China’s Economic Fluctuations and Consumption Smoothing:
Is Consumption More Volatile than Output in China?

Min Zhao\textsuperscript{a} Minchung Hsu\textsuperscript{b}\textsuperscript{*}

Abstract
This paper provides a fundamental study of China’s consumption and output fluctuations. The most recent literature reports that, in the post-1978 period, detrended consumption is significantly more volatile than detrended output in China. This indicates the inability to impose consumption smoothing. However, in those previous studies, consumption of durables, which has some features of capital, as discussed in the real business cycle literature, was not separated from private consumption. This paper is the first to estimate consumer durables for China and their service values following the method introduced in Cooley and Prescott (1995). We adjust the consumption measure to make it consistent with the real business cycle literature, and find that consumption of durables is much more volatile than output, but non-durable consumption is less volatile than, and less correlated with, output that provides evidence that supports consumption smoothing in China.

\textit{JEL Classification:} E32, E21, C82, N15
\textit{Keywords:} consumption smoothing, economic fluctuations, consumer durables, China

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1 Introduction

In the most recent literature on Chinese economic fluctuations, He et al. (2009), Xu (2007) and Boyreau-Debray and Wei (2005) report that detrended consumption is significantly more volatile than detrended output in China in the period after the 1978 economic reform. This finding has features that are the opposite of those in the US that are well known in the real business cycle (RBC) literature. It is also inconsistent with the theory of consumption smoothing, and it may indicate bad risk sharing in consumption. However, in those previous studies, the measure of consumption includes the consumption of durables. As described in Cooley and Prescott (1995), consumer durables have features similar to capital, and the consumption of durables is typically separated and classified as investment in the RBC literature. The inclusion of the consumption of durables is likely to result in an over-estimation of consumption volatility.

This paper aims to improve the measurement of consumption in order to understand better the features of economic fluctuations in China. Because direct information on consumer durables in China is not available, this paper is the first attempt to provide such an estimation. The procedure of constructing a measure of consumption, which is consistent with the RBC literature, is as follows. First we estimate the series of consumption of consumer durables, which includes durable daily use articles, recreational durables, means of transportation, means of communication and households’ consumption of construction and decoration materials. The data for these items are not complete. Some items are available for a certain period, but some provide no direct information at all. For those items and years without direct data, we find that the information on each item’s upper-category consumption amounts and price indexes can be used to identify the weights of the items in their upper categories. This enables us to calculate the amount of each consumer durable, with its estimated weights. Using this method, we successfully construct the series of the consumption of durables from 1981 to 2006.

Secondly, although the consumption of durables should be treated as investment, the services provided by durables should be included in current consumption as well as output. We estimate the stock of consumer durables by its law of motion, and then the service values of the consumer durables. The service values are added to non-durable consumption and output. We find that the consumption of durables is much more volatile than that of output, whereas non-durable consumption is less volatile than, and less correlated with, output from 1981 – 2006. This finding suggests that the Chinese people do smooth (non-durable) consumption, in a way that is consistent with what is observed in the US.

The rest of this paper is organized as follows. Section 2 describes the procedure
of constructing consistent measures of consumption and output. Section 3 presents the results of our estimation and calculation of consumption and output volatility. Section 4 concludes the paper.

2 The Measurement

We obtain GDP data (by the expenditure method) from the Data of Gross Domestic Product of China 1952-2004 (DGDPC) and China Statistical Yearbook (CSY) published by the National Bureau of Statistics (NBS) of P.R.C. NBS also provides GNP at current prices for the years after 1978. We estimate real GDP at the price of year 2000 with GDP deflator.¹

Consumption data are also from NBS, and are deflated by the consumption deflator of national accounts (at the price of year 2000).² We focus on per capita output and consumption. Population data are also available in CSY for calculating per capital level figures. Please note that every economic variable we discuss below without additional specification is defined as per capita level.

Consumption of durables is classified as investment in the RBC literature (see Cooley and Prescott, 1995, for example) and its accumulation is counted in capital. The inclusion of consumer durables is likely to result in an over-estimation of the volatility of consumption, since it has the feature of investment. However, the service provided by the stock of consumer durables should be counted as private consumption.

To be consistent with the RBC theory, we adjust consumption and output from the original data as follows:

\[ Y = Yo \text{ (original data)} + Yd; \]  
\[ CNDS = CONS \text{ (original data)} - Cd + Yd; \]

where \( Y \) is aggregate output, \( CNDS \) is private non-durable consumption, \( Yd \) is the service provided by consumer durables, and \( Cd \) is consumption of durables.

**Consumer durables (\( Cd \))**

Estimating consumer durables in China is a challenge. In the literature, no one has provided an estimation for China. This is the first attempt. We use household survey data from CSY. The items we include in consumer durables are durable daily-

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¹GDP deflator can be derived from the data of real GDP growth provided by NBS.
²In the national account, NBS also provides real aggregate consumption growth data, which can be used to identify consumption deflator.
use articles, recreational durables, means of transportation, means of communication and households’ consumption of construction and decoration materials.

CSY provides the data of per capita consumption of durable daily use articles and recreational durables from 1986 through 2006 in the urban area, and construction and decoration materials are available only from 1985 to 1991. For the rest, CSY provides only aggregated data of their upper categories. The direct information available is not complete, but if we can identify the weights of each subcategory, we are able to obtain the consumption of each item of durable goods. Fortunately, price index data, which are calculated from weighted average prices, are available to identify the weights. CSY provides a consumer price index (CPI) for all categories and sub-categories from 1985 to 2006. For the years before 1985 CPI data are not available, and we use the retail price index (RPI) instead. We use the price index information to estimate the weight of each durable good in its upper category. For instance, the category of housing from 1994 through 2000 contains two subcategories – rent and construction materials. We would like to establish expenditure on construction materials, but only expenditure on housing is available. Because the price of housing ($P_h$) is a weighted average of the price of rent ($P_r$) and the price of construction ($P_c$), which are available in the CPI and RPI data, we can present the following equation:

$$ P_h = w \times P_c + (1 - w) \times P_r, \tag{3} $$

where $w$ is the weight of construction materials in housing consumption. Rearranging the equation, we obtain the weight $w$ of construction materials:

$$ w = \frac{P_h - P_r}{P_c - P_r}. \tag{4} $$

Once $w$ is known, we are able to compute expenditure on construction materials.

When there are $n$ subcategories under an upper category, we need at least $n - 1$ observations (years) to identify the weights by solve the following equations:

$$ P = \sum_i w_i \times P_i; \tag{5} $$

$$ \sum_i w_i = 1; \quad 0 < w_i < 1, \tag{6} $$

where $i \in \{1, 2, ..., n\}$. If $n$ is 2, we basically use one observation so that we can have one weight of a durable consumption category for each year. There are some cases in which we can not obtain a reasonable solution, we use either average or interpolation/extrapolation to determine the weight according to the over-time pattern of available weights.
If \( n \) is greater than 2, a moving-window calculation is used to decide the weight for each year. If the moving-window calculation verifies that the weights are stable over time, we can assign the average weights to the years we study. If there is a specific trend over time, then we use interpolation/extrapolation to assign the weights.

We successfully estimate the weights in most cases. There are few occasions on which the calculated weights are not reasonable or the weights cannot be identified due to data limitation. In such cases, we have to make some assumptions for estimation. Whenever an assumption is needed, we try to make it conservative (i.e. in a way that smoothes the pattern) so that we will not over-estimate the volatility of consumption of durables. For example, if the weight based on available years shows an increasing or decreasing trend, we estimate the weight in a specific year by linear interpolation/extrapolation. However, we show in the text that even with those assumptions, the consumption of durables is still much more volatile than the non-durable consumption. The details of the estimation of consumer durables are described in appendix A.

For the years before 1981, the data are limited and we cannot obtain precise estimation. Because total consumption in the household survey is consistently lower than private consumption in national accounts, we calculate the annual consumption shares of durables along with the survey data, and use the shares to derive the consumption of durables in each year, using the national accounts data. The consumption shares of durables from 1981 to 2006 are shown in figure 1.

Figure 1: Consumption shares of durables
Service from the stock of consumer durables

Although consumption of durables is classified as investment, the service provided by consumer durables should be counted as consumption. Because the official data do not include the return on consumer durables (equivalent to the value of their service), we need to estimate the return values (denoted by $Y_d$) and add these values to consumption and output.

We first need to estimate the stock of consumer durables ($K_d$). Following the method of estimating capital stock in Chow (1993) and Chow et al. (2002), we estimate $K_d$ by the law of motion:

$$K_{d,t+1} = C_{d,t} + (1 - \delta_d)K_{d,t};$$

(7)

In Chow (1993), the depreciation rate of physical capital (denoted by $\delta_p$) is set at 0.05. We assume that consumer durables depreciate faster than physical capital, and follow Cooley and Prescott (1995) by setting $\delta_d$ at 0.2. To prevent the bias of the initial value of $K_d$, we linearly interpolate $C_d$ back to 1952, and start the calculation of its stock $K_d$ from 1952. The initial value of $K_d$ at the end of year 1952 is assumed to be four times of $C_d$ in 1952. Because consumer durables depreciate faster and the $C_d$ in 1978 is still small (less than 1% of total private consumption), the estimation of the sequence of $K_d$ is not sensitive to the initial value of $K_d$. Figure 2 presents the stock of consumer durables to GDP ratio from 1981 to 2006.

Second, we need a proxy of the rate of return for $K_d$. It is intuitive to use the rate of return on physical capital (denoted by $K_p$) for the proxy. We do the estimation of the rate of return on $K_p$ using the following steps.

1) We need the income share of capital ($\theta_p$) for $K_p$:

$$\theta_p = \frac{\text{gross return of capital}}{Yo}.$$  

(8)

Bai et al. (2006) have already provided an estimation of the capital income share for the period from 1978 to 2005. We adopt their capital income share to calculate the rate of return on physical capital.

2) We then calculate the net rate of return ($r$) of $K_p$ from the equality below:

$$\text{gross capital income} = (r + \delta_p)K_p = \theta_pYo.$$  

(9)
Rearranging the above equation, we have:  

\[ r = \frac{\theta_p y_o}{K p} - \delta_p. \]  

(10)

3) We use the \( r \) and \( \delta_d \) to create the income share for \( K_d \), and then calculate the flow of service of consumer durables (\( Y_d \)):

\[ Y_d = (r_t + \delta_d)K_d t = (\theta_p y p_t / K p_t - \delta_p + \delta_d)K_d t. \]  

(11)

Figure 3 shows the service of consumer durables \( Y_d \) to GDP ratios from 1981 to 2006.

Measures of output and consumption

Using the above information and following Cooley and Prescott (1995), we construct a measure of consumption (\( CNDS = CONS - Cd + Y_d \)) and a measure of output (\( Y = Yo + Y_d \)), both of which are consistent with the RBC literature.

3 Volatility of Consumption and Output

We first use the Hodrick-Prescott filter (H-P filter) to remove the growth trends of each variable. Because only annual data are available in China, we set the H-P filter lambda

\[ \lambda = 64. \]

\[ \text{Volatility of Consumption and Output} \]

We still follow Chow (1993) to estimate the \( K_p \) sequence from 1952, by using the law of motion of capital, his depreciation rate of physical capital, 0.05, and his estimation of the initial value of capital \( (K_p) \) at the end of 1952 including land value, at about 2.7 times the year 1952’s output.
coefficient as 6.25, as suggested by Ravn and Uhlig (2002), so that the statistical features of the annual data become comparable with the quarterly data. Figures 4 and 5 show the de-trended fluctuations.

Volatility is measured by the standard deviation of each de-trended variable (i.e., deviation from its trend). Table 1 shows the results. The first row presents standard deviations, and the second row presents the ratios of the standard deviations to output $Y$’s. We can see that the private consumption $CONS$ (official data, durables included) is more volatile than $Y$, as found by previous studies. The standard deviation of $Y$ is 1.82% and that of $CONS$ is 1.97%, which is 8% higher than the output $Y$ volatility.\footnote{The standard deviation of official GDP (detrended) is 1.73%. $CONS$ is 14% more volatile.} However, if we separate consumption of durables from private consumption, we find that both $CND$ and $CNDS$ are less volatile than $Y$. The measure $CNDS$, which is consistent with the RBC literature, with standard deviation of 1.43% is 21% lower than the $Y$ volatility. In contrast, consumption of durables $Cd$ is more volatile, with a standard deviation of 11.96%.

The third row of table 1 presents each variable’s correlation with $Y$. Because risk averse consumers would like to smooth their consumption, we expect consumption to be less volatile than, and not highly correlated with, output (income). We find that consumption of durables $Cd$ and private consumption $CONS$, which contains $Cd$, are more correlated with $Y$ than $CND$ or $CNDS$. Non-durable consumption $CND$ is less corre-
Figure 4: Volatility of output and consumption measures (H-P filtered)

Figure 5: Volatility of output and consumption of durables (H-P filtered)
Table 1: Fluctuations along the trend (1981–2006)

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>CONS</th>
<th>Cd</th>
<th>CNDS</th>
<th>CNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation</td>
<td>0.0182</td>
<td>0.0197</td>
<td>0.1196</td>
<td>0.0152</td>
<td>0.0143</td>
</tr>
<tr>
<td>Relative Volatility</td>
<td>1.0000</td>
<td>1.0824</td>
<td>6.5714</td>
<td>0.8352</td>
<td>0.7857</td>
</tr>
<tr>
<td>Correlation with $Y_t$</td>
<td>1.0000</td>
<td>0.6882</td>
<td>0.7056</td>
<td>0.3017</td>
<td>0.6078</td>
</tr>
</tbody>
</table>


Table 2: Growth rates and Volatility (1981–2006)

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>CONS</th>
<th>Cd</th>
<th>CNDS</th>
<th>CNDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Growth rate</td>
<td>0.0991</td>
<td>0.0816</td>
<td>0.1374</td>
<td>0.0780</td>
<td>0.0842</td>
</tr>
<tr>
<td>Standard deviation</td>
<td>0.0280</td>
<td>0.0293</td>
<td>0.2096</td>
<td>0.0233</td>
<td>0.0232</td>
</tr>
<tr>
<td>Relative Volatility</td>
<td>1.0000</td>
<td>1.0464</td>
<td>7.4857</td>
<td>0.8321</td>
<td>0.8286</td>
</tr>
<tr>
<td>Correlation with $Y_t$</td>
<td>1.0000</td>
<td>0.6826</td>
<td>0.6415</td>
<td>0.3317</td>
<td>0.6366</td>
</tr>
</tbody>
</table>


lated with output, and its correlation coefficient with output is only 30%. The measure $CNDS$, which is $CND$ plus service of consumer durables, has a higher correlation with $Y$ than that of $CND$, but it is still lower than those of $CONS$ and $Cd$.

In addition to the H-P filtered series, we also check volatility of growth rates. The standard deviations of the growth rates are calculated and presented in the second row of table 2. We again find that $CONS$ is more volatile than output $Y$, but non-durable consumption $CND$ and $CNDS$ are less volatile than, and less correlated with, $Y$.

Although the focus of this paper is not on investment, an adjusted investment series with consumer durables is presented in appendix B.

4 Conclusion

This paper provides a fundamental study of China’s economic fluctuations in output and consumption. We undertake a standard procedure, as suggested in the RBC literature, to separate the consumption of durables from private consumption, and to estimate the service values of consumer durables, in order to construct consistent measures of output and consumption.
Compared to previous studies, which report that detrended consumption is more volatile than detrended output in China during the post-1978 period, we find that the consumption of durables is much more volatile than output, whereas non-durable consumption is less volatile than, and less correlated with, output.

In contrast to the previous findings, which are inconsistent with consumption smoothing and may indicate bad risk sharing in consumption, our findings provide evidence that supports consumption smoothing in China.

References


Appendix A: Measure of Consumer Durables

We first estimate the urban consumption of durables. Because data availability and quality very largely across different categories, we describe the details of estimation in each category below.

A.1 Urban Consumption of Durables

We estimate the per capita consumption of categories of durable daily-use articles, recreational durables, means of transportation, means of communication and consumption of construction and decoration materials in the urban area.

A.1.1 Durable Daily-use Articles

CSY provides the data of per capita consumption of durable daily use articles from 1986 through 2006 in the urban area. For the period from 1981 to 1985, only the yearly consumption amounts of total daily-use articles are available. Under the daily-use articles category, there are three subcategories: normal daily-use articles, furniture and household facilities, and miscellaneous commodities. So the number of subcategories in this case is 3. We choose the furniture and household facilities subcategory as the consumption of durable daily-use articles. The goal is to identify the weight of this subcategory from price indexes of these categories.

In this case, we need at least \( n - 1 \) (i.e. 2) observations to identify the weights of the subcategories \( (w_i, i \in \{1, ..., n\}) \). An reasonable solution should satisfy \( 0 < w_i < 1 \) and \( \sum_i w_i = 1 \). If we use \( n - 1 \) observations, the condition \( \sum_i w_i = 1 \) is used to identify the weights. We do a moving-window calculation using both \( n - 1 \) observations and \( n \) observations. In practice, sometimes the condition \( \sum_i w_i = 1 \) can not be reached exactly by using numerical approaches, but the sum of the estimated weights is close to 1. In this case we adjust the weights proportionally so that the sum of weights is one (e.g. if the sum of \( w_i \) is 0.997, we inflate each \( w_i \) with the ratio 1/0.997).

We basically find an increasing trend of the weight of furniture and household facilities consumption during the period by solving for the weight with both \( n - 1 \) and \( n \) observations. For some years we can not have a reasonable solution with using \( n - 1 \) observations, so we use the results of the calculation with \( n \) observations. Because of the increasing trend, we assign the estimated weight from each moving-window calculation to the middle year among the observations (the estimated weight from 1981-83 observations is assigned to 1982), and do linear interpolation for 1981 and 1985. See the estimation result in table 3.
Table 3: Estimated weight of durable daily-use articles (1981–85)

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (durable daily-use articles)</td>
<td>0.0788</td>
<td>0.1325</td>
<td>0.1862</td>
<td>0.2202</td>
<td>0.2542</td>
</tr>
</tbody>
</table>

Notes: Moving-window calculation for 1982-84; Linear interpolation for 1981 and 1985

A.1.2 Recreational Durables

CSY provides the data of per capita consumption of recreational durables from 1986 through 2006 in the urban area. The recreational consumption category has two subcategories – ‘paper and stationery’ and ‘recreational electronics’, during 1981-85. The consumption of recreational electronics is counted as consumption of durables. Since the $n$ is only 2 in this case, we can identify the weight of recreational electronics from price indexes for each year during 1981-85. We also find the estimated weights satisfying the required conditions.

A.1.3 Construction and Decoration Materials

We need to estimate the consumption of construction/decoration materials from its upper category starting from 1992. It is under the housing category. The price index of consumption of housing has two subcategories during 1994-2000 – rent and construction/decoration materials. Price indexes for 1992-93 are not available. We are able to identify the weight of the subcategory construction/decoration materials from price indexes for each year during 1994-2000. We have reasonable solutions and find the weight is stably in a range between 0.50 and 0.55. So we use linear extrapolation to estimate the weights for 1992-93.

From 2001, the housing category expanded to have 4 subcategories instead of 2. Two additional subcategories are included, and therefore we use 3-years observations and moving-window calculation to identify the weight of construction/decoration materials. There is a light increasing trend over time, and so we assign the weight to the middle year among the observations (e.g. the estimated weight from 2001-03 observations is assigned to 2002), and do linear interpolation for 2001. Table 4 presents the results of the estimation with moving-window calculation.
Table 4: Estimated weight of construction/decoration materials (2002–06)

<table>
<thead>
<tr>
<th>Year</th>
<th>2002</th>
<th>2003</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (construction materials)</td>
<td>0.18761</td>
<td>0.2274</td>
<td>0.2472</td>
<td>0.3142</td>
<td>0.2802</td>
</tr>
</tbody>
</table>

Notes: Based on moving-window calculation.

A.1.4 Durables of Transportation and Communication

Transportation equipments (e.g. cars) and communication equipments (e.g. cell phones) are counted as durables. However, only the consumption of the aggregate category, transportation and communication, is available. There are two subcategories under it in the price indexes—transportation subcategory and telecommunication subcategory. The category, means of transportation, is one of the five subsubcategories under the transportation category; the category, means of communication, is one of the two subsubcategories under the communication category.

The first step of the identification is to find the weights for transportation and communication subcategories. Unfortunately, the price indexes are available only for years starting from 2001. However, we find the weights, based on price indexes, from 2001 to 2005 are very stable, around 43% for transportation and 57% for communication. From 2006, the weight of transportation becomes higher: 49% in 2006 and 51% in 2007. We assume the weights for years before 2001 are also stable as in 2001-05. This assumption would lead to an under-estimation of the volatility of the consumption of durables.

The second step is to estimate the weights of durables in each subcategory.

Means of Transportation  There are 5 subcategories under the transportation category. We use 4 observations to identify the weight of transportation equipments with moving-window calculation. The results show a slightly increasing trend (see table 5). Therefore, we assume that the estimated weights represent middle points among the corresponding observations, and then use linear interpolation/extrapolation to determine the weights for years between 1992 and 2006. The per capita level of consumption of transportation equipments is small and close to 0 in 1992. Therefore we assume the consumption of transportation equipments is 0 before 1992.

Means of communication  There are two subcategories, means of communication and services, under the communication consumption category. So we can calculate the weight of means of communication with each year’s observation. We find that during 2001-06, the weight of means of communication is in a range between 0.18 and 0.20, and there is no specific pattern. So we assume the weight of means of communication
Table 5: Estimated weight of means of transportation

<table>
<thead>
<tr>
<th>Year</th>
<th>2001-04</th>
<th>2002-05</th>
<th>2003-06</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>0.2628</td>
<td>0.2657</td>
<td>0.2846</td>
</tr>
<tr>
<td>(means of transportation)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: Based on moving-window calculation.

Figure 6: Urban per capita consumption of durables (current price)

before 2001 is the same as it in 2001 (which is 0.20). This assumption would lead to an under-estimation of the volatility of the consumption of durables. We also observe that the communication consumption is low in 1990s. Even we assume the highest weight of means of communication from available observations, it does not affect total consumption of durables much.

The composition of consumption per capita on durables in urban areas is shown in figure 6. We then use the urban population data to calculate aggregate consumption of durables in urban areas.

A.2 Rural Consumption of Durables

Because the national price index $P_n$ is a weighted average of urban $P_u$ and rural $P_r$ prices, and we already have the urban consumption of durables, we use national, urban and
rural price indexes of each durable consumption item to identify the weights of urban and rural consumption of durables. We solve $w_u$ and $w_r$ for each item of consumer durables in each year with the following two equations:

$$P_n = w_u P_u + w_r P_r; \quad (12)$$
$$w_u + w_r = 1; \quad (13)$$

where $w_u$ is the weight of urban consumption, $w_u$ is the weight of rural consumption. Let $C_u$ and $C_r$ denote the urban and rural consumption of a item, respectively. We can obtain the rural consumption $C_r$ by

$$C_r = \frac{w_r}{w_u} C_u. \quad (14)$$

The advantage of this approach is that we can easily identify the rural consumption of durables for each year without further assumptions. We find that the rural consumption of durables basically shows an increasing trend overtime. Only in 2001 we have an unreasonable estimate with this approach, which is much lower than the values in 2000 and in 2002. Hence we use a linear interpolation for the consumption of durables in 2001 instead. This adjustment would smooth the pattern of rural consumption of durables and might lead to an under-estimation on the volatility of consumer durables. However, we show in the text that even with those assumptions, which might smooth the consumption pattern of durables, the consumption of durables is still much more volatile than the non-durables consumption.

Because the urban population is increasing over time (see figure 7), we show in figure 8 the estimated urban and rural consumption of durables in per capita level with current price.

**Appendix B: Adjustment to Investment**

We have reconstructed a new investment series with taking into account consumer durables. Figure 9 shows real investment per capita in 2000 price. The solid line is the original investment series, and the dash line is adjusted series with consumer durables.

Table 6 presents the volatilities of output, consumption and investment. We show that the official consumption series is more volatile than the output, but the adjusted consumption $CNDS$, which is consistent with the RBC literature, is not. We also find that the investment is more volatile than the output, as found in the US and other countries, and the volatility of the adjusted investment is slightly higher than the original (the first row of table 6). In addition, we can observe that the adjusted investment is more
Figure 7: Urban population ratio

Figure 8: Urban and Rural consumption per capita of durables (current price)
Figure 9: Real investment per capita (2000 price)

Table 6: Fluctuations along the trend (1981–2006)

<table>
<thead>
<tr>
<th></th>
<th>Y</th>
<th>CONS</th>
<th>CNDS</th>
<th>INV</th>
<th>adjINV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard deviation</td>
<td>0.0182</td>
<td>0.0197</td>
<td>0.0143</td>
<td>0.0345</td>
<td>0.0378</td>
</tr>
<tr>
<td>Relative Volatility</td>
<td>1.0000</td>
<td>1.0824</td>
<td>0.7857</td>
<td>1.8956</td>
<td>2.0796</td>
</tr>
<tr>
<td>Correlation with $Y_t$</td>
<td>1.0000</td>
<td>0.6882</td>
<td>0.6078</td>
<td>0.7137</td>
<td>0.8854</td>
</tr>
</tbody>
</table>

correlated with output $Y$ and adjusted consumption $CNDS$ is less correlated with $Y$. The difference between the unadjusted investment $INV$ and consumption $CONS$ is not that large (the third row of table 6).