

## INFLATIONARY PRESSURE IN CHINA'S CONSUMPTION GOODS MARKET: ESTIMATION AND ANALYSIS

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### I. INTRODUCTION

**I**N a market economy, the rate of change of the consumer price index, the CPI-based rate of inflation, indicates the magnitude of inflationary pressure in the consumption goods market. The two critical assumptions in this relationship are that the consumption goods market is in equilibrium and that the CPI is unbiased in representing transaction prices. Because these two conditions often have not been satisfied in centrally planned economies, the official CPIs are imperfect indicators of inflationary pressure in these economies. China's official CPIs in the last few decades are not exceptions. Despite the successive liberalization of prices under economic reforms since the late 1970s, extensive price controls and rationing were among the main features of China's consumption goods market until recently, and this price rigidity brought about repressed inflation. The oft-reported violations of price regulations, moreover, cast doubt on the unbiasedness of the official CPIs in representing transaction prices.

The objective of this paper is to develop a repressed inflation-adjusted measure of inflationary pressure in China's consumption goods market and examine the patterns of inflation in the past thirty-five-plus years with this measure. To this end, the biases of China's CPIs are investigated and the disequilibrium relationships in the consumption goods and currency markets are analyzed. In this paper, the focus placed on inflationary pressure in the consumption goods market is due to the fact that the behavior of the main agents, households, can be approximated by standard constrained maximization. This characteristic allows us to define and estimate the demand function for consumption goods, the size of excess demand, and the theoretical market-clearing price level with which an alternative measure of inflationary pressure is computed. This straightforward approach cannot be employed for the producers' goods market when the softness of budget constraints for China's state sector producers is considered.<sup>1</sup> This study deals with the 1954-92 period.

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<sup>1</sup> According to Kornai, state ownership and generous provision of subsidies weaken the financial accountability of enterprises in centrally planned economies [10]. Given soft budget constraints, the demand function is not well-defined for the producers' goods market. Kornai's characterization still applies to the behavior of China's state enterprises [11, pp. 296-97]. Wong and Naughton discuss the behavioral patterns of China's enterprises with Kornai's framework [23, pp. 369-77] [14, pp. 155-56].

In the following sections, I discuss the sources of potential downward biases in China's CPIs and examine whether the official index is consistent with the disaggregated retail sales data (Sections II and III). Then the behavior of China's households in the presence of market disequilibrium is analyzed with a model in order to develop an estimation procedure for the magnitude of repressed inflation and a theoretical market-clearing price index (Sections IV and V). Estimated measures of inflationary pressure are introduced, and the patterns of China's inflation in the 1954–92 period are reviewed with these measures (Sections VI and VII). The major findings are summarized in the concluding section (VIII).

## II. OFFICIAL CPIs AND THEIR BIASES

The two most-cited official price indices for consumption goods in China are the cost of living index for staff and workers and the general retail price index. These two indices are compiled by the State Statistical Bureau. Both of them are Paasche price indices comprising the prices of state-controlled retail outlets and free markets.<sup>2</sup> While the prices in the former category were generally heavily regulated until recently, direct official controls have been minimal for the latter category. The cost of living index for staff and workers represents the retail prices of consumption goods and services in urban areas only, and its weights reflect the pattern of the urban population's consumption expenditure. The general retail price index, despite its omission of services, covers consumption goods sold in rural as well as urban areas. It also includes the retail sales of agricultural producers' goods, and its weights are based on retail sales value.

The general retail price index has various subclassifications; one of these, the consumption goods price index, comprises the retail prices of consumption goods after excluding agricultural producers' goods from the general retail price index. In this paper, this consumption goods price index was selected as the representative index for China's official CPIs. The exclusion of consumer services from the index does not affect the outcome substantially, because of the relatively

<sup>2</sup> The general retail price index is defined in Ma [13, pp. 495–96]. The computational formula for the index is:

$$\text{General retail price index} = \frac{\text{Total retail sales for state commerce and free markets during the reporting period}}{\text{Total retail sales for state commerce and free markets during the reporting period, evaluated at the prices in the base period}} \times 100.$$

Free markets are informal marketplaces in urban and rural areas where peasants, small manufacturers, and others can sell their products directly to consumers. Major sales items include grain, edible oil, pork, chicken, eggs, vegetables, fruits, draft animals, and handicrafts. For items placed under formal rationing, such as grain and edible oil, peasants have been allowed to sell surpluses at higher than official prices after fulfilling their delivery contracts to the state. A large part of the goods traded in free markets are not subject to price controls [13, pp. 298–300]. The free markets' share in retail sales was 27.8 per cent in 1991 [21, 1992 edition, pp. 605, 619].

small size of their sales value. The consumer services share of household consumption expenditure was 10.7 per cent in 1993.<sup>3</sup>

This figure may rise soon, however, because of the fast growth of service expenditures in recent years, which reflects rises in prices of, and increasing demand for, services. Main service expenditure items in China are housing, education, water and electricity, and transportation.<sup>4</sup> Housing expenditures in rural areas have been increasing in the past decade as housing stock, which was largely privately owned, expanded and its quality improved. Public housing has been the most important item rationed for the urban population. Since around 1990, local governments and work units in urban areas that manage public housing have begun to adjust apartment rents upward by wide margins from heavily subsidized levels.<sup>5</sup> The prices of water, electricity, and transportation have been rising or are expected to rise fast as the government reconsiders public utilities' long-standing low-price policies. Despite higher prices, rapidly increasing household incomes in the post-1979 period have generated sizable new demand for services. Consequently, the proportion of services in household expenditures is bound to rise, and this will restrict the use of the consumption goods price index as the price index for China's households.

Potential downward biases in China's official CPIs come from two major sources: covert price hikes and repressed inflation. Each of these are reviewed.

#### A. *Covert Price Hikes*

Unbiasedness in representing transaction prices is the basic requirement for CPIs in centrally planned economies because indices failing to represent even the general trends of transaction prices offer little information about inflationary pressure. In this respect, the incidence of covert price hikes for goods to which regulated prices apply should be considered seriously. Official Chinese sources have reported the prevalence of violations of price regulations during the Cultural Revolution (1966–76) and in the 1980s.<sup>6</sup> These illegal practices consist of unauthorized hikes in goods prices, illegal surcharges and premiums applied to the goods, and disguised price hikes by the introduction of new high-priced products not significantly different from those they replace. Unauthorized price hikes, either in goods prices or through surcharges and premiums, are by nature unlikely to be detected by the government statistical experts. Disguised price hikes may be treated, for the purpose of price index accounting, as the introduction of new

<sup>3</sup> [21, 1993 edition, pp. 602, 611]. The consumer services share has been rising, however. The share was 6.1 per cent in 1985 and 8.0 per cent in 1990. The 1985 figure was cited from [21, 1987 edition, pp. 481, 483].

<sup>4</sup> *Zhongguo tongji nianjian* lists the expenditures of representative urban and rural households in recent years for these items [21]. The 1992 edition lists the tables on pages 284 and 310.

<sup>5</sup> Kojima [9] offers a detailed discussion of recent developments in urban housing.

<sup>6</sup> For the Cultural Revolution period, see [25, 1981 edition, p. IV-165]. Each edition of *Zhongguo jingji nianjian* since 1981 gives an annual review of the price situation in the previous year [25]. The prevalence of violations of price regulations was reported in 1980, 1981, 1984, 1986, 1988, 1989, and 1990 in the annual reviews.

products at high prices, rather than outright price hikes in existing products. If these covert price hikes had been indeed widely practiced, the official index could have underestimated the magnitude of the rise in transaction prices.

### B. *Repressed Inflation*

The CPI fails to account for repressed inflation when the prices recorded are lower than implicit market-clearing levels. In this case, consumers are subject to informal rationing of consumption goods because of shortages in the market. If the official CPI accurately records the weighted mean of transaction prices and the weighted mean index of implicit market-clearing prices can be obtained, the positive percentage difference between the two indices stands for the magnitude of repressed inflation. This percentage indicates the rate of price increase required to wipe out excess demand in the market.

The presence of repressed inflation in China was demonstrated until recently by extensive price controls and institutionalized rationing on the one hand and the persistence of shortages in major consumption goods on the other. Note that the cumulative effect of price decontrol under economic reforms seems to have dispelled chronic shortages by the end of the 1980s. Except during this most recent period, the transaction prices of a wide range of goods in China appeared to have deviated persistently downward from market-clearing levels. The behavior of planners seems to have perpetuated repressed inflation. Planners altered state-fixed prices (also referred to as state-mandatory prices) infrequently, even if the underlying market conditions varied continuously. Price hikes were routinely delayed until the detrimental effects of shortages became conspicuous. Planners were reluctant to impose hikes in state-fixed prices for two reasons. First, policy priority of providing necessities to the population at low prices and maintaining general stability in transaction prices was high. Second, price changes involved administrative work to implement, and they tended to complicate the management of economic plans.

Price control of consumption goods began around 1953 and its coverage of goods widened rapidly until around 1956, as retail establishments were nationalized or collectivized [15, pp. 178–96]. The prices of virtually all merchandise marketed through state-controlled retail outlets were placed under government regulation by the end of 1956. Free markets where regulations on prices were moderate did not command a substantial share in retail sales before the initiation of economic reforms in 1979.<sup>7</sup> Although the mode and degree of price control on some goods and the number of goods rationed changed periodically, the government maintained strict control on retail prices in the pre-economic reform period. Reportedly, goods sold at state-fixed prices accounted for 97 per cent of retail sales and those sold at market-determined prices for only the remaining 3 per cent in 1978 [12].

The formal rationing of selected consumption goods, a small number of necessities and consumer durables, was introduced in 1953. Ration coupons were

<sup>7</sup> The free markets' share in retail sales in 1978 was 8.0 per cent [221, 1984 edition, pp. 345, 363].

issued to households or to workers through work units depending on the kinds of goods, and rationed goods were sold at state-fixed prices in exchange for coupons at commercial outlets. Because formal rationing in China has been used to impose transaction prices below market-clearing levels, such a scheme can be regarded as a form of price control. There were some variations in numbers and kinds of goods rationed across regions and periods. Grain and edible oil have always been rationed nationally since late 1953 until late 1992 [5, pp. 51–52]. At the height of inflation after the discontinuation of the Great Leap Forward policy, the number of rationed goods reached high levels. In the first half of 1962, 102 goods were rationed and 20 kinds of ration coupons were used in Beijing [5, p. 115].

Although the period since the initiation of economic reforms has been characterized by a substantial relaxation of direct controls on economic activities, price decontrol followed a slow track. As recently as 1986 the ratio of goods sold at state-fixed prices was confirmed to have dropped to less than 50 per cent [25, 1987 edition, p. V-39]. This ratio further declined to 29.7 per cent in 1990 [12] and to 5 per cent in 1993 [17, November 30, 1993]. Floating prices, in which retailers can set the prices within predetermined ranges around the benchmarks stipulated by the state, were introduced in 1979 to bring some flexibility in regulated prices [25, 1981 edition, p. IV-165]. Some other new measures, such as replacing fixed prices with price ceilings or letting retailers apply to the commercial authorities for approval of price changes, were introduced later [8, pp. 503–4]. The prices regulated under these new methods were referred to as state-guided prices. The number of consumption goods to which state-guided prices applied increased gradually thereafter, and they accounted for 17.2 per cent of retail sales in 1990 while market-determined prices accounted for 53.1 per cent of retail sales that year [12].

The number of rationed goods decreased gradually<sup>8</sup> and the parallel markets where the same goods were available at higher market-determined prices without coupons expanded after the initiation of economic reforms. These developments substantially softened the impact of formal rationing upon the overall level of transaction prices through the 1980s. From late 1992 and the first half of 1993, the rationing of grain and edible oil was abolished in almost all the regions.<sup>9</sup> The government, facing high inflationary pressure, halted temporarily new price decontrol measures in the fall of 1988 [22, p. 135]. As the prices stabilized, price decontrol resumed. There were two sharp hikes in state-fixed grain prices in 1991 and 1992 prior to the abolition of grain rationing.<sup>10</sup>

Shortages of consumption goods in the past thirty-five-plus years were commonly observed in subsidiary foods such as vegetables, fruits, meat, and fish, and consumer durables, typically in the form of scarce stocks and queues at retail

<sup>8</sup> For example, cotton cloth rationing was abolished at the end of 1983 [5, p. 131]. Pork rationing was implemented only when significant shortages were anticipated in the 1980s. For an example of such occasion, see *Wall Street Journal*, December 2, 1987.

<sup>9</sup> [17, December 10, 1992] [17, July 8, 1993] [17, November 30, 1993].

<sup>10</sup> *Nihon keizai shimbun*, May 2, 1991 and March 19, 1992.

outlets.<sup>11</sup> These shortages varied in severity across periods. Conspicuous and extensive shortages in consumption goods were acknowledged in official Chinese records in 1956, 1959–62, 1968, 1974, and 1976 during the pre-reform period, and in 1984 and 1988 since 1979.<sup>12</sup>

As prices were gradually decontrolled, the extent of shortages seems to have declined through the 1980s. To contain the outbreak of price inflation which accompanied a brief spell of acute shortages in 1988, a strict contractionary macroeconomic policy was adopted in the fall of 1988. As the economy went through a recession in the 1989–90 period, inflationary pressure receded. Pervasive shortages, a lasting feature of China's consumption goods market, appear to have abated dramatically by 1990 because of the weakened demand in the market where the prices of most of the goods had already become market-determined. Moreover, on the supply side in 1990, China had a good harvest.<sup>13</sup> Note that food still accounts for the majority of consumption goods sales in China.<sup>14</sup> According to an official account, at the macroeconomic level, aggregate supply and demand were basically in equilibrium in 1990 [25, 1991 edition, p. II-1]. Also the retail market that year was reportedly characterized by an ample supply of merchandise, a conspicuous fall in price hike rates, and an increase in merchandise stock held by the state commercial sector [25, 1991 edition, pp. II-44–45]. Judging from these accounts, we may legitimately conclude that China's consumption goods market, by and large, regained equilibrium in 1990, thus putting an end to the period of continuous repressed inflation which began in the latter half of the 1950s.

### III. CONSISTENCY TEST ON THE CPI

Official Chinese data on retail sales value and quantity are available for major consumption goods for the 1952–90 period. These data allow us to compute the unit prices of various goods with which a parallel CPI series can be constructed. This new series provides a measure for assessing the extent of bias in the official CPI (the consumption goods price index: see  $p$  in the Appendix for the sources) due to covert price hikes.

As long as the retailers who engage in surreptitious price hikes do not simultaneously falsify either sales value or quantity reported so as to maintain consistency among sales prices, quantities, and values, these price hikes will appear as rises in unit prices. Disguised price hikes, which, by definition, do not significantly

<sup>11</sup> A correspondent in Beijing vividly describes shortages in consumption goods in Beijing in the early 1980s [4, pp. 192–204].

<sup>12</sup> Shortages were acknowledged typically via the phrase, "market supply was constrained" [1]. Reported years: 1956 (p. 177), 1959 (p. 251), 1960 (p. 292), 1961 (p. 322), 1962 (p. 356), 1968 (p. 449), 1974 (p. 532), and 1976 (p. 561). Shortages in 1984 and 1988 were reported in [25, 1985 edition, p. IV-3] and [17, January 21, 1989] respectively.

<sup>13</sup> In 1990, agricultural output grew by 7.6 per cent, and grain output by 9.5 per cent, over the previous year [21, 1991 edition, pp. 318, 346].

<sup>14</sup> The food share of consumption goods sales in 1990 was 55.4 per cent [21, 1991 edition, p. 599].

change the attributes of products, also result in rises in unit prices because the commodity categories of retail sales data available are quite comprehensive. Therefore, the official index is considered to be biased if significant discrepancies appear between the computed unit price-based index and the official index (which is based on reported prices).

The test procedure begins by setting up a representative commodity basket of  $k$  goods for which sales value and quantity data are available. Let  $l$  stand for the number of commodities included in the official index ( $0 < k < l$ ). The nominal sales value index ( $SVI_k$ ) and Laspeyres sales quantity index ( $SQI_k$ ) are constructed with  $k$  goods data. Subscripts  $k$  and  $l$  are used to indicate the dissimilar numbers of commodities on which indices are based. By taking the ratio of  $SVI_k$  and  $SQI_k$ , a time series of the unit price-based Paasche CPI ( $CPI_k$ ) is obtained.<sup>15</sup>

Twenty-one goods which meet the following two criteria have been selected for the representative commodity basket ( $k = 21$ , see the note in Table I for the complete list of these goods and Appendix for the sources): (i) the sales values in 1990 are relatively large within each of the five commodity groups of the Chinese classification for consumption goods (food, clothing, articles used daily, articles for cultural life and recreation, and fuels) and (ii) the sales values in 1952 are nonzero. The values of  $CPI_l$  and  $CPI_k$  for the 1952–90 period are listed in Table I along with the percentage difference between the two indices (DEV).

Although  $CPI_l$  has been lower than  $CPI_k$  for thirty-three years in the thirty-eight-year period (this excludes the base year, 1952), the percentage differences in these two indices are not particularly large. The percentage difference in the final year (1990) is –14.4 per cent: a modest size when the length of the period is considered. Relatively large negative differences were observed during the Cultural Revolution (1966–76) and the 1987–90 period. This is consistent with some of the official Chinese accounts on the incidence of covert price hikes.<sup>16</sup>

The widening of the negative gap since the middle of the 1980s may overstate the extent of bias attributable to covert price hikes in this period. Food and light industrial goods which use agricultural products for raw materials are more heavily represented in the twenty-one goods unit price-based index than in the official

<sup>15</sup> This relationship can be demonstrated:

$$SVI_k/SQI_k = \frac{\sum_{i=1}^k p_{it}q_{it}}{\sum_{i=1}^k p_{i0}q_{it}} = CPI_k/100,$$

where

$$SVI_k = \left( \frac{\sum_{i=1}^k p_{it}q_{it}}{\sum_{i=1}^k p_{i0}q_{i0}} \right) \cdot 100,$$

$$SQI_k = \left( \frac{\sum_{i=1}^k p_{i0}q_{it}}{\sum_{i=1}^k p_{i0}q_{i0}} \right) \cdot 100,$$

$p_i$  = retail price of good  $i$ ,

$q_i$  = retail sales quantity of good  $i$ ,

0 = base year, and

$t$  = current year.

<sup>16</sup> See footnote 6 for sources.

TABLE I  
OFFICIAL CPI AND THE UNIT PRICE-BASED INDEX

Year	CPI <sub>i</sub>	CPI <sub>e</sub>	DEV (%) <sup>a</sup>
1952	100.0	100.0	0.0
1953	102.2	102.3	-0.1
1954	104.6	105.2	-0.5
1955	107.0	107.3	-0.3
1956	107.5	107.2	0.3
1957	108.6	109.7	-1.0
1958	108.8	111.1	-2.0
1959	109.8	110.9	-1.0
1960	114.0	110.2	3.4
1961	133.7	119.9	11.5
1962	137.3	133.8	2.6
1963	128.5	136.9	-6.1
1964	124.4	132.5	-6.1
1965	122.0	130.9	-6.8
1966	122.9	131.3	-6.4
1967	122.0	132.9	-8.2
1968	122.8	133.7	-8.1
1969	121.8	132.4	-8.0
1970	121.6	132.2	-8.0
1971	123.3	131.7	-6.4
1972	123.0	133.1	-7.6
1973	125.1	137.2	-8.8
1974	125.2	138.5	-9.6
1975	126.2	138.1	-8.6
1976	126.6	139.2	-9.1
1977	130.5	138.7	-5.9
1978	132.4	140.1	-5.5
1979	135.2	143.4	-5.7
1980	144.7	144.5	0.1
1981	158.5	150.0	-1.0
1982	151.4	151.7	-0.2
1983	153.2	155.5	-1.5
1984	155.8	158.9	-2.0
1985	170.4	180.3	-5.5
1986	181.5	192.6	-5.7
1987	194.9	215.0	-9.3
1988	231.9	260.1	-10.8
1989	272.5	311.2	-12.4
1990	276.8	323.2	-14.4

Source: See the Appendix.

Note: The unit price-based index consists of the following twenty-one goods (the figures in parentheses indicate 1990 sales in billion yuan): grain (48.4), pork (64.3), sugar (14.1), cigarettes (68.9), liquors (53.7), cotton cloth (24.5), woolen fabrics (10.8), silk and satin (7.7), underwear (6.7), knitting wool (5.1), leather shoes (10.9), rubber shoes (7.3), cloth shoes (4.0), soap (2.9), thermos bottles (1.7), ordinary bulbs (1.4), batteries (2.2), wrist watches (2.8), bicycles (7.2), radio sets (0.5), and coal (13.8).

<sup>a</sup> The percentage deviation of CPI<sub>i</sub> from CPI<sub>e</sub>.



index.<sup>17</sup> The prices of those goods rose rapidly, reflecting the government's policy of adjusting producers' and retail prices of agricultural products upward in this period. The difference in the speed of productivity increase between the agricultural and industrial sectors also affected the relative price in favor of the former. The difference in commodity weights should have brought about a faster growth in the unit price-based index than in the official index in the latter half of the 1980s. On the whole, the discrepancies between the two indices do not appear to be large enough to discredit the official index. I therefore use the consumption goods price index as the measure of the general level of transaction prices. This leaves the other source of bias, repressed inflation, to be considered.

#### IV. ANALYTICAL FRAMEWORK OF REPRESSED INFLATION

The standard estimation method of the magnitude of repressed inflation in China's consumption goods market utilizes the relationship between currency stock and nominal retail sales. Given the presence of repressed inflation, excess demand in the retail goods market is backed by excess supply in the currency market. The two markets being in continuous disequilibrium, nominal retail sales represent the supply of, and the realized demand for, consumption goods, and the currency stock indicates its supply. Hsiao, Chen, and Hou estimated the magnitude of repressed inflation by taking the difference in the growth rates of nominal retail sales and currency stock for 1953–57 (Hsiao [7, pp.230–32]) and 1979–83 (Chen and Hou [2, pp.822–23]). These authors assumed that currency demand, which could not be detected because of the market disequilibrium, grew in proportion to nominal retail sales. This assumption allowed them to attribute observed fluctuations in the velocity of circulation (nominal retail sales divided by currency stock) to changes in currency supply. Then, a faster growth in currency supply than in retail sales was interpreted as the indication of rising shortage of commodities in the market.

Because the observed changes in the velocity of circulation do not by themselves reveal whether they resulted from movements in currency demand or supply, the relationship between excess currency supply and repressed inflation cannot be tested. The above inference is plausible, nevertheless, for two reasons: (i) the observed amplitude of short-term fluctuations in velocity appears to have been too large to be attributed to changes in currency demand and (ii) a deceleration in velocity usually coincided with the appearance of significant shortages in consumption goods in the past.<sup>18</sup> It can be argued, furthermore, that currency demand

<sup>17</sup> For example, the food sales value share of the twenty-one goods in 1990 was 69.5 per cent as against a share of 55.4 per cent in all consumption goods.

<sup>18</sup> While Hsiao and Chen-Hou examine the velocity of circulation with respect to nominal retail sales, I adopt the income-currency ratio as the velocity measure. The observed income velocity is found in Table II ( $y/M$ ). Velocity exhibits wide short-term fluctuations and takes relatively low values in years when serious shortages were reported (1956, 1959–62, 1968, 1974, and 1976) in the pre-economic reform period. Velocity since 1979, however, may not be comparable with the preceding period. The increase in currency demand due to the change in household currency-holding behavior after the initiation of

in China has been relatively stable, particularly in the pre-reform period. This stability was the result of the continuity of monetary institutions in China: a set of strict institutional arrangements governing financial settlements and the use of currency since the early 1950s, and underdeveloped financial markets.<sup>19</sup>

Feltenstein and Ha offer a variant of Hsiao's and Chen-Hou's approach in their studies of repressed inflation in the 1979–88 period [3]. The difference between the growth rates of broad money balances (household currency and savings deposits balances) and nominal retail sales approximately indicates the magnitude of repressed inflation in the study.

The Hsiao and Chen-Hou approach with its assumption of stable currency demand is used here as well, but a new estimation method for repressed inflation is proposed. The currency and retail goods markets are implicit in the Hsiao and Chen-Hou approach, and the study by Feltenstein and Ha restricts its analysis to the money market. In this study, the currency and consumption goods markets are analyzed explicitly with a six-equation model of the households, and the household currency demand and consumption goods demand functions are estimated. The excess currency supply in the model can be ascribed to the consumption goods market disequilibrium stemming from high household nominal incomes and rigid prices. The new method is based on an examination of the budget allocation of households in the markets with disequilibrium.

China's monetary and payments system provides a direct link between the currency and consumption goods markets. Cash transactions are largely limited to those involving households, because settlements among the state and cooperative sectors are normally carried out via transfers between deposit accounts. For households, however, cash is by far the dominant means of payment due to the underdevelopment of consumer financial services. About 80 per cent of currency in circulation in China is held by households.<sup>20</sup>

Currency receipts for households are channeled primarily through wages and the proceeds from the sale of agricultural and sideline products; currency payments by households are for retail merchandise, with consumption goods predominating. In addition, withdrawals from and acquisitions of savings deposits offered by the state-run banking system generate other significant channels for receipts and payments of currency. Under these circumstances, growth in household cash incomes without compensating growth in the market supply of consumption goods generates repressed inflation, which is reflected in the passive increase in household currency balances.

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economic reforms appears to have brought about a continuous fall in velocity in this period.

<sup>19</sup> The same reasoning was originally presented by Hsiao. In her words: "the currency flow, and thus the velocity also, was regulated by the state sector. This regulation was possible because wages and agricultural payments from state organs plus socialistic retail sales were the main determinants of the currency circulation. Besides, there was no speculative demand for money in this economy. The holding of money was solely for transactional and precautionary motives that, under normal circumstances, were relatively stable" [7, p. 231].

<sup>20</sup> The share of currency in circulation held by households was 78.6 per cent at the end of 1992 [21, 1993 edition, pp. 602, 664].

Let us examine the budget allocation of China's households with a simple framework. To begin with, the economy is divided into two sectors: the business sector and households. The business sector is largely state-owned or state-controlled, and it includes the banking system. Households receive incomes in cash from the business sector and then use incomes either to purchase consumption goods or to save by increasing currency or savings deposits balances. There are two financial assets (currency and savings deposits) and one good (consumption goods) in this framework. The budget allocation of households involves these three markets, where households are the sole demander and the business sector is the sole supplier.

The three markets must be either simultaneously in equilibrium or, at least, two markets must be in disequilibrium. Repressed inflation, the predominant pattern in this scheme, implies that excess demand persists in the consumption goods market, and the corresponding excess supply, the spillover from the consumption goods market, is present in the other two markets.

The predominant spillover must fall into the currency market, because currency is the closest substitute for currently available consumption goods on account of its high liquidity. The liquidity of savings deposits is low, with more than 80 per cent of them being time deposits.<sup>21</sup> The low liquidity also implies a low adjustment speed of savings deposits balances relative to that of currency balances. Excess balances in savings deposits, therefore, are likely to exert much less demand pressure on the consumption goods market than do excess currency balances of the same size. Provided that these savings deposits are inactive, their inflationary impact can be discounted.<sup>22</sup> Based on this reasoning and because of the technical difficulty in determining excess supply of savings deposits, I assume that the savings deposits market is always in equilibrium.<sup>23</sup> This assumption implies that savings deposits are supplied to satisfy household demand fully at given interest rates, and the banking system does not restrict withdrawals by households against their will. Under this treatment, the size of excess consumption goods demand matches that of excess currency supply. The real value of these two stock variables can be expressed in constant prices.

Repressed inflation must have been by far the most common pattern of market disequilibrium in China because other patterns were improbable. To illustrate this, let us examine the currency market. In China, currency has been supplied to

<sup>21</sup> Time deposits accounted for 80.6 per cent of savings deposits at the end of 1992 [21, 1993 edition, p. 285]. For many years, the shortest time deposit was for six months until a three-month one was introduced on June 1, 1989 [17, May 25, 1989].

<sup>22</sup> China's planners appear to follow this reasoning. For example, the Chinese monetary authorities regard the promotion of savings deposits during the inflationary periods as an effective means of lowering the demand pressure in the retail market. By organizing campaigns to raise savings deposits, "the realization of part of social purchasing power is deferred" [6, p. 30].

<sup>23</sup> Because the objective of this study is to assess the magnitude of inflationary pressure in the consumption goods market, omitting the potential excess supply of savings deposits is unlikely to introduce a sizable bias into the estimation results. The pressure measure developed is different from the would-be rate of inflation in the absence of disequilibria in all major markets.

households without restrictions, and households have not been forced to purchase more consumption goods than they demanded. It follows that the currency market must have been either in equilibrium or in excess supply. An excess supply of currency, moreover, must have been a manifestation of excess demand in the consumption goods market. If goods had been readily available, households could have disposed of excess balances simply by purchasing additional merchandise.

Observation of the consumption goods market leads to a similar conclusion. The supply of consumption goods has been a major bottleneck in the Chinese economy. The government's control over consumption goods demand, furthermore, has often been weakened by its proclivity to maintain low transaction prices and high employment. Under these circumstances, excess supply of consumption goods, which would be indicated by the appearance of merchandise inventory in the state commercial sector significantly higher than the normal level, can be taken as exceptional. Leaving aside this rare occasion, the consumption goods market must have been either in equilibrium or in excess demand. In the latter case, households have ended up holding larger-than-desired currency balances, because supply deficiencies have prevented them from fully realizing their demand for consumption goods.

## V. MODEL OF HOUSEHOLDS

The above analysis of market disequilibrium suggests that we can assess the approximate size of the stock of excess consumption goods demand in China by estimating household excess currency balances. These excess balances are always nonnegative and are part of the observed household currency stock. The size of excess currency balances at a given point, relative to nominal sales of consumption goods to households in the relevant time period, indicates the magnitude of repressed inflation.

Based on this reasoning, the theoretical market-clearing price index (referred to as the market-clearing price) will be computed, using the estimated household consumption goods demand function and estimates of excess currency balances. The repressed inflation-adjusted measure of inflationary pressure (adjusted rate of inflation) is the annual growth rate of this index; the new measure approximates the sum of open inflation and the increment of repressed inflation. A six-equation model of China's households is presented for analytical clarity. The time unit for the model is a calendar year.

### A. Notation

Numerical subscript  $-1$  indicates the previous year, and  $\Delta$  denotes the annual increment. Endogenous and exogenous variables are, respectively, represented by uppercase and lowercase letters.

Stock variables (outstanding balance at year-end):

$D$  = nominal household currency demand (desired household currency balances),  
 $F$  = nominal savings deposits balances,

$M$  = nominal currency supply (observed household currency balances), and  
 $U$  = household excess currency balances (stock of excess consumption goods demand) in 1952 prices.

Flow variables (annual aggregate):

$C$  = notional demand for consumption goods in 1952 prices,  
 $q$  = supply of consumption goods (realized consumption goods demand) in 1952 prices, and  
 $y$  = nominal household disposable income.

Prices:

$p$  = transaction price of consumption goods (1952 level = 1) and  
 $P^*$  = market-clearing price of consumption goods (directly comparable to  $p$ ).

Others:

$t$  = time trend (1979 = 1, 1980 = 2, . . . , and 1990 = 12; zero in other years).

#### B. *The Model*

$$M/p = D/p + U, \quad U \geq 0, \quad (1)$$

$$D/p = \alpha_1(y/p) + \alpha_2 t(y/p), \quad \alpha_1, \alpha_2 > 0. \quad (2)$$

Equations (1) and (2) describe the currency market. Household real balances (equation 1) consist of currency actually demanded ( $D/p$ ) and excess balances ( $U$ ). The household currency demand function (equation 2) is a modified Cambridge cash balance equation. A time trend ( $t$ ) accounts for the continuous increase of the currency demand-income ratio ( $D/y$ ) because of the change in household currency-holding behavior after the initiation of economic reforms in 1979.

$$U = \gamma(C - q), \quad \gamma = 1. \quad (3)$$

When notional demand for consumption goods ( $C$ ) is not fully realized due to the shortfall of supply ( $q$ ), excess demand remains. The unrealized consumption goods demand during the current year turns into excess currency balances at the end of the year; these balances also represent the stock of excess consumption goods demand. Gamma is unity because of the calendar year-based time unit.

$$C = \beta_1(y/p) + \beta_2 q_{-1} + \beta_3(p_{-1}/p)U_{-1} + \beta_4 t(y/p), \quad (4)$$

$$\beta_1, \beta_2 > 0, \beta_3 = 1, \text{ and } \beta_4 < 0.$$

The household consumption goods demand function is based on standard consumption functions where current-year real income ( $y/p$ ) and the previous year's realized consumption goods demand ( $q_{-1}$ ) are among the independent variables. How both excess currency balances carried from the previous year ( $U_{-1}$ ) and the change in currency-holding behavior in the post-1979 years ( $t$ ) affect current-year consumption goods demand is also considered. Households dispose of excess currency balances to adjust their currency stock by spending. It is assumed that, during the current year, households attempt to spend their entire excess currency

balances they held at the end of the previous year. The coefficient  $\beta_3$  is unity because the time period of the model is a calendar year.<sup>24</sup> The fourth term accounts for the effect of the increase in currency demand since 1979 on consumption. The coefficient  $\beta_4$  is negative because the accumulation of real balances is achieved mainly by the reduction in the purchase of consumption goods.

$$\frac{y}{p} = q + \frac{\Delta M}{p} + \frac{\Delta F}{p}, \tag{5}$$

$$p^* = \frac{\beta_1 y + \beta_3 p_{-1} U_{-1} + \beta_4 t y}{q - \beta_2 q_{-1}}. \tag{6}$$

Equation (5) is the budget constraint for households. The demand function for savings deposits is omitted in this model because the level of savings deposits can be obtained from equation (5). Equation (6) defines the market-clearing price of consumption goods. This can be obtained by replacing the dependent variable ( $C$ ) in equation (4) by  $q$  and then solving the new equation for the price.

Six endogenous variables ( $C, D, F, M, P^*$ , and  $U$ ) are then determined by this fully recursive system.<sup>25</sup> The behavioral equations, (2) and (4), can be estimated independently.

### VI. ESTIMATION

The procedure begins with the estimation of the household currency demand function (equation 2). I have developed an indirect method for estimating equation (2) without the data for nominal household currency demand ( $D$ ), because the currency market disequilibrium does not allow one to observe these data. The

<sup>24</sup> The coefficient  $\beta_3$  represents the adjustment coefficient of currency balances. It becomes unity when the adjustment is completed in a year or less, and falls below unity when it takes more than a year. Because households normally adjust currency balances rapidly, the case where  $\beta_3$  is less than unity need not be considered.

<sup>25</sup> The table below shows the structure of the model.

Equation Number	Variables															
	Endogenous						Lagged Endogenous			Exogenous						
	$D$	$C$	$P^*$	$U$	$M$	$F$	$U_{-1}$	$M_{-1}$	$F_{-1}$	$y$	$p$	$q$	$t$	$p_{-1}$		$q_{-1}$
(2)	X	—	—	—	—	—	—	—	—	O	O	—	O	—	—	
(4)	—	X	—	—	—	—	O	—	—	O	O	—	O	O	O	I
(6)	—	—	X	—	—	—	O	—	—	O	—	O	O	O	O	
(3)	—	O	—	X	—	—	—	—	—	—	—	O	—	—	—	II
(1)	O	—	—	O	X	—	—	—	—	—	O	—	—	—	—	III
(5)	—	—	—	—	O	X	—	O	O	O	O	O	—	—	—	IV

Note: X=endogenous variables that are associated with the equations. O=other endogenous variables that appear in the equations. Roman numerals in the far right column denote the order of iteration.

TABLE II  
HOUSEHOLD CURRENCY BALANCES AND INCOME

Year	$M/p^a$	$y/p^a$	$q^a$	$y/M$	$D/p^a$	$U^a$
1952	2.2	26.5	25.4	12.04	2.4	-0.2
1953	3.1	31.9	30.6	10.34	2.9	0.2
1954	3.2	32.8	32.3	10.35	3.0	0.2
1955	3.0	32.7	32.4	10.91	2.9	0.1
1956	4.0	38.6	37.0	9.70	3.5	0.5
1957	3.7	39.7	39.1	10.72	3.5	0.2
1958	4.8	44.9	41.9	9.37	4.0	0.8
1959	5.0	49.4	47.9	9.87	4.4	0.6
1960	6.0	50.1	49.0	8.29	4.4	1.6
1961	7.4	41.6	40.2	5.64	3.7	3.7
1962	6.2	38.2	40.2	6.18	3.4	2.8
1963	5.4	41.7	42.6	7.74	3.7	1.7
1964	4.8	45.6	45.6	9.52	4.1	0.7
1965	5.6	49.5	48.0	8.83	4.4	1.2
1966	7.1	52.5	50.4	7.42	4.7	2.4
1967	8.0	54.9	53.8	6.83	4.9	3.1
1968	8.6	52.7	51.7	6.11	4.7	3.9
1969	8.9	55.5	55.4	6.20	4.9	4.0
1970	8.0	58.0	58.6	7.22	5.2	2.8
1971	8.5	61.7	60.2	7.22	5.5	3.0
1972	9.5	67.9	65.8	7.16	6.1	3.4
1973	10.3	71.5	69.3	6.97	6.4	3.9
1974	10.9	75.2	73.4	6.92	6.7	4.2
1975	11.1	79.4	78.0	7.13	7.1	4.0
1976	11.8	83.2	81.7	7.04	7.4	4.4
1977	11.0	86.5	85.2	7.87	7.7	3.3
1978	11.7	94.1	91.0	8.01	8.4	3.3
1979	14.5	111.9	103.7	7.71	11.3	3.2
1980	17.7	130.6	118.3	7.39	14.8	2.9
1981	20.8	140.8	128.8	6.75	17.5	3.3
1982	23.6	150.7	137.5	6.40	20.6	3.0
1983	28.9	170.5	150.7	5.89	25.2	3.7
1984	41.3	210.1	176.6	5.09	33.6	7.7
1985	47.3	245.3	211.8	5.19	42.1	5.2
1986	53.6	272.4	229.3	5.09	50.0	3.6
1987	59.6	302.9	250.3	5.08	59.1	0.5
1988	73.0	325.4	271.0	4.46	67.3	5.7
1989	67.9	308.2	253.1	4.54	67.4	0.5
1990	75.5	334.7	257.9	4.43	77.1	-1.6
1991	88.2	372.3	284.6	4.22	—	—
1992	113.3	431.6	320.9	3.81	—	—

Source: See the Appendix.

<sup>a</sup> Billion 1952 yuan.

data for nominal household currency demand are then generated from equation (2) with the estimated coefficients. With these generated data, excess currency balances ( $U$ ) are computed from equation (1). This series of excess balances is used to obtain the notional demand for consumption goods ( $C$ ) from equation (3). With these data, the household consumption goods demand function (equation 4)

is estimated, and the market-clearing price ( $P^*$ ) is computed through equation (6) with the estimated coefficients. The annual growth rate of this price is the adjusted rate of inflation. The sources of data used in this section are given in the Appendix, and some series of data used for estimation are listed in Table II.

#### A. Household Currency Demand Function

Among the three variables in the currency market identity (equation 1), only household currency balances at the year end,  $M/p$ , can be observed. Assuming that the household currency demand function (equation 2) is valid, this function is estimated indirectly for the 1952–90 period. The estimation procedure relies on one inference (i) and one assumption (ii):

- (i) The pattern of the currency market disequilibrium analyzed (Section IV) indicates that household currency balances are not smaller than currency demand. Because currency demand is likely to have been stable reflecting the continuity of the monetary institutions, it has been assumed in equation (2) that household currency demand is proportional to disposable income in the pre-reform period. For these reasons, the lowest household currency-income ratios ( $M/y$ ) observed during the 1952–78 period would serve as the estimates of  $\alpha_1$ .
- (ii) It is assumed that the covariance of household excess currency balances and household disposable income in 1952 prices,  $\text{Cov}[U, y/p]$ , does not change from the pre-reform period to the 1979–90 period.

Equation (7) is formulated using  $M/p$  instead of  $D/p$  for the dependent variable.

$$M/p = \delta_1(y/p) + \delta_2 t(y/p). \quad (7)$$

An OLS of equation (7) yields two estimates,  $\hat{\delta}_1$  and  $\hat{\delta}_2$ . Equation (7) is misspecified because  $M/p$  includes excess currency balances ( $U$ ) in addition to  $D/p$ . Coefficients  $\hat{\delta}_1$  and  $\hat{\delta}_2$  would most likely be biased estimates of  $\hat{\alpha}_1$  and  $\hat{\alpha}_2$ . Leaving the biases to be corrected later, equation (7) is estimated by OLS for the 1952–90 period.

$$M/p = 0.131(y/p) + 0.008t(y/p), \quad (7')$$

(37.040)            (19.919)

$$\bar{R}^2 = 0.996, \quad D.W. = 1.403, \quad \text{period} = 1952-90.$$

(Figures in parentheses are  $t$ -statistics.)

A time trend ( $t$ ) that begins in 1979 is included in equations (2) and (7). The household currency-income ratio ( $M/y$ ) has exhibited a rising trend since the initiation of economic reforms in 1979 (see the reciprocal of  $M/y$  in Table II). A continuous increase in either the currency demand-income ratio ( $D/y$ ) or the excess currency balances-income ratio ( $pU/y$ ), implying a heightening of repressed inflation, caused this rise in  $M/y$ . There was little indication of a general increase in shortages in the consumption goods market since 1979 from the level in the preceding period. Price decontrol implemented gradually in the post-1979 period



should have led part of the shortages into outright price hikes. By 1990, the market appeared to have regained equilibrium, ending the long period of repressed inflation. These developments suggest that the rise in currency supply was backed by the corresponding increase in demand.

Some of the measures introduced by the economic reform, indeed, seem to have raised the level of currency demand by changing household currency-holding behavior and to have monetized the economy further. Three notable developments have contributed to successive increases in household currency demand. The adoption of the contract responsibility system in agriculture created family farms that rely heavily on cash for transactions. The increase of the number of small cooperative and private business establishments has had a similar positive effect on currency demand. Finally, a significant part of the sales of state-owned commercial outlets has been diverted to free markets and private commercial outlets. This raised the demand for currency because the private commercial sector is generally not subject to the same strict regulations on currency use that state-controlled outlets must follow. Because the institutional changes were initiated on a limited scale and then expanded continuously, their effect on household currency-holding behavior should have been cumulative. This effect can be approximated by a time trend, in the absence of information on its actual pattern. The time trend  $t$  included in equations (2) and (7), therefore, captures the successive rises in  $D/y$  in the post-1979 period that have been caused by institutional changes in the model.

Note that the estimate of the magnitude of repressed inflation would be quite high if the above effect on household currency-holding behavior were to be omitted. Feltenstein and Ha ruled out the increase in demand for money owing to rapid monetization of the economy in the post-1979 period [3]. This led to a high estimated magnitude of repressed inflation obtained as the difference between the true and official price indices in their study: "by the end of 1988 the 'true' price index was 114 percent higher than the official index, based on the assumption that the two were equal at the beginning of 1979" [3, p. 292]. If one accepts the disappearance of repressed inflation by 1990, this estimate for 1988 appears to be too high because the rise in the official price index from 1988 to 1990 was much too small to close the gap between the two price indices.

The next step deals with estimating  $\hat{\alpha}_1$  from the samples of the observed  $\hat{\delta}_1$  based on the inference (i). Note that  $\hat{\alpha}_1$  will be biased if the analytical framework (Section IV) misrepresents the underlying state of the currency market. The observed  $\hat{\delta}_1$  (referred to as  $\bar{\delta}_1$ ) for each year is defined:

$$\bar{\delta}_1 = \frac{M/p - \hat{\delta}_2 t (y/p)}{y/p} \quad (8)$$

$$\hat{\alpha}_1 = \frac{D/p - \hat{\alpha}_2 t (y/p) - \hat{\varepsilon}}{y/p} \quad (9)$$

The symbol  $\hat{\varepsilon}$  in equation (9) represents the hypothetical residual when equation (2) is estimated by OLS. Deviations in  $\hat{\delta}_1$  from  $\hat{\alpha}_1$  are generated by the presence

of positive  $U$  in  $M/p$ , the bias in  $\hat{\delta}_2$  ( $=\hat{\delta}_2-\hat{\alpha}_2$ ), and the residual  $\hat{\epsilon}$ . However, when only the pre-reform period (1952–78) is considered, the bias in  $\hat{\delta}_2$  can be ignored because the value of  $t$  is zero in this period. In addition, if  $U$ 's value actually becomes zero in some years in the 1952–78 period, the remaining deviations can be attributed solely to the residuals. Due to the absence of  $U$ , the values of  $\bar{\delta}_1$  in these years must have been minimal, given that the residuals are relatively small. Considering the residuals, I select the three years in which the value of  $\bar{\delta}_1$  was the lowest, 1952, 1955, and 1957, and use the mean of  $\bar{\delta}_1$  in these years (0.89) for  $\hat{\alpha}_1$ .<sup>26</sup> This computational method assumes that excess currency balances were zero in the three years, and positive in all other years between 1952 and 1978.

To compute  $\hat{\alpha}_2$ , I express the biases of  $\hat{\delta}_1$  and  $\hat{\delta}_2$  in terms of the variances (Var) and covariances (Cov) in three variables,  $y/p$ ,  $U$ , and  $t(y/p)$ , in the 1952–90 period.<sup>27</sup>

$$\hat{\delta}_1 - \hat{\alpha}_1 = \kappa \{ \text{Var}[t(y/p)] \cdot \text{Cov}(U, y/p) - \text{Cov}[y/p, t(y/p)] \cdot \text{Cov}[U, t(y/p)] \}, \quad (10)$$

$$\hat{\delta}_2 - \hat{\alpha}_2 = \kappa \{ \text{Var}(y/p) \cdot \text{Cov}[U, t(y/p)] - \text{Cov}[y/p, t(y/p)] \cdot \text{Cov}(U, y/p) \}, \quad (11)$$

where  $\kappa = 1/\{\text{Var}(y/p) \cdot \text{Var}[t(y/p)] - \text{Cov}[y/p, t(y/p)]^2\}$ . There are three unknown variables,  $\hat{\alpha}_2$ ,  $\text{Cov}(U, y/p)$ , and  $\text{Cov}[U, t(y/p)]$ , and six known variables,  $\hat{\delta}_1$  (0.131),  $\hat{\delta}_2$  (0.008),  $\hat{\alpha}_1$  (0.089),  $\text{Var}[t(y/p)]$  (1,158,797.5),  $\text{Var}(y/p)$  (8,404.029), and  $\text{Cov}[y/p, t(y/p)]$  (94,301.172), in equations (10) and (11).

Among the three unknown variables,  $\text{Cov}(U, y/p)$  for the 1952–78 period is available. Because  $t(y/p)$  is zero in this period, the estimates of currency demand,  $D/p$ , in the 1952–78 period can be computed with  $\hat{\alpha}_1$  from equation (2). These estimates are substituted into equation (1) to obtain the estimates of excess currency balances,  $U$ , with which  $\text{Cov}(U, y/p)$  for the 1952–78 period is computed ( $=20.494$ ). Because the relationship between  $U$  and  $y/p$  does not appear to have experienced a discrete change after 1979, assuming that (ii) holds, I use  $\text{Cov}(U, y/p)$  for the 1952–78 period (twenty-seven samples) as an estimate of  $\text{Cov}(U, y/p)$  for the 1952–90 period (thirty-nine samples).<sup>28</sup> With this estimate

<sup>26</sup> The above number (0.089) may overstate  $\hat{\alpha}_1$  if the residuals are very small. In this case, the lowest value of  $\bar{\delta}_1$  (0.083) in 1952 should be accepted as  $\hat{\alpha}_1$ . The potential estimation error would be modest, nevertheless, because the two values are close.

<sup>27</sup> For the computational formulas, see [16, p. 74].

<sup>28</sup> A simple sensitivity test has been performed on the assumption (ii). Depending on the behavior of the two variables in the 1979–90 period,  $\text{Cov}(U, y/p)$  for the 1952–78 period ( $=20.494$ ) may under- or overstate the covariance for the entire period (1952–90). Because the trend growth rate of  $y/p$  rose after 1979, the presence of a downward bias seems to be more likely than an upward bias. How a downward bias affects the computed value of  $\hat{\alpha}_2$  can be determined by assigning an arbitrary value to the covariance. If  $\text{Cov}(U, y/p)$  in the entire period were twice as large as in the 1952–78 period ( $=40.988$ ), the computed  $\hat{\alpha}_2$  would be 0.01154 instead of 0.01175 and  $D/p$  in 1990 would be 76.2

of  $\text{Cov}(U, y/p)$ , equations (10) and (11) are solved, respectively, for  $\text{Cov}[U, t(y/p)]$  and  $\hat{\alpha}_2$ :  $\text{Cov}[U, t(y/p)] = -122.352$  and  $\hat{\alpha}_2 = 0.012$ .

The estimated bias in  $\hat{\delta}_1$  is 0.042 and in  $\hat{\delta}_2$  is  $-0.004$ . The computed values for  $\hat{\alpha}_1$  and  $\hat{\alpha}_2$  are substituted into equation (2) to obtain the estimates of currency demand,  $D/p$ , in the 1979–90 period. The estimates of excess currency balances,  $U$ , in the same period are then obtained from equation (1). (The estimates of  $D/p$  and  $U$  are listed in Table II.)<sup>29</sup> The estimated excess currency balances in 1990 are reasonably close to zero:  $-1.6$  billion yuan in 1952 prices and  $-4.5$  billion yuan in current prices. This is consistent with the inference made above, that the consumption goods market and, therefore, the currency market, regained equilibrium by the end of 1990.

### B. Household Consumption Goods Demand Function

According to equation (3), the sum of household expenditures on consumption goods and excess currency balances in 1952 prices stands for notional demand for consumption goods ( $C$ ). The household consumption goods demand function (equation 4) is estimated with this notional demand by OLS for the 1953–90 period with the constraint,  $\beta_3 = 1$ , imposed.

instead of 77.1 billion yuan. Because the difference between these two estimates is small, assumption (ii) does not appear to generate a large bias in  $\hat{\alpha}_2$ . The table below lists the estimates of  $D/p$  and  $U$  for the 1979–90 period under the two cases (Case A:  $\text{Cov}=40.988$ ; Case B: initial assumption). The differences between the two estimated values for each variable are of modest size.

	(Billion 1952 yuan)			
	$D/p$		$U$	
	Case A	(Case B)	Case A	(Case B)
1979	11.3	(11.3)	3.2	(3.2)
1980	14.7	(14.8)	3.0	(2.9)
1981	17.4	(17.5)	3.4	(3.3)
1982	20.4	(20.6)	3.2	(3.0)
1983	25.1	(25.2)	3.8	(3.7)
1984	33.3	(33.6)	8.0	(7.7)
1985	41.7	(42.1)	5.6	(5.2)
1986	49.5	(50.0)	4.1	(3.6)
1987	58.5	(59.1)	1.1	(0.5)
1988	66.6	(67.3)	6.4	(5.7)
1989	66.6	(67.4)	1.3	(0.5)
1990	76.2	(77.1)	$-0.7$	( $-1.6$ )

<sup>29</sup> Although the analytical framework adopted implies that household excess currency balances are always nonnegative, the estimates of  $U$  in 1952 and 1990 take negative values. A negative value appears in 1952 because  $\bar{\delta}_1$  in 1952 is lower than the mean of the three chosen years (1952, 1955, and 1957). According to the estimation procedure adopted, this discrepancy is caused by the residual. Because the consumption goods market appears to have regained equilibrium in 1990, that year's  $U$  should take the value of zero. This discrepancy is attributed to a random error in estimation. Note that  $RP$  (repressed inflation rate) discussed below also takes a small negative value in 1990 because the computation of this variable uses the estimated 1990 value of  $U$ .

$$C = 0.855(y/p) + 0.132q_{-1} + \beta_3(p_{-1}/p)U_{-1} - 0.014t(y/p), \quad (4')$$

(20.657)      (2.785)      (-16.877)

$$\bar{R}^2 = 0.999, \quad D.W. = 2.065, \quad \text{period} = 1953-90.$$

As may be seen from the  $t$ -ratios reported in parentheses in equation (4)',  $y/p$ ,  $q_{-1}$ , and  $t(y/p)$  are highly significant with the expected signs. When the unrestricted version is estimated,  $\hat{\beta}_3$  (0.765) becomes significantly different from zero but not from unity at the 5 per cent level ( $\hat{\beta}_3$ 's standard deviation = 0.338).

The estimated function implies that price hikes reduce household consumption goods demand because the main channel in which the price affects demand is through the change of real income ( $y/p$ ) in the first term. The computed short-term price elasticity of household consumption goods demand at the sample mean is  $-0.880$ . The market-clearing price ( $P^*$ ) is calculated by plugging the estimated coefficients into equation (6).

### C. Excess Consumption Goods Demand

Let us rewrite the household consumption goods demand function (equation 4) in terms of the price.

$$C = f(p). \quad (12)$$

By utilizing this functional form, three kinds of excess consumption goods demand are defined:

$$T = f(p_{-1}) - q, \quad (13)$$

where  $T$  = ex-ante excess demand.

$$X = f(p_{-1}) - f(p), \quad (14)$$

where  $X$  = part of ex-ante excess demand that is removed by price hikes.

$$U = f(p) - q, \quad (15)$$

where  $U$  = ex-post excess demand.

$$f(P^*) = q. \quad (16)$$

$$T = X + U. \quad (17)$$

The difference between the current-year household consumption goods demand when the price stays at the previous-year level ( $f[p_{-1}]$ ) and the current-year market supply ( $q$ ) is ex-ante excess demand ( $T$ ) in equation (13). This is the source of the inflationary pressure that China's planners face. They can reduce or completely eliminate excess demand by raising the transaction price. The  $f(p)$  is the consumption goods demand when the new price is applied in the current year (=  $C$ ). When the current-year price is adjusted upward, household consumption goods demand falls accordingly (equation 14). Thus  $X$  is the decrement of demand due to the price hike (open inflation). When the planners do not set the new price high enough to clear the market, positive excess demand

( $U$ ) still remains (equation 15). This is ex-post excess demand, which appears as repressed inflation. Excess demand disappears only when the market-clearing price is applied (equation 16). Note that equation (17) holds. Then  $f(p_{-1})$  can be computed by substituting  $p_{-1}$  into the estimated household consumption goods demand function (equation 4').

#### D. Inflationary Pressure

Four measures of estimating inflationary pressure are defined:

$$TP = 100[(P^*/p_{-1}) - 1], \quad (18)$$

where  $TP$  = total inflation rate.

$$OP = 100[(p/p_{-1}) - 1], \quad (19)$$

where  $OP$  = open inflation rate (CPI-based rate of inflation).

$$RP = 100[(P^*/p) - 1], \quad (20)$$

where  $RP$  = repressed inflation rate.

$$AP = 100[(P^*/P^*_{-1}) - 1], \quad (21)$$

where  $AP$  = adjusted rate of inflation.

The estimates of  $TP$ ,  $RP$ , and  $AP$  in the 1954–90 period are listed along with the CPI-based rate of inflation ( $OP$ ), the estimated market-clearing price ( $P^*$ ), and the growth rate of NMP (net material product) or GDP in recent years in Table III.  $TP$  is the rate of price hike in the current year that would fully eliminate ex-ante excess demand. When the actual rate of price hike ( $OP$ ) is lower than  $TP$ , repressed inflation ( $RP$ ) appears. Thus  $RP$  represents an open-inflation-rate equivalent for repressed inflation. Repressed inflation can accumulate over the years because excess currency balances are passed on to the next year. The repressed inflation carried over from the previous year via excess currency balances becomes part of inflationary pressure in the current year. The adjusted rate of inflation,  $AP$ , indicates the inflationary pressure newly generated in the current year. This approximately matches  $TP$ , net of the carryover component of  $RP$  (first row below), or the sum of open inflation and the increment of repressed inflation (second row):

$$AP \cong TP - RP_{-1},$$

or

$$AP \cong OP + (RP - RP_{-1}), \text{ where } TP \cong OP + RP. \quad (22)$$

Note that the bias in the CPI-based rate of inflation ( $OP - AP$ ) appears when the current year's repressed inflation rate is different from that in the previous year.

TABLE III  
MEASURES OF INFLATIONARY PRESSURE

Year	Inflation (Disinflation)	AP (%)	OP (%)	RP (%)	TP (%)	100·P*	NMP/GDP (%)
1954		2.3	2.3	0.8	3.2	105.5	5.8
1955		1.7	2.3	0.3	2.6	107.3	6.4
1956	i	1.8	0.5	1.6	2.1	109.2	14.1
1957	(i)	-0.1	1.0	0.5	1.5	109.1	4.5
1958	ii	1.8	0.2	2.1	2.3	111.0	22.0
1959	ii	0.2	0.9	1.4	2.3	111.3	8.2
1960	ii	6.2	3.8	3.7	7.7	118.3	-1.4
1961	ii	25.5	17.3	11.0	30.2	148.4	-29.7
1962	(ii)	0.1	2.7	8.3	11.2	148.6	-6.5
1963	(ii)	-9.7	-6.4	4.5	-2.2	134.3	10.7
1964	(ii)	-5.7	-3.2	1.8	-1.5	126.6	16.5
1965	(ii)	-0.9	-1.9	2.8	0.8	125.4	17.0
1966	iii	3.3	0.7	5.5	6.2	129.6	17.0
1967	iii	0.5	-0.7	6.8	6.0	130.3	-7.2
1968	iii	2.6	0.7	8.9	9.6	133.7	-6.5
1969	(iii)	-1.2	-0.8	8.4	7.5	132.1	19.3
1970	(iii)	-2.8	-0.2	5.6	5.4	128.4	23.3
1971		1.5	1.4	5.8	7.2	130.4	7.0
1972		-0.1	-0.2	5.9	5.7	130.3	2.9
1973		2.2	1.7	6.4	8.2	133.1	8.3
1974		0.2	0.1	6.5	6.6	133.3	1.1
1975		0.3	0.8	5.9	6.8	133.7	8.3
1976		0.6	0.3	6.2	6.5	134.4	-2.7
1977		1.3	3.1	4.3	7.6	136.2	7.8
1978		1.3	1.5	4.2	5.7	137.9	11.7
1979		1.4	2.1	3.4	5.6	139.8	7.6
1980	iv	6.3	7.0	2.7	9.9	148.6	7.8
1981	(iv)	2.8	2.6	2.9	5.6	152.8	4.5
1982		1.6	2.0	2.5	4.5	155.2	8.3
1983		1.5	1.2	2.8	4.0	157.4	10.4
1984	v	3.8	1.7	4.9	6.7	163.4	14.6
1985	v	7.2	9.4	2.8	12.4	175.1	12.9
1986	(v)	5.5	6.5	1.8	8.4	184.7	8.5
1987	vi	5.7	7.4	0.2	7.6	195.3	11.1
1988	vi	21.7	19.0	2.5	22.0	237.7	11.2
1989	(vi)	14.9	17.5	0.2	17.8	273.1	4.3
1990	(vi)	0.6	1.6	-0.7	0.9	274.8	3.9
1991		—	2.9	—	—	—	8.0
1992	vii	—	5.6	—	—	—	13.2

Source: [21, 1993 edition, p. 31 (GDP) and p. 34 (NMP)].

Note: Roman numerals indicate inflationary spells. Disinflationary periods are indicated in parentheses. For the CPI (=100·p), see CPI<sub>t</sub> in Table I. NMP/GDP indicates the growth rates of NMP (1954–77) and GDP (1978–92) in constant prices.

## VII. INTERPRETATION OF THE ESTIMATION RESULTS

### A. *Identifying Inflationary Spells*

I have dated approximate periods of inflationary spells in the 1954–92 period based on the adjusted rate of inflation, *AP*, (*OP* for 1991 and 1992) and chronological economic reports.<sup>30</sup> Six complete inflationary spells and subsequent disinflationary periods (in the parentheses) were identified: (i) 1956 (1957); (ii) 1958–61 (1962–65); (iii) 1966–68 (1969–70); (iv) 1980 (1981); (v) 1984–85 (1986); and (vi) 1987–88 (1989–90). The seventh inflationary spell (1992–) is in progress. (These years are marked in Table III.) The main causes of the inflationary spells were: (a) economic booms led by state-sector fixed investment (i, ii, iii[1966], v, vi, and vii); (b) hikes in wage rates and/or in purchasing prices of agricultural products (i, iii[1966], iv, v, vi, and vii); (c) poor harvests (ii and iii[1968]); and (d) disrupted production during the climactic years of the Cultural Revolution (iii). The causes (a) and (b) brought about demand-pull inflation. When state-sector fixed investment surged, employment in the investment goods and construction sectors expanded, and this raised the demand for consumption goods through the augmentation of total wage payments. The latter cause also led to a higher demand for consumption goods through the increase of household incomes. Poor harvests as well as the effects of the Cultural Revolution were adverse supply shocks that lowered the output of consumption goods without reducing the level of demand proportionally.

These events, as a rule, had negative impacts on the budgetary balance and led to an unanticipated rise in currency supply because the bulk of budgetary deficits had been covered by borrowing from the central bank (People's Bank of China). The surges in loans by state banks to finance fixed investment in the 1980s had the same effect on currency supply. The abrupt increase in currency supply on these occasions provided the linkage between the goods and currency market disequilibria.

All of the six complete inflationary spells were eventually countered by contractionary macroeconomic policies. The main component of these policies was either restraint of budgetary investment expenditures (for the first four inflationary spells) or restraint of state bank lending (for the fifth and sixth spells). The main policy tool changed because state enterprises increased their dependence on bank loans for financing fixed investment through the 1980s. Contractionary policies, on the one hand, lowered the growth rate of currency supply and reduced the currency market disequilibrium. These adjustments were achieved through the improvement of the financial position of the Treasury against the central bank (such a position can be indicated by the balance of fiscal deposits net of borrowing

<sup>30</sup> Most of the chronological references used are official Chinese ones: [1] for 1954–80; [25, 1981–91 editions] for 1980–90; [21, 1993 edition] for statistical reference, 1954–90; [17, various dates] for 1981–93; *Beijing Review*, various issues, for 1978–93; *Nihon keizai shimbun*, various dates, for 1981–93; and *Wall Street Journal*, various dates, for 1981–93.

outstanding) or the deposit-loan position of the state banking system (expressed as the balance of non-fiscal deposits net of non-fiscal loans outstanding). Contractionary policies, on the other hand, subdued the demand for consumption goods by reducing the growth rate of household incomes. The economy went into disinflationary phases with some delays. Contractionary policies were adopted in the following periods: (i) 1957; (ii) 1961–62; (iii) 1968; (iv) 1981; (v) 1985 (second half)–1986 (first quarter); and (vi) 1988 (fall)–1990 (spring).

### B. *Behavior of AP, OP, and RP*

Taking the adjusted rate of inflation (*AP*) as the main measure of inflationary pressure, some new findings and conjectures based on Table III are presented. Here, short- and long-term refer to any periods shorter and longer than ten years.

First, the long-term downward bias of the CPI-based rate of inflation (*OP*) originating from the omission of repressed inflation was modest. Although chronic repressed inflation was present, its level moved cyclically rather than rose monotonically. The repressed inflation rate (*RP*) registered a double-digit figure only once (11.0 per cent in 1961) in the 1954–90 period. The *RP* rate stayed below the 5 per cent level except in the following two periods: the two years which followed the discontinuation of the Great Leap Forward policy (1961–62) and the years of the Cultural Revolution (1966–76). Because *RP* changed no more than 7.0 per cent (from 1959 to 1969) in any ten-year span between 1954 and 1990, the long-term behavior of *AP* and *OP* was similar. In other words, low long-term rates of inflation implied by *OP* were not inconsistent with the persistence of repressed inflation in China. Take the Cultural Revolution period for example. Although *AP* rose by only 0.6 per cent per annum during the period, *RP* continuously registered relatively high rates. The high *RP* was a consequence of the government's policy to freeze the bulk of state-fixed prices in that period.

Second, because the amplitude of short-term fluctuations of *AP* was larger than that of *OP*, the official CPI understated the degree of short-term movement in inflationary pressure. The standard deviations in the 1954–90 period were 6.3 per cent for *AP* and 5.3 per cent for *OP*.

Third, the data confirm that *OP* is sticky and its movement lags behind changes in *AP*. When a new inflationary spell begins, a substantial part of inflationary pressure initially tends to be reflected in an increase in repressed inflation (*RP*: 1956, 1958, 1960–61, 1966–68, 1984, and 1988) because of the slow changes in state-fixed and state-guided prices. As the hikes in these regulated prices accelerate (1957 and 1985) and/or inflationary pressure recedes (1957, 1962–64, 1969–70, 1986, and 1989–90), *RP* tends to fall. The CPI-based rate of inflation (*OP*) understates short-term fluctuations in inflationary pressure because it omits this cyclical movement of the repressed inflation rate.

Fourth, China experienced a significant rise in inflationary pressure since the initiation of economic reforms in 1979. The adjusted inflation rate (*AP*) was 5.9 per cent per annum in the 1979–90 period compared with 1.2 per cent per annum in the 1954–78 period. In the 1979–90 period, price controls and rationing were relaxed successively, and the relative prices were adjusted extensively by allowing



the prices of some goods to rise without lowering those of others on a corresponding scale. Because the prices of consumption goods became more flexible, the repressed inflation rate fell through the 1979–90 period (*RP*'s arithmetic mean: 4.8 per cent for 1954–78 and 2.2 per cent for 1979–90) until repressed inflation seems to have disappeared in 1990. For this reason, the *OP* level was higher than the *AP* level in this period. The *OP* rate per annum rose from 1.0 per cent in the 1954–78 period to 6.3 per cent in the 1979–90 period (*AP*'s growth rate per annum in this period was 5.9 per cent).

Fifth, *AP* has generally been moderate except in 1961 (25.5 per cent) and the 1988–89 period (21.7 per cent and 14.9 per cent): these were the only years when double-digit figures were registered in the 1954–90 period. Shortages of staple food and daily necessities in the aftermath of the Great Leap Forward policy were responsible for acute inflationary pressure in 1961. A strong economic boom and fast credit expansion in the latter half of the 1980s generated sharp inflation, which reached its peak in 1988. It could be inferred that China's planners, in their macroeconomic management, have used measures of inflationary pressure in the consumption goods market similar in nature to *AP*. Conspicuous rises in the measures seem to have prompted planners to implement contractionary policies for the restoration of price stability. Contractionary policies lasted until the target levels for the inflationary pressure measures were reached.

Finally, there appears to have been a discontinuity in the patterns of inflationary spells around 1983. While *AP* registered above 5 per cent in only three years before 1983 (1960, 1961, and 1980), this level was surpassed in five of the years (1985–89) in the period from 1983 to 1990. Two peculiarities in macroeconomic management led to a high rate of inflation in this period: (i) contractionary policies were discontinued in 1986 before *AP* dropped to low levels comparable to those of past disinflationary periods, and (ii) the imposition of the next round of contractionary policies came later than in past inflationary spells. The *AP* level in the one-year disinflationary period of 1986 was 5.5 per cent. A vigorous economic expansion began with this relatively high rate of inflation. When the next contractionary policies were announced in the fall of 1988 [24], inflationary pressure had already reached historically high levels; *OP* in September 1988 was 25.4 per cent above the level of the previous year.<sup>31</sup> The current inflationary spell began in 1992 after the adoption of Deng Xiaoping's proposal to accelerate the pace of economic development. Investment-driven economic boom raised the *OP* level from 2.9 per cent in 1991 to 5.6 per cent in 1992 and to 13 per cent in 1993.<sup>32</sup> Despite clear indications of inflation acceleration, the government has been reluctant to implement strong contractionary policies, as of early 1994. The relatively high rate of inflation in the post-1983 period indicates that the macroeconomic policy of this period was more expansionary than that of the preceding period.

<sup>31</sup> *Zhongguo tongji yuebao* [China's monthly bulletin of statistics] (December 1988), p. 78.

<sup>32</sup> The 1993 figure is based on the general retail price index [17, December 29, 1993].

## VIII. CONCLUSION

I have examined the sources of biases in China's official CPIs in order to determine whether the CPI-based rate of inflation accurately represents the inflationary pressure in China's consumption goods market. Although a downward bias due to covert price hikes has been suspected, the CPI (the consumption goods price index) was largely consistent with a unit price-based parallel index constructed with disaggregated retail sales data. The CPI, however, failed to account for the chronic repressed inflation generated by pervasive price controls. Taking the CPI as the index of the general level of transaction prices, a method of correcting for repressed inflation was developed. The examination of China's household behavior in the presence of market disequilibrium suggested that excess currency balances held by households indicate the approximate value of excess demand for consumption goods. With the estimated household consumption goods demand function and estimates of excess currency balances, the theoretical market-clearing price index was computed. The growth rate of this price index is the alternative measure of inflationary pressure (adjusted rate of inflation). The positive percentage difference between the market-clearing price index and the CPI denotes the repressed inflation rate.

Based on the adjusted rate of inflation, six complete inflationary spells and subsequent disinflationary periods were identified in the 1954-92 period. The main causes of these inflationary spells were investment-led economic booms and hikes in wage rates and/or in purchasing prices of agricultural products. The estimated measures of inflation in the 1954-90 period indicate that long-term downward bias in the CPI-based rate of inflation is modest because the repressed inflation rate did not exhibit rising trends. The CPI-based rate of inflation understated the degree of short-term movement in inflationary pressure because the repressed inflation rate moved cyclically. Although China has experienced a significant rise in inflationary pressure since the initiation of economic reforms in 1979, the repressed inflation rate dropped considerably over this period because the prices of consumption goods became less rigid through price decontrol. Available information suggests that China's consumption goods market by and large regained equilibrium by 1990. China's planners appear to have been quite responsive to increases in inflationary pressure. Because contractionary policies were adopted whenever inflationary pressure in the consumption goods market became conspicuous, the adjusted rate of inflation generally stayed at low levels. The relatively high rate of inflation in the past decade may indicate that China's macroeconomic policy has become more expansionary.

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## APPENDIX

## SOURCES OF DATA

- p*: Consumption goods price index in the general retail price index (base year = 1952; 1952 level = 100) is divided by 100. *China Trade and Price Statistics 1988* [19, p. 82] for 1952–87 data; *Zhongguo jingji nianjian* [25, 1989 edition, p. X-127] for 1988, [25, 1990 edition, p. VIII-122] for 1989, and [25, 1991 edition, p. VIII-118] for 1990; and *Zhongguo tongji nianjian* [21, 1993 edition, p. 239] for 1991–92.
- $CPI_k$ : The sales values and quantities of twenty-one goods are cited from: *Zhongguo maoyi wujia tongji ziliao, 1952–1983* [20, pp. 90–108] for 1952–83 data; *Zhongguo tongji nianjian* [21, 1986 edition, pp. 455–56] for 1984–85, [21, 1988 edition, pp. 694–95] for 1986–87, and [21, 1990 edition, pp. 630–31] for 1988–89, and [21, 1991 edition, pp. 599–600] for 1990.
- M*: Nominal household currency balances. *Zhongguo maoyi wujia tongji ziliao, 1952–1983* [20, p. 161] for 1952–83 data; *Zhongguo tongji nianjian* [21, 1991 edition, p. 582] for 1986–90, and [21, 1993 edition, p. 602] for 1991–92. The figures for 1984–85 are computed from [18, p. 25] and *Zhongguo tongji nianjian* [21, 1991 edition, p. 275] regarding savings deposits for 1983–85. Because the total household savings in [18] are the sum of the increases in savings deposits and household currency balances, the increments of household currency balances can be obtained by deducting the increments of savings deposits from the total household savings for 1984 and 1985. These increments of household currency balances are added to the year-end balances in 1983 to extend the series up to 1985.
- y*: The sum of *pq* and the annual increments of *M* and savings deposits is used for nominal household disposable income. Savings deposits are cited from *Zhongguo tongji nianjian* [21, 1993 edition, p. 285].
- q*: Nominal value of household expenditures for consumption goods and services is divided by *p*. Household expenditures for consumption goods are cited from *Zhongguo tongji nianjian* [21, 1993 edition, p. 611]. Those for services are cited from [21, 1986 edition, p. 443] for 1952–85 data, [21, 1991 edition, p. 582] for 1986–90, and [21, 1993 edition, p. 602] for 1991–92.