

Appendix D1

Construction of the Joint Basket and Provincial-level Pricing of the Joint Basket

Introduction

The table below represents the joint basket, i.e., the aggregate rural-urban nationwide uniform basket. The joint basket consists of a set of products with nationwide average per capita consumption quantities and product category adjustment factors. To derive the category-specific adjustment factors, nationwide joint, i.e., average rural-urban prices of individual products are needed. These joint prices of individual products are multiplied with the corresponding average quantities to yield product values, and the product values then added up within each category; what is needed to bridge the gap between the sum of product values within each category and the living expenditures in that category are the adjustment factors.

Once the joint basket is established, it can be priced across provinces at provincial-level rural prices (as the rural basket was before), at provincial-level urban prices (as the urban basket was before), or at provincial-level joint prices. Joint prices for individual products, thus, are necessary at the nationwide level to derive the product category adjustment factors for the joint basket in the first place, while provincial-level joint prices can later be used to derive the provincial-level joint basket values (which cover the whole province rather than just the rural or the urban areas of a province).

Construction of the joint basket

The joint basket involves (a) a nationwide per capita quantity for each good, (c) a nationwide price for each good, and (b) category-specific adjustment factors which depend on nationwide living expenditures.

(a) Nationwide per capita quantity = rural quantity * rural share of the population + urban quantity * urban share of the population. Quantity data are not available for all goods and services; special cases are examined below when discussing joint prices. For details on the population weights see the appendix on population data.

(b) Nationwide living expenditures for a particular category = rural per capita living expenditures for this category * rural share of the population + urban per capita living expenditures for this category * urban share of the population.

(c) The derivation of the joint price involves a number of complications. Depending on the pricing procedure, five groups of goods and services can be distinguished.

(c.1) For some products no separate rural and urban price data are available, only retail prices in the 29 provincial capitals and possibly a nationwide value. These retail prices then

constitute the joint (provincial, nationwide) prices.¹ This category includes several “other foods,” clothing, articles for daily use, and energy.

(c.2) Medicine / medical articles: no quantity data are available to begin with. The derivation of quantity data in the case of the *rural basket* is explained in the appendix on the construction of the rural living expenditure basket; the urban case uses the same price data and follows the same procedure (there are no separate rural and urban prices, only one province-wide price).

The quantity in the rural basket is obtained as follows: Among the available (provincial-level) price data on medicine and medical articles, those products are chosen which are uniformly defined across all provinces and have price data for all provinces. Altogether, 18 products fulfill the two requirements. For any particular product, the price in a provincial capital was divided by the arithmetic mean of the prices across all provincial capitals. For each provincial capital, the 18 price ratios were added up and divided by 18 to obtain the price of medicine and medical articles in this province (relative to the average nationwide price). The nationwide price, in the frequent absence of a nationwide price here defined as the arithmetic mean of the prices across all provincial capitals, thus, by design, equals unity. In the rural case, dividing the nationwide per capita living expenditures on medicine and medical articles of 13.23 yuan by this price (of unity) yields the quantity measure of 13.23 units of medicine and medical articles to be priced in each province.

In the urban case, dividing the nationwide per capita living expenditures on medicine and medical articles of 19.65 yuan by this price (of unity) yields the quantity measure of 19.65 units of medicine and medical articles to be priced in each province.

In the joint basket, the joint price is the same as the rural price (unity in the nationwide case) and the same as the urban price (unity in the nationwide case). The rural and urban quantities are 13.23 units and 19.65 units, and the nationwide joint quantity is the population-weighted average of 14.57 units.

(c.3) In the case of staples, the joint price is obtained by dividing joint living expenditures by joint consumption quantities. This joint price is the *average price paid per unit purchased* (the plutocratic price).

(c.4) In the case of services, consumption quantities are not available to begin with. To obtain the *rural* quantity, the rural living expenditures on services are divided by the rural service price level (measured as annual industrial TVE wage per laborer); i.e., the quantity is measured in form of a fraction of a particular type of work year. To obtain the *urban* quantity, the urban living expenditures on services are divided by the urban service price level (measured as the annual wage of staff and workers in industrial enterprises); i.e., the quantity is measured in form of a fraction of a particular type of work year, with the particular type possibly slightly different between the rural and urban case. The nationwide

¹ If no separate nationwide price is available, the arithmetic mean price across those provincial capitals for which price data are available is used as the nationwide price. The nationwide prices of coal and gas differ unreasonably from the arithmetic mean and are therefore replaced by the arithmetic mean.

In later pricing the basket at the provincial level, the provincial-level joint price is always applied to the *nationwide uniform* joint quantity, which is a population-weighted average of rural and urban per capita quantities consumed.

quantity is the population-weighted combination of these two (slightly differently defined) quantities.

The nationwide price is nationwide living expenditures on services divided by the nationwide quantity of services. (The nationwide living expenditures on services are obtained as usual, using population weights.)

If it weren't for the slightly different type of work year (in industrial TVEs vs. industrial enterprises), this method would be the same as the previous method, and thereby yield a plutocratic measure. We don't see any possibility to obtain an exactly same type of quantity for rural and urban services. Even using household per capita income straight out would not help, because rural and urban income are defined differently. In defense of our procedure, apart from the fact that we are not aware of any other possibility to address the issue: (i) the two types of quantities are reasonably close in definition; (ii) if the relationship of industrial TVE wages to industrial enterprise wages is the *same across provinces*, this has the same effect in the calculations here as using identically defined rural and urban types of quantities.

This is the closest approximation of a plutocratic measure we can come up with.

Housing falls either under (c.3) or (c.4). It falls under (c.3) if constructions costs are identically measured in rural and urban areas, and then only has in common with (c.4) that the rural and urban quantities are derived indirectly. If constructions costs are not identically measured in rural and urban areas, then housing faces exactly the same situation as services (c.4).

(c.5) For some non-staple foods (edible oil, pork, beef and lamb, poultry, eggs, fish, and fruit), agricultural procurement prices are available and relevant for rural areas, while retail prices are the relevant prices for the urban areas. For these products, no *provincial-level rural quantity data* are available. It is, thus, not possible to later, when pricing the basket at the provincial level, derive a joint price at the provincial level using the plutocratic procedure ('rural price times rural quantity' plus 'urban price times urban quantity,' divided by the population-weighted nationwide quantity).

In the absence of provincial-level rural quantity data for these products, the only possibility to derive a provincial-level joint price is to weight the rural and urban *prices* using *population weights*, which ignores that the per capita quantity consumed probably differs between rural and urban areas. The resulting joint price is not the average price paid per unit purchased, but the product *price faced by the average person* (the democratic price).

In this one instance, thus, we resort to a democratic price.

It would have been possible to, at the *nationwide* level, derive the average price paid per unit of a particular product purchased, by taking the rural consumption value (agricultural price * rural quantity) and the urban consumption value (retail price * urban quantity), weight the two values using the population weights, and to divide this weighted value by a population-weighted joint quantity. But when pricing the basket at the *provincial level*, only a democratic price is possible. This suggested to stick to a democratic price in the establishment of the basket, too. In the derivation of the nationwide joint basket, use of a plutocratic price would have led to a slightly different adjustment factor for "all other goods." That is the only difference to the current practice of calculating joint prices nationwide using

the same (democratic) method as at the provincial level later (where there is no choice of method). It appears preferable to use one method consistently both in constructing the basket and in pricing it. Comparing, at the nationwide level, the two different joint prices, obtained using the two different methods, the difference between the two joint prices is always less than 15%, with either sign; the adjustment factor based on the average price per unit purchased would have been 1.1979 instead of 1.2228.

Angus Deaton (2003) and Angus Deaton and Alessandro Tarozzi (2000) use a democratic price index. Their procedure differs significantly from ours. For China, the necessary data to use the Deaton/Tarozzi procedure are not available. Details are in the appendix on Angus Deaton's alternative procedure in the case of India.

The set of products presented in the table below, with nationwide average per capita consumption quantities and product category adjustment factors, constitutes the joint basket—all other information provided in the table is only used to derive the nationwide joint quantities and the adjustment factors. By design, multiplying for each product the nationwide per capita consumption quantity by the nationwide price and by the relevant adjustment factor, and summing up across all products, reconstitutes the nationwide average per capita living expenditures of 729.24 yuan. Pricing the joint basket at provincial-level joint prices yields the values of the joint basket across provinces. Pricing the joint basket at provincial-level rural prices—the same rural prices as previously used to price the rural basket—yields the values of the joint basket across rural areas of China's provinces; similarly for the urban case.

A note on average prices in the construction of the joint basket

The average price paid per unit purchased (for staples, housing, and services) is our preferred measure of the average price. Angus Deaton (1998) and Robert Pollak (1998) touch on a similar issue when discussing the Bureau of Labor Statistics' practice of deriving expenditure weights for its CPI from consumer expenditure surveys: by using *aggregate* expenditures to derive the weights, the consumption patterns of rich households count more than the consumption patterns of poor households. The CPI then is a *plutocratic* rather than a *democratic* index. In the instance here, the same argument applies to the per capita average rural vs. urban expenditures. The average price paid per unit purchased gives rich households more weight, corresponding to how much more of the product than the poorer household they purchase; in the calculations here, this means urban consumers receive significantly more weight. The product price faced by the average person, on the other hand, is a "democratic" average price that treats everybody, rural or urban person, equally. Since the Bureau of Labor Statistics, and presumably also other statistical bureaus around the world, use aggregate expenditure weights, this plutocratic method is also the preferred method here (i.e., the average price paid per unit purchased is our preferred average price).

But in the fifth scenario above, the proper average price is simply not available. Therefore the price faced by the average person is used. For staples, housing, and services, where we use a plutocratic price, the democratic price, faced by the average person, can also be calculated; it is 2.26% higher for staples, 6.31% higher for housing, and 5.72% lower for services than the (preferred) average price paid per unit purchased. The relative small size of the difference suggests that using the price faced by the average person for those non-staples where no proper average price can be calculated is unlikely to make much difference.

The problem can be further illustrated as follows. Assume a country has two times more farmers (rural population) than non-farmers (urban population) and, to simplify, reduce it to two farmers and one non-farmer. There is only one product; it sells for three dollars in the countryside, and for six dollars in the urban areas. Assume the average farmer consumes two units of the product, and the one (average) non-farmer consumes five units of the product. The average price of this product in this country is total expenditures divided by total quantity consumed, i.e., 42 dollars (price of 3 dollars in the countryside * 2 farmers * 2 products each farmer + price of 6 dollars in the urban areas * 1 non-farmer * 5 products) divided by 9 products, which yields a price of 4.67 dollars per unit of the product. This is the average price paid per unit purchased, which is the plutocratic average price.

If expenditure or quantity data are lacking, the only possible average calculation is to take the rural and the urban prices and to weight them using population weights, i.e., 3 dollars per unit in the countryside * 0.67 (two out of three persons) + 6 dollars per unit in the urban areas * 0.33 (one out of three persons), which yields a price of 4 dollars per unit of the product. This is the price faced by the average person, or the democratic average price.

Provincial-level pricing of the joint basket

--- Also see the appendices on the pricing of the rural and of the urban basket. ---

Tobacco:

The quantity data refer to packs of cigarettes, but prices are available only for three different quality categories of cigarettes. In the aggregate rural-urban basket the retail price of tobacco is constructed as a composite retail price of first-grade cigarettes (10%), second-grade cigarettes (40%), and third-grade cigarettes (50%).

Alcohol:

The aggregate rural quantity of alcohol consumed is assumed to cover spirits, beer, and other alcohol in the same proportions as the urban quantity does.

Vegetables:

The rural quantity data are for “vegetables,” and the urban quantity data are for “fresh vegetables” and “dried vegetables” (the latter a very small quantity, as reported in the urban basket table). It is assumed that the rural quantity data refer to “fresh” vegetables.

Beef, lamb:

Quantity data on the consumption of beef and lamb are only available in form of a joint figure. The price of beef is applied to this quantity. (The prices of beef and lamb differ little, and for many provinces provincial-level prices of lamb are not available.)

Fruit:

The rural quantity figure covers all fruit; it is split to cover fresh melon and (all other) fresh fruit in the proportions indicated by the separate urban quantity data for the two products. The price of fruit is a composite price of apples, pears, and tangerines. The rural quantity data are likely to be underestimates of the actual quantity of fruit consumed in rural areas; they appear too small in comparison to the urban data. The *Statistical Yearbook 1991* and the *Rural Statistical Yearbook 1991* do not include fruit in the relevant quantity table,

only the *Rural Household Survey Yearbook 2002* (p. 15) does, in a table with historical data; the table, for example, shows a doubling of rural fruit consumption between 1992 and 1993, also raising questions about the quality of these data. No reasonable adjustments to the 1990 rural quantity of fruit consumption are possible.

Shoes:

The aggregate rural quantity of shoes consumed is assumed to cover the same types of shoes, in the same proportions, as the urban quantity does. All “other shoes” are assumed to be sports shoes.

Services:

The rural price of services is the average rural industrial TVE wage, the urban price of services is the average wage of urban industrial enterprise staff and workers.

References relevant for this appendix and not listed in the paper

Deaton, Angus. “Getting Prices Right: What Should Be Done?” *Journal of Economic Perspectives* 12, no. 1 (Winter 1998): 37-46.

Pollak, Robert A. “The Consumer Price Index: A Research Agenda and Three Proposals.” *Journal of Economic Perspectives* 12, no. 1 (Winter 1998): 69-78.

Joint Basket

	Living expenditures per capita (yuan)			Quantity consumed per capita			Nationwide average prices (in yuan) per unit of the product			Ave. value:	Adj. factor:
	Rural	Urban	Ave.	Rural	Urban	Average	Rural	Urban	Average	ave. quantity * ave. prices	ave. liv. exp. / ave. value
Total	584.63	1278.89	729.24								
A. Consumer goods (91.96%)	544.23	1150.80	670.58								
1. Foods (56.65%)	339.30	693.77	413.14								
a. Staples (17.12%)	135.47	84.50	124.85								1.0000
implicit (kg)				262.08	130.72	234.7177	0.5169	0.6464	0.5319	124.85	
b. All other foods (39.53%)	203.83	609.27	288.28							235.7586	1.2228
Tobacco (packs, cigarettes)				27.38	35.12	28.9922			0.5926	17.1808	
Alcohol (kg)				6.14	9.25	6.7878					
Spirits (<i>baijiu</i>)				(1.9914)	3.00	2.2015			2.963	6.5230	
Beer				(3.3853)	5.10	3.7425			1.322	4.9476	
All other alcohol				(0.7634)	1.15	0.8439			4.489	3.7883	
Tea leaves (kg)				0.27	0.24	0.2638			20.0487	5.2888	
Fresh vegetables (kg)				134.00	138.70	134.9790			0.5700	76.9380	
Edible oil (kg)				5.17	6.40	5.4262	1.4893	3.200	1.8456	10.0146	
Pork (kg)				10.54	18.46	12.1897	3.3569	5.734	3.8520	46.9547	
Beef, lamb (kg; price for beef)				0.80	3.28	1.3166	5.3298	6.801	5.6363	7.4208	
Poultry (kg)				1.26	3.42	1.7099	6.3605	7.140	6.5229	11.1535	
Eggs (kg)				2.41	7.25	3.4182	4.2939	5.376	4.5193	15.4479	
Fish (silver carp) (kg)				2.13	7.69	3.2881	2.8732	4.185	3.1464	10.3457	
Sugar (kg)				1.50	2.14	1.6333			2.666	4.3544	
Fruit				5.89							
Fresh melon (kg)				(2.9070)	20.29	6.5279	0.3310	0.7200	0.4120	2.6895	
Fresh fruit (kg)				(2.9830)	20.82	6.6984	1.2508	2.8867	1.5915	10.6605	
Milk (kg)				1.08	4.63	1.8195			1.127	2.0506	
2. Clothing (9.80%)	45.34	170.90	71.49							35.4141	2.0187
Cotton cloth (meter)				0.90	1.33	0.9896			3.129	3.0965	
Chemical fiber (meter)				1.74	1.46	1.6817			7.765	13.0584	
Nylon (meter)				0.08	0.26	0.1175			31.7504	3.7307	
Silk (meter)				0.04	0.41	0.1171			19.3526	2.2662	
Shoes (pairs)				0.67	2.29	1.0074					
Leather shoes (pairs)				(0.067)	0.61	0.1801			35.8620	6.4587	

Rubber shoes (pairs)				(0.067)	0.25	0.1051			13.0300	1.3695	
Cotton shoes (pairs)				(0.335)	0.49	0.3673			6.545	2.4040	
Plastic shoes (pairs)				(0.134)	0.25	0.1582			3.6998	0.5853	
Others (ass. sports, pairs)				(0.067)	0.69	0.1968			12.4230	2.4448	
3.-6. (11.95%)	50.60	226.19	87.18							52.0040	1.6764
3. Articles for daily use (items)	32.18	129.66	52.49	per	100	persons					
Bicycle				2.6529	3.0971	2.7454			276.786	7.5989	
Sewing machine				1.0730	0.1829	0.8876			253.047	2.2460	
Mechanical watch				2.6637	2.2400	2.5755			51.668	1.3307	
Clock				0.8779	1.5800	1.0242			43.4643	0.4452	
Electric fan				2.0201	3.1029	2.2456			273.308	6.1374	
Washing machine				0.3183	0.7229	0.4026			532.965	2.1457	
Refrigerator				0.0811	1.3314	0.3415			1697.7572	5.7978	
Cloth stand				1.6094	0.1771	1.3110			315.908	4.1416	
Desk				1.2588	0.1571	1.0293			202.0268	2.0795	
Color TV				0.2777	1.4286	0.5174			2440.065	12.6249	
Black and white TV				1.6908	0.1686	1.3738			540.037	7.4190	
Radio				0.0131	0.5714	0.1294			28.852	0.0373	
4. Cultural and recreational articles	12.11	68.25	23.80								
5. Books, newspapers, magazines	3.20	11.15	4.86								
6. Other goods	3.11	17.13	6.03								
7. Medicine and med. art. (2.00%)	13.23	19.65	14.57	13.23	19.65	14.5673			1.0000	14.5673	1.0000
8. Housing (8.09%)	69.30	19.98	59.03								
Construction costs per sqm				0.5625	0.1151	0.4693	123.2106	173.6636	125.7872	59.03	1.0000
9. Energy: Coal (kg) (3.45%)	26.46	20.31	25.18	544.5365	206.04	474.0277			0.0486	23.0340	1.0932
B. Services (labor-years) (8.05%)	40.40	128.09	58.67	0.031996	0.056224	0.037043	1262.6767	2278.20	1583.72	58.6658	1.0000

Published data are reported with as many decimals as in the original source. Four decimals are reported for calculated prices and adjustment factors; in further calculations all decimals are used. Calculated value data are presented with two decimals.

The average price of staples, housing, and services are proper average prices (the average price paid per unit purchased); the average prices of those non-staples for which rural and urban price data are available are the prices faced by the average person (rather than the average price paid per unit purchased).

The percentages given in parentheses after the labels of the main product categories are their shares in nationwide average per capita living expenditures.

The nationwide rural and urban population weights are 0.7917 and 0.2083; for details see the appendix on income and population data.

The products covered in the table are those products for which both rural and urban quantity data are available or can be constructed.

On product-specific data see the appendices on the construction of the rural and the urban basket, and on provincial-level data the appendices on the provincial-level pricing of the rural and urban basket.

Sources: see rural basket and urban basket tables in the paper.