	18.8	.2	.6	.1	.1	0	.6	0	3.8
▷ Coupons	-	-	-	-	-	-	-	-	-	-	-	-
▷ Gifts	0	.1	1.0	.9	.7	14.4	2.7	2.6	2.4	3.6	2.9	5.1
▷ Expenditures	94.3	80.0	53.5	80.3	99.1	85.0	97.2	97.3	97.6	95.8	97.1	91.1
Utilities	0	0	0	.0	.2	.2	.2	.2	.1	.1	.0	.1
Housing Service	0	.4	.2	3.9	.1	.8	.1	.6	0	0	0	1.6
Child Care	0	.5	4.6	1.2	1.6	1.8	2.6	1.0	0	.5	5.4	1.7
Education	4.2	20.1	13.1	17.5	17.8	22.3	24.2	23.6	23.3	17.8	25.7	18.7
Health Service	.1	1.7	4.1	2.4	2.6	3.5	4.5	3.6	4.8	2.1	2.2	3.1
Semidurable	2.2	2.2	8.1	6.4	5.7	11.8	7.4	10.6	8.7	11.8	12.2	8.0
	100	100	100	100	100	100	100	100	100	100	100	100
						Income Sources (%)						
Labor	0	9.2	27.1	31.2	59.8	71.9	78.9	74.4	78.9	75.3	66.3	60.7
Agriculture	4.1	15.0	11.5	8.3	.5	.6	.1	1.8	0	3.5	0	1.2
Business	0	11.5	11.5	17.0	10.8	8.8	7.6	14.7	8.8	14.4	32.2	10.1
Capital	4.5	17.7	11.6	9.5	5.0	5.9	6.7	3.8	3.7	5.3	.3	4.5
Net Transfers	91.5	46.7	38.4	34.0	24.0	12.8	6.8	5.3	8.5	1.5	1.2	23.5
	100	100	100	100	100	100	100	100	100	100	100	100
						Transfers Received, Portfolio (%)						
Public Trans. Rec.:	73	146	238	134	141	249	232	228	175	330	169	135
(Above=100)												
▷ Food Coupons	-	-	-	-	-	-	-	-	-	-	-	-
▷ Sub. Work Unit	0	7	2	7	15	26	38	40	32	39	100	15
▷ Sub. Gov.	7	6	5	5	1	1	1	1	1	1	0	1
▷ Pension	93	88	93	88	84	73	61	59	67	60	0	84
Private Trans. Net	27	-46	-138	-34	-41	-149	-132	-128	-75	-230	-69	-35
	100	100	100	100	100	100	100	100	100	100	100	100

Table 3: Minimum Distance Partial Insurance and Variance Estimates: Various Income Measures

		Disposable Income		Earnings + Private Transf.		Earnings + Public Transf.		Earnings Only	
		Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
σ^2_ζ	1992-3	.2238	.0774	.2668	.1251	.2091	.0833	.2608	.0780
		(.0315)	(.0293)	(.0327)	(.0324)	(.0317)	(.0296)	(.0325)	(.0272)
	1994-7	.2620	.2456	.2777	.3331	.2103	.2610	.2812	.1616
		(.0529)	(.0646)	(.0535)	(.0846)	(.0498)	(.0708)	(.0521)	(.0487)
	1998-00	.2381	.2055	.2749	.1944	.2032	.1859	.2800	.0723
		(.0525)	(.0701)	(.0553)	(.0821)	(.0520)	(.0857)	(.0525)	(.0508)
	2001-4	.3762	.2501	.4200	.6870	.3881	.3565	.4027	.2063
		(.0549)	(.0614)	(.0585)	(.1151)	(.0494)	(.0807)	(.0483)	(.0550)
	2005-6	.3160	.2432	.3810	.5521	.2718	.1235	.2391	.1316
		(.0403)	(.0452)	(.0399)	(.0766)	(.0354)	(.0393)	(.0353)	(.0438)
σ^2_ε	1991	.2835	.1267	.2922	.1427	.2870	.1309	.2998	.1520
		(.0193)	(.0164)	(.0201)	(.0197)	(.0197)	(.0166)	(.0200)	(.0178)
	1993	.3874	.2581	.3511	.2103	.3974	.2564	.3544	.1981
		(.0320)	(.0302)	(.0324)	(.0332)	(.0323)	(.0310)	(.0326)	(.0276)
	1997	.4626	.2258	.4774	.3300	.4578	.2171	.4652	.2094
		(.0435)	(.0503)	(.0447)	(.0713)	(.0425)	(.0557)	(.0418)	(.0475)
	2000	.5274	.3062	.5177	.3157	.4758	.3683	.3829	.2788
		(.0460)	(.0511)	(.0465)	(.0546)	(.0431)	(.0580)	(.0355)	(.0493)
	2004	.4660	.3024	.4160	.2652	.3993	.3241	.4037	.2721
		(.0352)	(.0422)	(.0342)	(.0541)	(.0337)	(.0416)	(.0329)	(.0389)
	2006	.3917	.2219	.3658	.2478	.3800	.2576	.3795	.2412
		(.0318)	(.0369)	(.0311)	(.0511)	(.0287)	(.0337)	(.0308)	(.0426)
σ^2_ξ		.0191	.0162	.0196	.0196	.0189	.0177	.0197	.0192
		(.0027)	(.0050)	(.0027)	(.0048)	(.0027)	(.0048)	(.0027)	(.0045)
$\psi_{\zeta,pre97}$		.1207	.0766	.0825	.1219	.1397	.1287	.1082	.2038
		(.0437)	(.0949)	(.0392)	(.0765)	(.0486)	(.0926)	(.0385)	(.1195)
$\psi_{\zeta,post97}$		.2968	.2200	.2703	.0704	.3059	.1530	.2796	.1788
		(.0320)	(.0542)	(.0273)	(.0320)	(.0345)	(.0632)	(.0358)	(.0990)
$\psi_{\varepsilon,pre97}$		-.0242	.2116	-.0170	.0829	-.0164	.1721	-.0226	.0750
		(.0291)	(.0526)	(.0302)	(.0694)	(.0288)	(.0581)	(.0290)	(.0727)
$\psi_{\varepsilon,post97}$		.0062	.0608	-.0160	.1131	.0231	.0832	.0188	.1162
		(.0277)	(.0588)	(.0287)	(.0596)	(.0300)	(.0498)	(.0331)	(.0542)
$\sigma^2_{u^c}$	1991	.1219	.1320	.1221	.1329	.1218	.1320	.1215	.1327
		(.0050)	(.0079)	(.0049)	(.0082)	(.0050)	(.0079)	(.0049)	(.0081)
	1993	.1291	.0947	.1294	.1029	.1291	.0976	.1287	.1035
		(.0087)	(.0136)	(.0086)	(.0138)	(.0086)	(.0137)	(.0086)	(.0136)
	1997	.1680	.1569	.1678	.1579	.1691	.1578	.1669	.1597
		(.0123)	(.0197)	(.0123)	(.0197)	(.0123)	(.0197)	(.0123)	(.0198)
	2000	.2091	.1611	.2088	.1537	.2086	.1577	.2076	.1527
		(.0133)	(.0188)	(.0133)	(.0187)	(.0132)	(.0185)	(.0133)	(.0180)
	2004	.1882	.1601	.1881	.1574	.1878	.1593	.1892	.1567
		(.0118)	(.0180)	(.0118)	(.0179)	(.0118)	(.0180)	(.0118)	(.0178)
	2006	.1897	.1839	.1889	.1828	.1913	.1865	.1943	.1824
		(.0087)	(.0140)	(.0087)	(.0136)	(.0085)	(.0138)	(.0085)	(.0136)
No. of HHs		3,560	1,825	3,559	1,820	3,549	1,820	3,546	1,814

Notes: This table shows the estimation results from a partial insurance model where different measures of income are used, for rural and urban areas separately. For a discussion of the model set-up see section 4.1 and of the results see section 4.2.

Table 4: Minimum Distance Partial Insurance and Variance Estimates: Cross-Sectional Evidence: By Rural Community Growth

		Community Growth	
		Low	High
σ^2_ζ	1992-3	.2386	.2036
		(.0454)	(.0430)
	1994-7	.3133	.1935
		(.0730)	(.0762)
	1998-00	.3366	.1185
		(.0722)	(.0770)
	2001-4	.3893	.3671
		(.0789)	(.0754)
	2005-6	.3260	.3047
		(.0517)	(.0630)
σ^2_ε	1991	.2804	.2878
		(.0273)	(.0272)
	1993	.4167	.3542
		(.0462)	(.0432)
	1997	.3981	.5437
		(.0577)	(.0661)
	2000	.5623	.4862
		(.0681)	(.0597)
	2004	.4463	.4863
		(.0470)	(.0529)
	2006	.3480	.4425
		(.0391)	(.0514)
σ^2_ξ		.0231	.0112
		(.0039)	(.0047)
$\psi_{\zeta,pre97}$		.0307	.1630
		(.0575)	(.0652)
$\psi_{\zeta,post97}$		.2220	.3954
		(.0410)	(.0494)
$\psi_{\varepsilon,pre97}$		.0656	-.0851
		(.0397)	(.0365)
$\psi_{\varepsilon,post97}$		.0128	.0035
		(.0399)	(.0380)
$\sigma^2_{u^c}$	1991	.1125	.1337
		(.0064)	(.0077)
	1993	.1246	.1317
		(.0117)	(.0125)
	1997	.1727	.1632
		(.0173)	(.0174)
	2000	.2105	.2147
		(.0189)	(.0190)
	2004	.1897	.1857
		(.0167)	(.0168)
	2006	.1901	.1893
		(.0118)	(.0132)
No. of HHs		1,863	1,697

Notes: This table shows the estimation results from a partial insurance model for rural households who reside in a fast-growing community and for rural households who reside in a slow-growing comunity. Asymptotic standard errors are in the paratheses. For a discussion of the results see section 4.3.

Table 5: Minimum Distance Partial Insurance Estimates: Savings, Housing Wealth and Investments in Children

(a) Savings

	Savings Rate (Level)				Savings Rate (Growth)			
	Rural		Urban		Rural		Urban	
	Low	High	Low	High	Low	High	Low	High
$\psi_{\zeta,pre97}$	.2214	.0613	.0925	.1243	.1488	.0282	.0377	-.0648
	(.0658)	(.0563)	(.1149)	(.1773)	(.1142)	(.1002)	(.1441)	(.1625)
$\psi_{\zeta,post97}$	.2374	.3873	.1957	.2476	.2338	.5587	.1597	.3812
	(.0623)	(.0388)	(.0721)	(.0958)	(.0732)	(.0955)	(.0853)	(.1297)
$\psi_{\varepsilon,pre97}$	-.0007	-.0631	.1916	.2052	-.0239	-.0143	-.0878	.3737
	(.0366)	(.0439)	(.0786)	(.0740)	(.0393)	(.0483)	(.1128)	(.0936)
$\psi_{\varepsilon,post97}$	.0774	-.0446	.0877	.0750	.0575	.0698	.1005	.2104
	(.0400)	(.0362)	(.0695)	(.0870)	(.0431)	(.0438)	(.0786)	(.0691)
No. of HHs	1,607	1,635	804	813	770	765	252	253

(b) Housing Wealth and Investments in Children

	Housing Wealth				Investments in Children			
	Rural		Urban		Rural		Urban	
	Low	High	Low	High	Low	High	Low	High
$\psi_{\zeta,pre97}$	.1213	.1373	.0850	-.0898	.0991	.1331	.2217	-.0998
	(.0611)	(.0671)	(.1116)	(.2030)	(.3085)	(.1455)	(.2835)	(.1241)
$\psi_{\zeta,post97}$	.3071	.3313	.0837	.3980	.1713	.5260	.0639	.5124
	(.0473)	(.0501)	(.0671)	(.0932)	(.0686)	(.1012)	(.0581)	(.1383)
$\psi_{\varepsilon,pre97}$	-.0483	-.0053	.0698	.2804	-.0631	.0291	.4248	.2709
	(.0402)	(.0422)	(.1273)	(.0655)	(.0624)	(.0940)	(.1721)	(.1649)
$\psi_{\varepsilon,post97}$	-.0139	.0110	.2019	.0190	.0169	.0680	.2863	.2493
	(.0428)	(.0380)	(.0759)	(.0729)	(.0547)	(.0799)	(.0931)	(.0770)
No. of HHs	1,604	1,580	636	628	589	319	242	171

Notes: The top panel shows the estimation results from our partial insurance model for two partitions of the sample and for rural and urban households separately. The first partition criterion is based on the level of the average saving rate of a household over the period 1989 to 2009. The second partition criterion is based on the growth of the savings rate between before to after 1997. Specifically, we compute the average annual savings rate of a household for the pre-1997 and the post-1997 periods seperately, and then compute the increase in the savings rate from before to after the 1997. The bottom panel provides the estimation results of our partial insurance model from two additional partitions associated with lifetime reasons to save. The first partition criterion is based on the average of the self-reported market value of the owner occupied housing unit over the period 1989 to 2009. The second partition criterion is based on the ratio of the expenditure on child education to the household saving in 2006. Asymptotic standard errors are in the parentheses. For a dicussion of the results of this Table see section 5. For brevity, only insurance parameters are reported. For the full report, see Table G-1 and Table G-2 in Appendix.

Table 6: Welfare Effects of Growing with Risk, China and U.S.

	No Growth $\{0, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$			No Risk $\{\gamma, 0, 0, \psi_\zeta, \psi_\varepsilon\}$			No Growth & No Risk $\{0, 0, 0, \psi_\zeta, \psi_\varepsilon\}$		
CRRA	Rural	Urban	U.S.	Rural	Urban	U.S.	Rural	Urban	U.S.
η =1	-37.77%	-43.42%	-18.22%	1.69%	3.99%	3.30%	-36.72%	-41.16%	-15.52%
η =2	-37.77%	-43.42%	-18.22%	4.06%	8.94%	6.70%	-35.25%	-38.36%	-12.74%
η =4	-37.77%	-43.42%	-18.22%	14.58%	27.68%	15.99%	-28.70%	-27.76%	-5.15%

Notes: The reference scenario is defined by the actual estimates of growth, risk and insurance parameters, i.e., $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$, separately for rural and urban China in section 4.2. The values in this table are consumption compensations for variations in growth and/or risk, see section 6 for a discusison. A positive value indicates a welfare gain of moving to the alternative scenario, that is, the amount of consumption (in units of percentage) across all periods and states that individuals living in our reference scenario will demand to remain indifferent between their current scenario and the alternative counterfactual scenario. We consider three alternative combinations of growth and risks scenarios as counterfactuals: Not growing with risks, growing without risk, and the case of no growth and no risks. For the case of the U.S. we use the benchmark estimates reported in Blundell et al. (2008), i.e., the before-tax earnings as is in the case of earnings only in their Table 7; only male earnings net of own taxes is available. For the U.S. we use an average growth rate of real personal income of 2.87%, and of real personal disposable income of 2.96% for the period 1979-1992—these figures are computed using the nominal values from personal income and personal disposable income from NIPA-Table 2.1 deflated with the price index for personal consumption expenditures from NIPA-Table 2.3.4. For the case of China, we conduct this exercise separately for rural and urban households. All our results are significantly different from zero at 95% confidence levels.

Table 7: Welfare Effects of Growing with Risk: Permanent and Transitory Risk Decomposition, China and U.S

(a) Permanent Risk Only: σ_ζ^2

	No Growth $\{0, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$			No Risk $\{\gamma, 0, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$			No Growth & No Risk $\{0, 0, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$		
CRRA	Rural	Urban	U.S.	Rural	Urban	U.S.	Rural	Urban	U.S.
η =1	-37.77%	-43.42%	-18.22%	1.68%	0.73%	3.31%	-36.73%	-43.01%	-15.51%
η =2	-37.77%	-43.42%	-18.22%	4.03%	1.82%	6.62%	-35.27%	-42.39%	-12.81%
η =4	-37.77%	-43.42%	-18.22%	14.55%	4.56%	15.67%	-28.72%	-40.84%	-5.40%

(b) Transitory Risk Only: σ_ϵ^2

	No Growth $\{0, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$			No Risk $\{\gamma, \sigma_\zeta, 0, \psi_\zeta, \psi_\varepsilon\}$			No Growth & No Risk $\{0, \sigma_\zeta, 0, \psi_\zeta, \psi_\varepsilon\}$		
CRRA	Rural	Urban	U.S.	Rural	Urban	U.S.	Rural	Urban	U.S.
η =1	-37.77%	-43.42%	-18.22%	.00%	3.15%	.03%	-37.77%	-41.64%	-18.20%
η =2	-37.77%	-43.42%	-18.22%	.00%	6.71%	-.12%	-37.76%	-39.62%	-18.10%
η =4	-37.77%	-43.42%	-18.22%	.00%	19.65%	-2.87%	-37.76%	-32.30%	-17.83%

Notes: The reference scenario consists of the actual estimates of growth, risk and insurance parameters, i.e., $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$, separately for rural and urban China in section 4.2, see notes for Table 6. The welfare analysis in this Table is identical to that in Table 6 except for the fact that here our counterfactuals separately study permanent and transitory shocks respectively in panel (a) and (b).

Table 8: Welfare Effects of Insurance in China 1989-2009

	Complete Markets: Full Insurance $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, 0, 0\}$		High Insurance $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, .5\psi_\zeta, .5\psi_\varepsilon\}$		Low Insurance $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, 2\psi_\zeta, 2\psi_\varepsilon\}$		PIH: No Perm. Insurance $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, 1, 0\}$		Autarky: No Insurance $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, 1, 1\}$	
CRRA	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban
η =1	1.69%	3.99%	1.34%	3.04%	-5.49%	-11.50%	-40.07%	-23.52%	-93.72%	-75.75%
η =2	4.06%	8.94%	3.19%	6.69%	-13.23%	-23.54%	-72.76%	-52.79%	-99.98%	-98.83%
η =4	14.58%	27.68%	10.93%	19.17%	-40.94%	-48.32%	-96.98%	-89.56%	-100.00%	-99.96%

Notes: The reference scenario consists of the actual estimates of growth, risk and insurance parameters, i.e., $\{\gamma, \sigma_\zeta, \sigma_\varepsilon, \psi_\zeta, \psi_\varepsilon\}$, separately for rural and urban China in section 4.2. This Table conducts a welfare analysis across alternative counterfactual insurance technologies. The first counterfactual is defined by the case of full insurance which for welfare purposes is identical to an extreme stabilization policy that entirely removes all risks, the second counterfacutal uses a high insurance technology that halves the reference insurance parameters, the third uses a low insurance technology that doubles the refence insurance parameters, the fourth is the case of the permanent income hypothesis (PIH) in which permanent shocks are not insured but transitory are fully insured, and the fifth is the case of autarky that implies no insurance in neither permanent nor transitory shocks.

Table 9: Welfare Effects of Growth, Risk and Insurance Across Time: Pre- vs. Post-WTO

(a) Disposable Income

	Cumulative Effect: Pre- to Post-WTO					
	Growth $\{\gamma^{post}, \sigma^{pre}, \psi^{pre}\}$		Risk $\{\gamma^{post}, \sigma^{post}, \psi^{pre}\}$		Insurance Tech. $\{\gamma^{post}, \sigma^{post}, \psi^{post}\}$	
CRRA	Rural	Urban	Rural	Urban	Rural	Urban
η =1	1.89%	4.54%	1.80%	4.28%	1.13%	4.75%
η =2	1.89%	4.54%	1.66%	4.00%	0.12%	4.89%
η =4	1.89%	4.54%	1.02%	3.50%	-4.85%	5.50%

(b) Earnings

	Cumulative Effect: Pre- to Post-WTO					
	Growth $\{\gamma^{post}, \sigma^{pre}, \psi^{pre}\}$		Risk $\{\gamma^{post}, \sigma^{post}, \psi^{pre}\}$		Insurance Tech. $\{\gamma^{post}, \sigma^{post}, \psi^{post}\}$	
CRRA	Rural	Urban	Rural	Urban	Rural	Urban
η =1	1.76%	0.71%	1.74%	0.52%	1.15%	0.37%
η =2	1.76%	0.71%	1.71%	0.30%	0.37%	0.00%
η =4	1.76%	0.71%	1.58%	-0.47%	-3.48%	-1.47%

Notes: We take as reference scenario the actual estimates of growth, risk and insurance in the pre-WTO areas reported in section 4.2. We do this separately for rural and urban households and for two measures of household income, disposable income in panel (a) and earnings in panel (b).

Table 10: Welfare Effects of Growth, Risk and Insurance Across Space: Rural to Urban

(a) Disposable Income

(a.1) Pre-WTO

CRRA:	Cumulative Effect: Rural (r) to Urban (u)					
	Growth $\{\gamma^u, \sigma^r, \psi^r\}$		Risk $\{\gamma^u, \sigma^u, \psi^r\}$		Insurance Tech. $\{\gamma^u, \sigma^u, \psi^u\}$	
	c_0^r	c_0^u	c_0^r	c_0^u	c_0^r	c_0^u
η =1	2.98%	9.68%	3.28%	9.99%	0.96%	7.53%
η =2	2.98%	9.68%	3.55%	10.28%	-0.62%	5.83%
η =4	2.98%	9.68%	4.00%	10.76%	-3.13%	3.16%

(a.2) Post-WTO

CRRA:	Cumulative Effect: Rural (r) to Urban (u)					
	Growth $\{\gamma^u, \sigma^r, \psi^r\}$		Risk $\{\gamma^u, \sigma^u, \psi^r\}$		Insurance Tech. $\{\gamma^u, \sigma^u, \psi^u\}$	
	c_0^r	c_0^u	c_0^r	c_0^u	c_0^r	c_0^u
η =1	6.24%	14.53%	7.56%	15.95%	5.13%	13.33%
η =2	6.24%	14.53%	8.87%	17.36%	5.29%	13.50%
η =4	6.24%	14.53%	12.18%	20.93%	10.44%	19.05%

Notes: We take as reference scenario the actual estimates of growth, risk and insurance in the rural areas reported in section 4.2 for household disposable income. We do this separately for the pre- and post-WTO sample periods. The columns headed with c_0^r refer to the case where we keep the initial level of rural consumption in the counterfactual environment, while the columns headed with c_0^u refer to the case where we replace the initial level of rural consumption for the initial level of urban consumption in the counterfactual environment.

(b) Earnings

(b.1) Pre-WTO

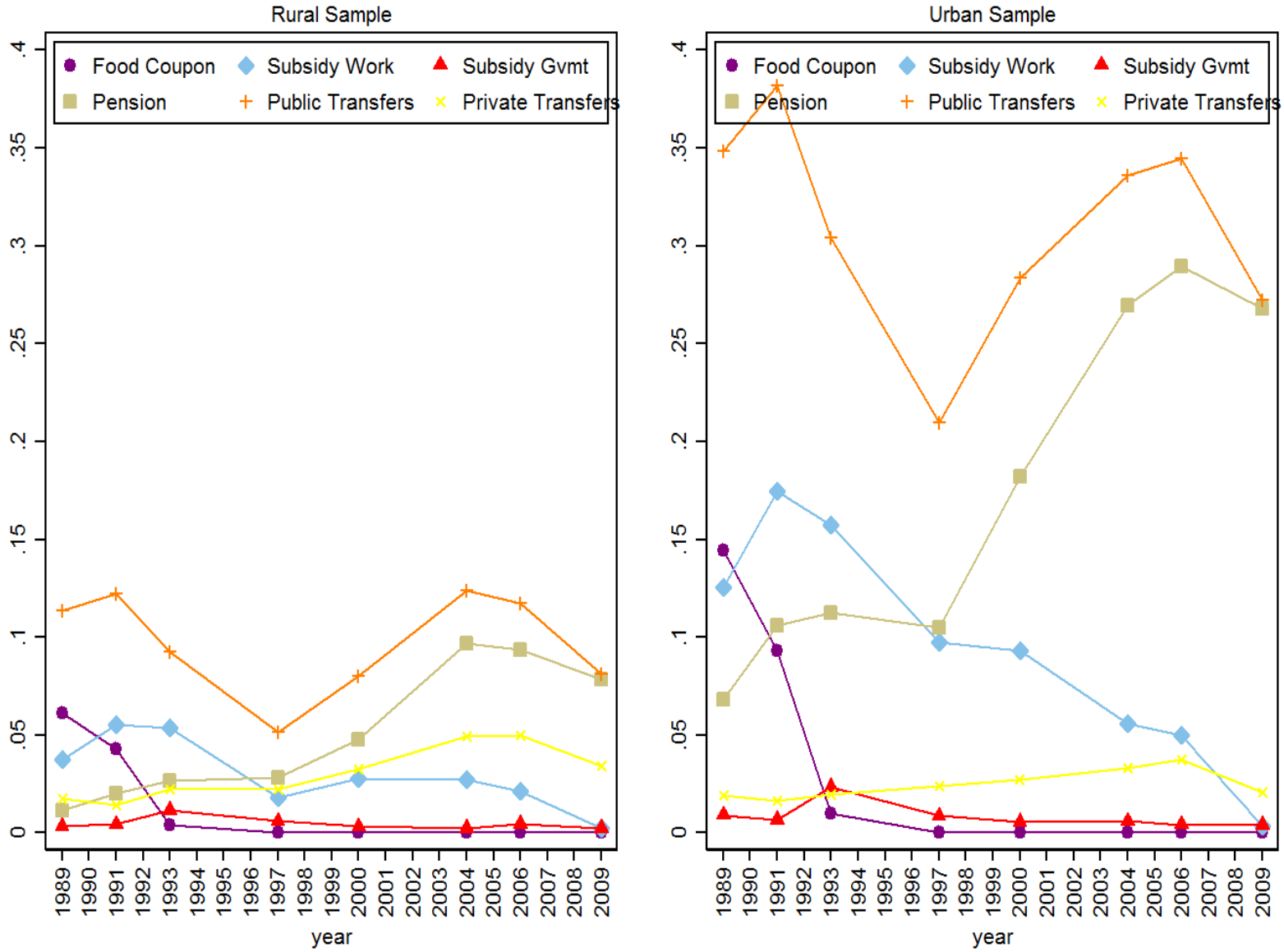
CRRA:	Cumulative Effect: Rural (r) to Urban (u)					
	Growth $\{\gamma^u, \sigma^r, \psi^r\}$		Risk $\{\gamma^u, \sigma^u, \psi^r\}$		Insurance Tech. $\{\gamma^u, \sigma^u, \psi^u\}$	
	c_0^r	c_0^u	c_0^r	c_0^u	c_0^r	c_0^u
η =1	7.70%	14.70%	8.09%	15.11%	7.29%	14.27%
η =2	7.70%	14.70%	8.52%	15.57%	7.11%	14.08%
η =4	7.70%	14.70%	9.56%	16.68%	8.79%	15.86%

(b.2) Post-WTO

CRRA:	Cumulative Effect: Rural (r) to Urban (u)					
	Growth $\{\gamma^u, \sigma^r, \psi^r\}$		Risk $\{\gamma^u, \sigma^u, \psi^r\}$		Insurance Tech. $\{\gamma^u, \sigma^u, \psi^u\}$	
	c_0^r	c_0^u	c_0^r	c_0^u	c_0^r	c_0^u
η =1	3.63%	11.71%	5.70%	13.94%	4.06%	12.18%
η =2	3.63%	11.71%	8.05%	16.48%	5.04%	13.23%
η =4	3.63%	11.71%	13.18%	22.01%	10.94%	19.59%

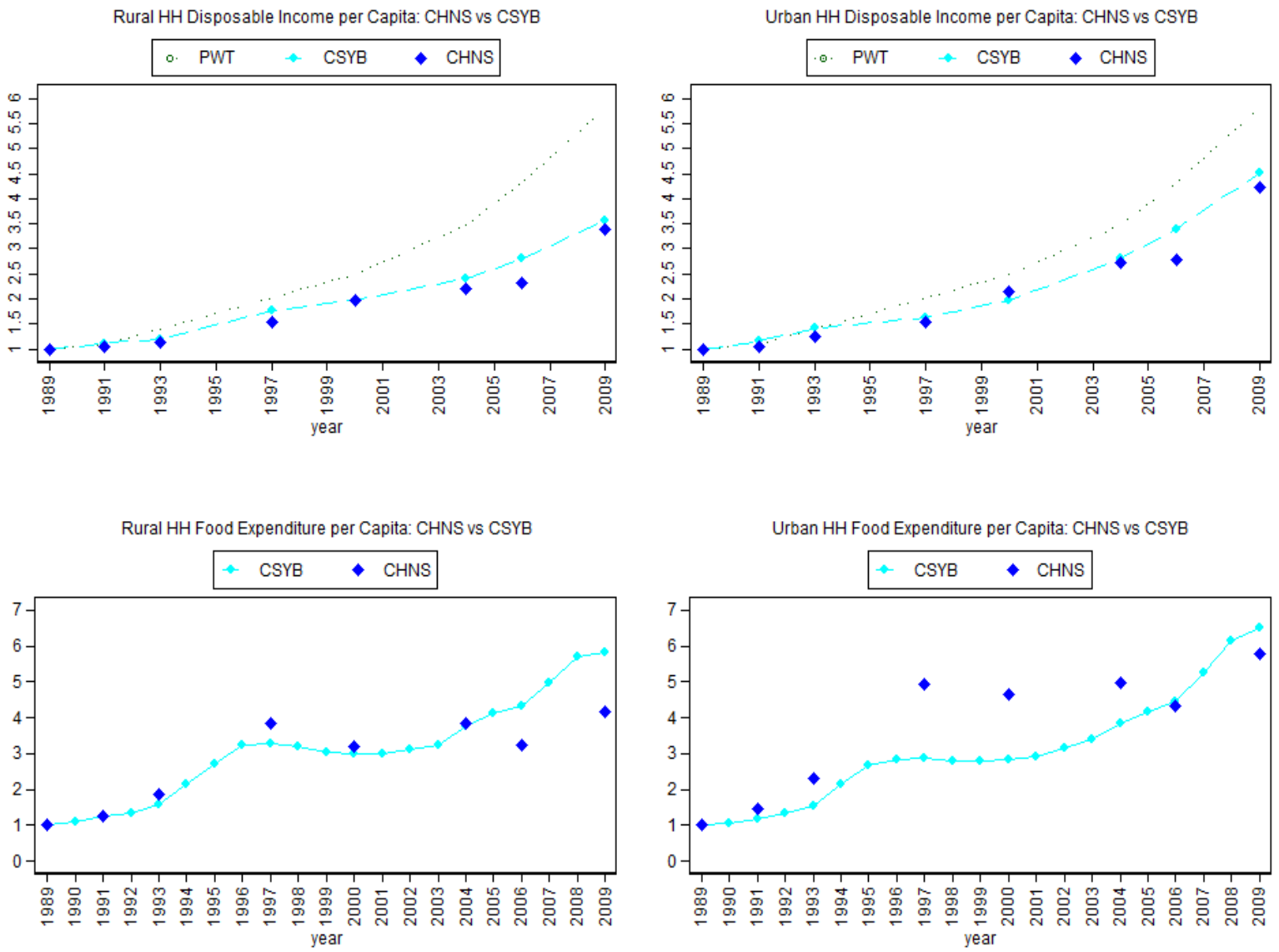
Notes: We take as reference scenario the actual estimates of growth, risk and insurance in the rural areas reported in section 4.2 for household earnings. We do this separately for the pre- and post-WTO sample periods. The columns headed with c_0^r refer to the case where we keep the initial level of rural consumption in the counterfactual environment, while the columns headed with c_0^u refer to the case where we replace the initial level of rural consumption for the initial level of urban consumption in the counterfactual environment.

Figure 1: Public and Private Transfers (% of Income), CHNS, China 1989-2009



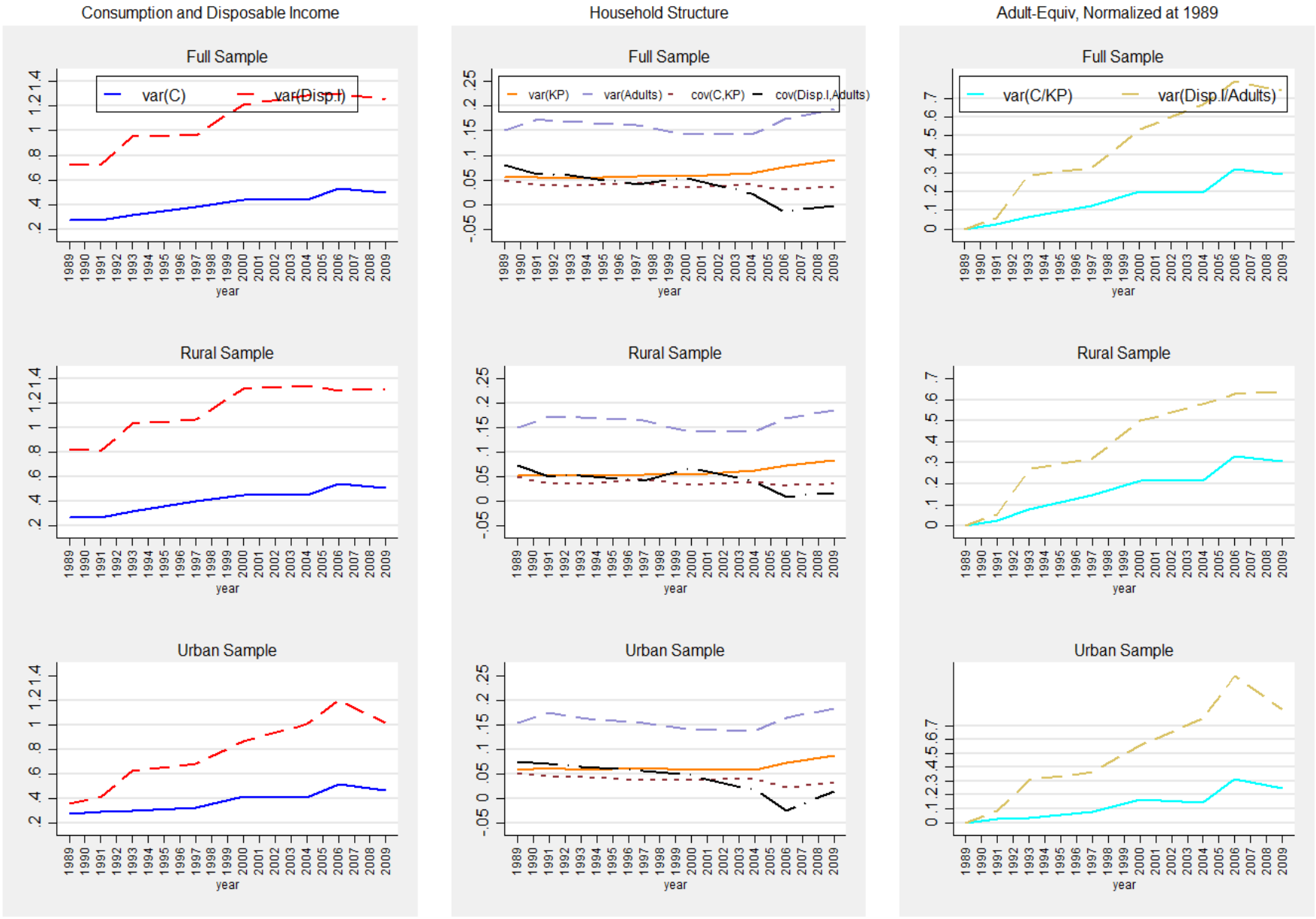
Notes: We plot the share of the aggregate amount of various public and private transfers in the aggregate income from 1989 to 2009 for the rural and urban CHNS sample separately. For the construction of the measure of transfers see section 3.1 in the text and section A.3 in the Appendix. For a dicussion of the transfers system in China, see section 2. For a discussion of the role transfers plays in consumption insurance in China see section 4.2.

Figure 2: Household Per Capita Net Income and Food Expenditure, CHNS and CSYB, China 1989-2009



Notes: The top figures show the household per capita net income from the CHNS against the household per capita net income from the CSYBs, for rural and urban China. The net income in the CHNS is constructed by deducting from the disposable income the value of in-kind transfers. The rural and urban household per capita net income from the CSYBs are derived from the provincial counterparts weighted according to the population weights in the CHNS. Real GDP per capita from the Penn World Table is also included in the two figures.The bottom two panels show the household per capita food expenditure from the CHNS and from the CSYBs. The food expenditure in the CHNS is constructed by deducting from the value of diet the value of food coupons and food gifts. All values are normalized to 1 in 1989. For a discussion on the data construction, see section 3.1.

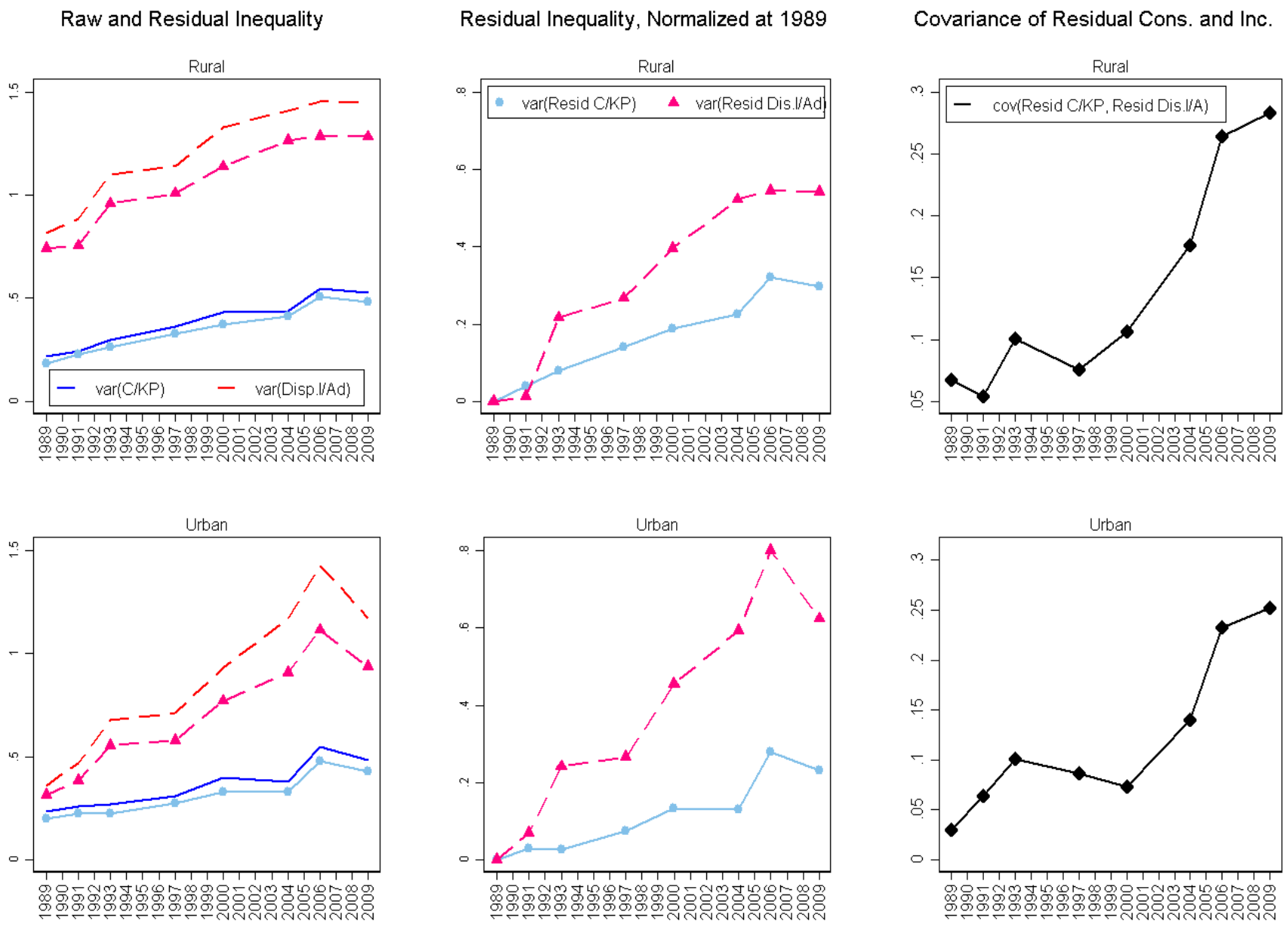
Figure 3: Adult-Equivalent Consumption and Income Inequality, Variance of Logs, CHNS, China 1989-2009



Source: CHNS 1989-2009.

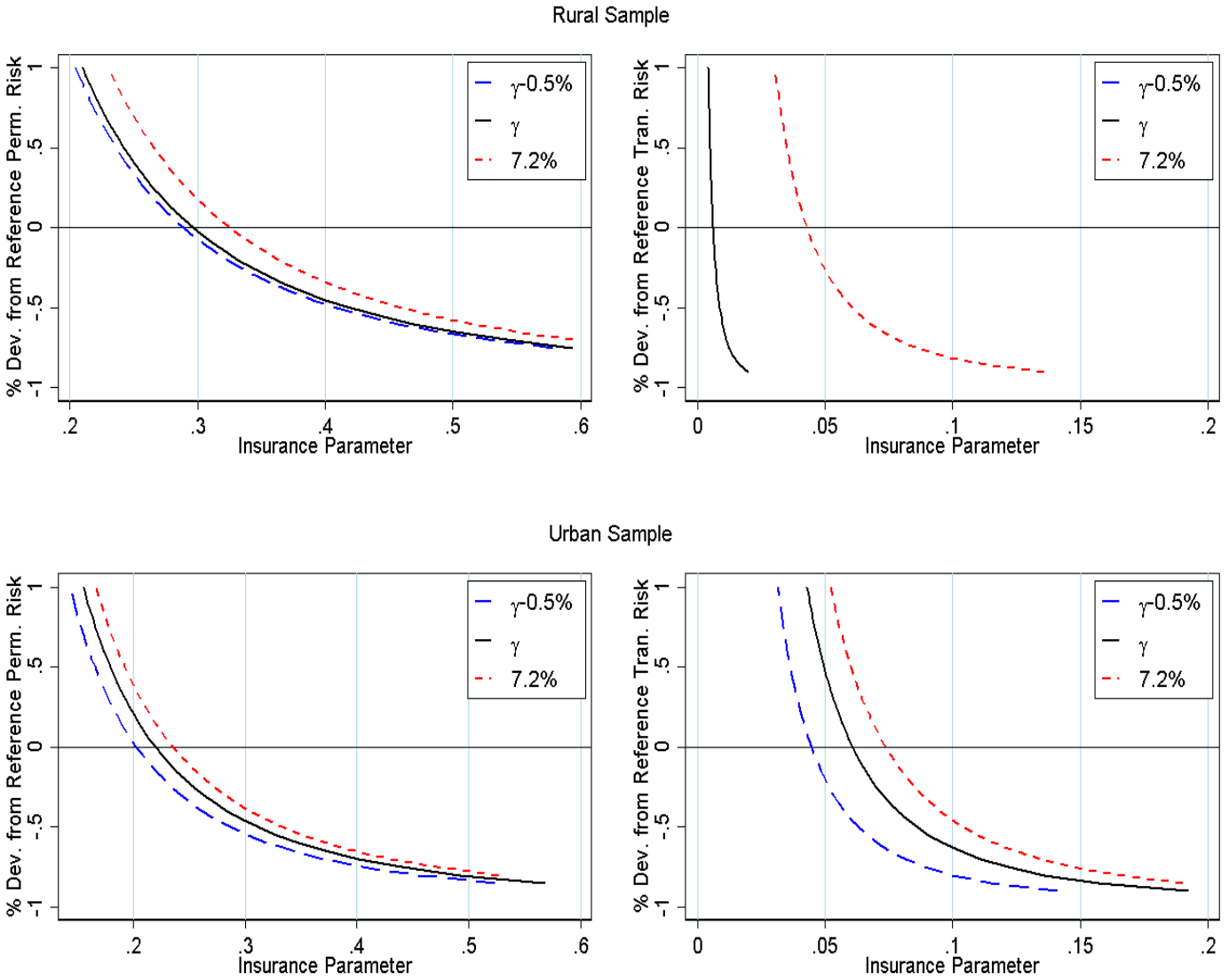
Notes: The left column shows the evolution of the variance of logged household consumption and disposable income from 1989 to 2009. The middle column shows the evolution of the variance of the NAS adult-equivalence scale and the number of adults, the covariance of the former with household consumption and the covariance of the latter with household disposable income. The right column shows the evolution of the variances of adult-equivalent consumption and disposable income normalized to 0 in 1989. For a discussion on the facts, see section 3.2.

Figure 4: Residual Consumption and Income Inequality, Variance of Logs, CHNS, China 1989-2009



Notes: The left column shows the evolution of the raw and residual inequality of the adult-equivalent consumption and disposable income from 1989 to 2009. The middle column shows the evolution of the residual inequality of consumption and disposable income, normalized to 0 in 1989, from 1989 to 2009. The right column shows the evolution of the covariance of residual adult-equivalent consumption and disposable income from 1989 to 2009. For a discussion on the facts, see section 3.2.

Figure 5: Welfare Preserving Policy Experiments: Growth Reforms vs. Stabilization Policies vs. Social Insurance Policies



Notes: In each panel all combinations of the variance of income shocks (in percentage deviations from reference estimates, vertical axis) and the level of insurance (horizontal axis) preserve status-quo/reference welfare and each curve consists of the combinations that preserve status-quo/reference welfare under a specific growth scenario. We entertain three income growth scenarios: the reference income growth rate minus 50 basis points, the reference and an optimistic 7.2%. For a discussion of the policy experiment, see section 7. The average rural income growth that defines our reference environment is 5.20% and the urban income growth rate is 6.71%, i.e., the post-WTO average income growth rates. The estimated reference annualized variance of permanent shocks, averaged over 2001 to 2009, is .1305 in rural areas and .0946 in urban areas. The numbers for the annualized variance of transitory shocks are .4295 in rural areas and .2580 in urban areas. Finally, the estimated reference insurance parameters in rural and urban areas are taken to be the same as the $(\psi_{\zeta}^{post}, \psi_{\varepsilon}^{post})$ in our benchmark.