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# Consumption of Own Production and Cost-of-Living Indexes

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## 11.1 Introduction

The Cost-of-Living index, or COLI, defined as the ratio of the minimum expenditures needed to maintain a constant level of utility under two different price regimes, is underpinned by the economic theory of consumer behavior in which rational utility-maximizing individuals react to changes in relative prices by adjusting the relative quantities they consume.<sup>1</sup> A COLI is widely regarded as the appropriate target index for consumer price index (CPI). However, in general, not all the prices and quantities needed to calculate a COLI are available, for two reasons.

First, the quantities that enter into a COLI are hypothetical for at least one of the periods. They are the quantities that *would be* consumed *if* the prices were different from those actually prevailing in the period. This problem has always been recognized. It may be dealt with by calculating a superlative index as defined by Diewert (1976).<sup>2</sup> A superlative index is an index calculated from the actual prices and quantities in both periods that may be expected to provide a satisfactory approximation to a COLI under most conditions, provided the prices and quantities used are appropriate.

The second problem is less tractable and not widely appreciated. Consumption is an activity in which households use goods and services to satisfy

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1. Originally proposed by Konüs (1924), the properties of the Cost-of-Living Index are explained in detail in chapter 17 of the international *Consumer Price Index Manual* (International Labor Office et al. 2004) entitled “The Economic Approach to Index Number Theory,” written by E. Diewert.

2. See chapter 17 of the *CPI Manual* (International Labor Office et al. 2004).

their own personal needs and wants. The quantities of goods and services that enter into personal utility functions are those that are actually consumed by households. They are not necessarily the same goods and services that households purchase in retail outlets and that are classified as consumers' expenditure in national accounts and household expenditure surveys. They also are not necessarily the goods and services for which prices are collected for CPI purposes.

Recent research has shown that even in developed countries, the majority of the goods and services purchased by households for purposes of consumption are used to provide inputs into various kinds of household production processes. They are used to produce other goods or services from which households actually derive utility. Some of these production processes may be quite simple, but others are complex, involving not merely the consumption of purchased goods or services as intermediate inputs but also the inputs of own (and possibly hired) labor services and inputs of capital services provided by household-fixed assets in the form of dwellings and household durable equipment. For example, expenditure on fuels may be a major item of consumers' expenditures, but fuels are obviously not consumed directly and instead are used as intermediate inputs into household production processes.

Utility is derived from consuming the outputs from household production. The difficulty for CPIs is that there are no prices to be observed for the outputs because they are not traded in market transactions. The problem has long been recognized in one or two special cases, such as the consumption of housing services produced by owner occupiers or the consumption of own agricultural produce. However, recent research indicates that consumption of own production is much more extensive than seems to be generally realized. Moreover, as in other fields of production, the technologies used in many kinds of household production have improved dramatically over the longer term.<sup>3</sup>

In practice, statistical offices seem to tacitly ignore the problem and treat the inputs purchased by households as if they were consumption goods and services. However, given advancing technology, the prices of the outputs from household production from which utility is derived can be expected to rise less fast than those of the inputs. There is a *prima facie* case for arguing that CPIs are likely to be subject to an upward bias, at least if a COLI is being targeted.

If the target is a cost-of-goods index, or COGI, rather than a COLI, the situation is rather different. The use of actual prices, even input prices, might be justified by *defining* the CPI as an index that measures changes in the market prices of goods and services purchased by households *for purposes of*

3. Nordhaus (1997) has provided a dramatic illustration of the effects of technological advance in the production of light by households.

*consumption*. In this case, it would not matter whether the goods and services are consumed directly without further processing or are used as inputs into household production of goods and services for own consumption. Such a definition is suggested in paragraphs 3.77 and 3.78 of the *2004 CPI Manual* (International Labor Organization et al. 2004). In this case, it has to be made clear to users that many, indeed most, of the goods and services included in the index are not actually consumed directly.

There is a parallel with public consumption. In principle, a price index for public consumption should refer to the prices of the consumption goods and services produced, or purchased, by government and provided to individual households or collectively to the community. As the goods and services in question are typically not sold but are provided free, or at a nominal charge, to households, there are usually no prices to be observed or collected. As a result, it is common for the price index for the output from government production to be estimated from changes in the market prices of the inputs, including labor inputs.

However, calculating the price index for public consumption on the basis of the prices of the inputs into its production is generally not considered to be acceptable. Again, assuming that there are advances in technology, it is likely that the prices of the outputs from government production rise less rapidly than the prices of the inputs. In this case, a price index based on the inputs is likely not only to overestimate the rate of inflation for government output but also to lead to an underestimation of the corresponding rate of real growth. These are matters of serious concern to government. They have led governments in a number of countries to promote research into the development of improved methods of estimating inflation and growth for government production and consumption.<sup>4</sup>

However, there seems to be not so much concern about the fact that the same problem occurs for CPIs. The purpose of this chapter is to draw attention to the nature and the scale of the problem. This has been made possible by the fact that for quite different reasons, a large amount of research into household production has been undertaken in recent years in a number of countries. Household production and consumption is no longer a black box.

## 11.2 Consumption and Consumption Expenditures

Consumption is a basic economic concept that is often not even defined, because its meaning is taken to be self-evident. However, it can mean different things in different contexts. In the present context, it is necessary to underline the fundamental distinction between consumption and consumption expenditures, even though the two terms are often casually used interchangeably.

4. For example, see Atkinson (2005) and Diewert (2008).

Consumption and production are opposite kinds of economic activities. Consumption, whether final or intermediate, is an activity in which goods and services are used up, whereas production is an activity in which goods and services are created.

Household final consumption is a particular type of economic activity in which members of households use goods or services to satisfy their personal needs, wants, or desires. By definition, a final consumption good or service provides utility to the person or household that consumes it. A final consumption good or service cannot be identified by its physical characteristics alone, however, as some goods or services may be used either for final consumption or as intermediate inputs into production.

Nondurable goods and services are single use, in the sense that they can be used once only. On the other hand, household durables are goods that may be used continuously or repeatedly over long periods of time to meet the needs and wants of households.<sup>5</sup> The consumption of durables therefore takes place gradually over time. It has become customary to describe the repeated use by saying that durables provide a flow of services.<sup>6</sup> Consumer durables are used directly for consumption, but durables such as boilers or cookers that provide a flow of capital services into household production in principle should be classified as fixed assets. In practice, only dwellings are classified as fixed assets in CPIs and national accounts. Dwellings provide flows of capital services into the production of housing services for household final consumption.

Household consumption expenditures may be defined as expenditures incurred by households to *acquire* goods and services that they intend to use for purposes of final consumption. They include expenditures on durables (but not, of course, purchases of dwellings). Most countries conduct periodic household budget surveys to collect information about household consumption expenditures, which are also used to derive expenditure weights for CPIs.

However, relatively few surveys have been undertaken on household consumption. One reason may be that production in national accounts has traditionally been confined mostly to market production. *By convention*, the production boundary in the international *System of National Accounts*, or SNA (Eurostat et al. 1993), and in the U.S. *National Income and Product Accounts*, or NIPAs, is drawn in such a way that with one important

5. Hicks introduced the terminology single-use goods and durable-use goods to emphasize that fixed assets and consumer durables are *in use*. He pointed out that some single-use goods, such as cans of food and drink, may be highly durable, in the sense that they do not deteriorate over time. He stated that the “common characteristic [of durable-use goods] is that they can go on being used for considerable periods of time” (1942, 27–30).

6. For example, Fisher described capital goods as providing a flow of services over time. He argued, “The services of an instrument of wealth are the desirable changes effected (or undesirable changes prevented) by means of that instrument. For instance, the services of a loom consist of changing yarn into cloth, . . .” (Fisher 1922, 19).

exception, the production of services within households is excluded.<sup>7</sup> The exception is the production of housing services by owner occupiers, which have always been included within the production boundary. Placing certain kinds of production outside the production boundary does not mean that the activities are regarded as nonproductive. It reflects the reluctance to include large nonmonetary flows in the accounts for which values have to be imputed.

Therefore, most of the value added created by household production does not enter into GDP. However, there is considerable interest among certain groups in knowing how much GDP would increase if the production boundary were to be extended to include all household production. As it is widely believed that the greater part of the unrecorded production may be carried out by women, the national accounts and GDP have often been criticized as understating the contribution of women to production and failing to reflect their role in the economy.

Many countries, including the United States, have therefore constructed satellite accounts<sup>8</sup> in order to be able to record household production for consumption. A recent study of household production and consumption in the United States by Landefeld and McCulla (2000, 300), using U.S. Bureau of Economic Analysis data, estimates that “the inclusion of household non-market services raises GDP by 43 percent in 1946 and by 24 percent in 1997.” They also conclude that only “12 percent of the conventional estimate of final consumption expenditures [for 1992 in the national income and product account (NIPAs)], is actually final consumption,” and adding household consumption of own production “to this remaining market consumption yields a new estimate of consumption, 91 percent of which is made up of own consumption” (304). The estimates made by Landefeld and McCulla are presented in more detail next.

Studies such as these show conclusively that consumption and consumers’ expenditures are quite different flows. Prices can be collected for the goods and services purchased by households in market transactions but not for goods and services produced and consumed within the same household.

### 11.3 A Household Production Account

In order to get a better picture of household production, it is useful to set up an illustrative production account. Consider the production of a final

7. In principle, the production of goods for own use within households is included within the production boundary, but in practice, few countries attempt to measure it systematically in their main accounts.

8. Satellite accounts are intended to supplement or complement the main national accounts. They respect the accounting rules and conventions of the main national accounts as much as possible but deliberately deviate from them in certain respects in order to be able to record activities or flows that are omitted from the main system.

consumption good such as bread, cake, or a cooked meal. The account has the same format as a production account for an enterprise engaged in food manufacturing. If the inputs and outputs are independently priced, the total values of the inputs and outputs will not be identical. In this case, the account is balanced by defining the difference between total values of the outputs and the inputs as the net operating profit or loss. However, if the value of the output is estimated as the sum of the inputs, the two totals must be identical, and there is no need for a balancing item. These valuation issues are considered further in table 11.1.

The first group of intermediate inputs consists of foodstuffs such as flour, eggs, sugar, spices, and so forth. If they have been bought on the market, their purchase would have been recorded under household final consumption expenditures, even though they are meant for intermediate, not final, consumption. As several different kinds of productive activities may be carried on within the same household, even some of the intermediate inputs, such as the foodstuffs or fuel in the example, may themselves have been produced within the household. For example, the electricity could have been produced for own use by the household's own generator, or the oven could have been fired by wood collected by the household.

If the kitchen durables had been bought on the market, the purchases would have been recorded under household consumption expenditures. However, the relevant inputs consist of the capital services they provide. The expenditures would only approximate the value of the services if the durables have very short service lives and high rates of depreciation (or the accounting period is very long). In any case, total measured household purchases would still fall far short of the total value of the bread and cakes produced and consumed, as the labor services provided by members of the household are not purchased and would not be recorded under household consumption expenditures.

**Table 11.1** Illustrative household production account

Inputs	Outputs
Intermediate inputs	Bread, cake, or other output
Foodstuffs used as ingredients	
Electricity, gas, or other fuel; water	
Other inputs	
Inputs of labor and capital services	
Labor inputs	
Capital services from fixed assets	
Kitchen equipment	
The dwelling	
Total	= Total

## 11.4 Some Estimates of the Magnitude of Consumption of Own Production

Interest in production for own consumption as a household activity stretches back many decades—at least to Margaret Reid’s 1934 book, *Economics of Household Production*. On the economic theoretical side, it received a considerable boost from Gary Becker’s influential paper “*A Theory of the Allocation of Time*” (1965).<sup>9</sup> It is now becoming feasible to make reasonably reliable estimates of household production by utilizing information derived from time-use surveys in which members of households are required to keep detailed diaries of the various ways in which they spend their time throughout all twenty-four hours of the day. Time-use surveys are being undertaken in an increasing number of countries.<sup>10</sup> While these surveys provide information about the quantities of labor inputs into household production, there still remains the major problem of how to value these inputs. One possibility is to value them at the wage rate payable for the same kind of work on the market (external opportunity costs). Alternatively, the inputs could be valued at the maximum wage rate that the household worker could have earned on the market for other kinds of work (internal opportunity costs). These alternatives are discussed in more detail later.

Estimates reported by Goldschmidt-Clermont and Pagnossin-Aligisakis (1999) in their report on time-use surveys undertaken in fourteen countries indicate that for thirteen out of the fourteen countries covered, the total amount of time spent by household members on unrecorded own account production is equal to or greater than the total amount of time spent working in SNA-type production that falls within the national accounts production boundary. Again, in thirteen out of fourteen countries, men tend to spend most of their time in SNA-type production, while women tend to spend most of their time on the unrecorded *non*-SNA-type activities.

A major new ongoing survey in the United States, the *American Time-Use Survey*, has recently been started by the U.S. Bureau of Labor Statistics. This survey is administered using computer-assisted telephone interviewing, rather than the paper diaries used in most other countries. A full description and some summary results for 2004 are published in the paper by Frazis and Stewart (2006).

These data are averages covering both the employed and the unemployed.

9. Diewert (2001, 231–38) develops the cost-of-living implications of Becker’s theory, both under the assumption that time-use data are available and under the assumption that they are not available. In the latter case, Diewert (2001, 234) presents a justification of the traditional acquisitions approach to the CPI but notes that his justification suffers from the problem of technical progress in the household production functions, and hence his blended utility function will not remain constant over time.

10. See, for example, the collection of papers presented at the International Conference on Time Use in Luneberg, Germany in 1998 and published in *Time Use: Research, Data, and Policy*, edited by J. Merz and M. Ehling (1999).



**Table 11.2** Where does the time go? Hours spent in major activities (United States, 2004)

Activity	Men	Women
Personal care activities (including sleeping)	9.13	9.54
Working on SNA-type production	4.57	2.87
Household productive activities outside the SNA production boundary	4.61	6.42
Leisure, sports, religious activities	5.70	5.18
Total	24.0	24.0

*Source:* This table condenses data from table 1 in Frazis and Stewart (2006).

Employed men spend an average of 6.26 hours per day at work. The results in table 11.2 are broadly consistent with the generalizations previously noted on the basis of the survey undertaken by Goldschmidt-Clermont and Pagnossin-Aligisakis (1999).

Time-use surveys provide data that may be used for the construction of household satellite accounts, although the surveys usually do not try to record actual quantities of goods and services produced. In general, the values of the outputs are estimated from the input side by summing the estimated costs of production, with the value of the labor inputs being one of the principal costs. Even valuing the outputs on the basis of the inputs presents serious difficulties, and these valuation problems are considered in more detail next, as they are relevant to the possible compilation of price indexes covering own-account consumption.

Goldschmidt-Clermont and Pagnossin-Aligisakis (1999) also report on the effects on GDP of including household production within the SNA production boundary. For the fourteen countries surveyed, the inclusion of household own-account production would increase GDP by amounts ranging from about 25 percent to 55 percent. As already noted, the estimates for the United States by Landefeld and McCulla (2000) increase GDP by 43 percent in 1946 and 24 percent in 1997. All the evidence indicates that household production makes a major contribution to the total production and consumption in both developing and developed countries.

One difficulty is that existing classifications of productive activities, such as standard industrial classifications, have been developed in relation to market production. However, some of the productive activities carried on within households may not have exact market equivalents or counterparts. Similarly, some of the outputs produced may not be exactly the same as commodities traded on markets. Good classifications are a prerequisite for useful analysis, and the lack of internationally agreed classifications in this area is an obstacle. Researchers into household production and consumption usually devise their own classifications of both the activities and their outputs.

The set of satellite household production accounts for the United States

compiled by Landefeld and McCulla (2000) include an input-output table for household production. The data in this table make it possible to examine the interrelationship between household consumption and consumers' expenditures in some detail, even if the data cannot be expected to achieve the same standards and reliability as those in the regular national accounts. Thirteen household production activities and commodities are distinguished: food preparation, cleaning, laundry, household management, animals and plants, repair, yard work, child care, health care, shopping, services, travel, and other. The activities consume intermediate inputs purchased from outside the household, labor services provided by members of the household, and capital services provided by the fixed assets owned by the households. As proposed in this chapter, household durables used in production are treated as household-fixed assets. The outputs from the activities are entirely consumed within the household.

Landefeld and McCulla compare the values of the outputs of household production consumed by households with the values of household expenditures on the same kinds of goods or services purchased in shops or other outlets. They give the following examples. The value of household food preparation in 1992 was \$717 billion,<sup>11</sup> compared with household food expenditures of \$253 billion on prepared meals in the marketplace. Household laundry output was valued at \$90 billion, whereas the value of expenditures on cleaning, storage, and the repair of clothing and shoes was only \$11 billion.

The figures in table 11.3 are found in Landefeld and McCulla's paper (2000, 304).

Only 12 percent of the goods and services purchased on the market by U.S. households for purposes of consumption in 1992 were directly consumed by households without further processing. Of the remaining 88 percent, 62 percent were used as intermediate inputs into household production of other goods and services for own consumption, while the remaining 26 percent were reclassified either as capital formation or as household value added.

Using data from the input-output table in Landefeld and McCulla's paper (2000, 303), it is possible to construct the aggregate production account for all households shown in table 11.4.

It should be noted that the total value of household consumption is actually \$5,713 billion, comprised of the \$5,189 billion produced by households *plus* the expenditures of \$524 billion shown in table 11.3 on goods and services that were consumed directly. Thus, only 9 percent of the final consumption of households consisted of goods and services purchased by households that were directly consumed without further processing.

11. Goldschmidt-Clermont and Pagnossin-Aligasakis (1999) report that in all of their countries except one, "food preparation requires the largest share of non-SNA time" (521).

**Table 11.3 Breakdown of household consumption expenditures by type or use (United States, 1992)**

	\$ (billions)	%
Personal (household) consumption expenditures (as recorded in the NIPAs), of which:	4,209	100
Goods and services subsequently used as intermediate inputs into household production	2,596	62
Purchases of durables (reclassified as gross capital formation)	471	11
Consumption of housing services produced by owner occupiers (reclassified as household value added)	618	15
Goods and services directly consumed by households without further processing	524	12

**Table 11.4 Aggregate production account for household production for own consumption (United States, 1992)**

Inputs	\$ (billions)	Outputs	\$ (billions)
Total value of households' personal expenditures on goods and services used as intermediate inputs	2,596	Total value of consumption goods and services produced and consumed by households	5,189
Gross value added produced within households, of which:	2,593		
Labor services provided by household members	1,449		
Capital services provided by household-fixed assets, including dwellings	1,144		
Total	5,189	Total	5,189

The \$5,713 billion of total household consumption exceeds the \$4,209 billion of total household consumption expenditures by \$1,504 billion, which is largely explained by the additional value created by the labor services provided by household members. The difference is also affected by various reclassifications, however, as neither durables nor housing services are treated as being consumed directly, both being treated as providing flows of capital services into household production.

#### 11.4.1 Valuing Household Consumption

As no monetary transactions occur for goods and services that are produced and consumed within the same household, no prices are generated. In this situation, there are two alternative ways of valuing the nonmarket output of household production. One is to try to find market prices that can

be used to value the outputs, and the other is to value the outputs by their costs of production. As already noted, the same valuation problem occurs with the output of nonmarket services produced by government enterprises or nonprofit institutions.

If the same goods and services are sold on the market and market prices can be found for them, they can be used to value the goods and services produced by households for own use. Valuation at market prices is the procedure adopted in national accounting whenever possible. For example, market rents may be used to value the output of housing services produced by owner occupiers. However, the qualities of the goods and services produced within households tend to systematically differ from those of similar kinds of goods and services sold on the market, if any. In general, there seem to be very few cases where appropriate market prices can be found to value the output of household production, so other valuation methods have to be adopted.

The alternative is to value the outputs by their costs of production. This method is widely used in national accounts to value all kinds of nonmarket output. For example, in the production account in table 11.4, the figure of \$5,713 billion for the output of household production is obtained as the sum of the intermediate and primary inputs on the left side of the account. There is assumed to be no net operating surplus or profit. This method shifts the problem of valuation from the outputs to the inputs.

There are three main inputs: intermediate inputs, capital services, and labor services. When purchased on the market, the value of the intermediate inputs is given straightforwardly by the expenditures incurred. The value of inputs of capital services is given by the user costs incurred—that is, by the sum of the depreciation and interest costs on the household-fixed assets. The main problem with the input approach is the valuation of the labor inputs. The labor inputs themselves are nonmarket, like the outputs they are being used to value. The valuation of labor inputs into household production is one of the more controversial topics in household production accounting.

The quantities of labor inputs can be estimated by using data on hours worked from time-use surveys, but they have to be valued. As already noted, the procedure adopted in national accounts is to value nonmarket flows of goods and services whenever possible at the prices at which the same goods and services are bought and sold on markets. To be consistent with this general principle, the labor inputs should be valued using the market wages payable to employees doing the same kind of work.

However, a case can also be made for valuing at internal opportunity costs—that is, what the person could have earned by taking paid employment. Valuing at internal opportunity costs is not generally favored in studies on household production, because it makes the value of the labor inputs depend on who does the work, rather than on the nature of the work done. In any case, most paid employees are not able to vary the amount of paid work

they do to suit their own preferences. If they take on a second job instead of working in the home, they are likely to be paid less than in their main job.

A further complication is that people may engage in certain household productive activities, such as child care, because they enjoy it. Certain types of work may actually be undertaken as a form of leisure activity. For example, many people undertake do-it-yourself activities, ranging from cooking and gardening to constructing extensions to dwellings, because they derive satisfaction from the work itself, not merely from the output produced. The trade-off may not be between do-it-yourself activities and paid employment but between do-it-yourself activities and other forms of leisure activities, such as watching television or sports activities. The motivation behind some household activities may be quite complex. For example, the activity of gardening is recognized to be a good form of exercise, so it may be undertaken as a substitute for going to the gym (and savings on gym subscriptions). At the same time, it produces fruit and vegetables for eating and flowers and pleasant surroundings that enhance the value of the house. The concept of the opportunity cost in these kinds of circumstances is not altogether clear. On balance, it seems preferable to value work done in household production at the corresponding market wage rate for that type of work. This is a simple, objective, and rational method of valuation.

#### 11.4.2 Price Indexes for Household Consumption

Notwithstanding the difficulties of valuing the labor inputs, estimating the value of the output of household production and consumption by summing the values of the inputs is likely to produce estimates of the right order of magnitude for a single period of time. From a CPI perspective, however, it is necessary to factor changes over time in the current values of household consumption into their price and quantity components. This is an altogether more difficult undertaking.

Although the total values of inputs and outputs may be identical for a single period of time, there is no corresponding identity between changes in the real values of inputs and outputs over time or between average changes in input and output prices. They diverge because of changes in productivity. Thus, even if satisfactory price indexes could be compiled for each of the inputs, a weighted average of the price indexes for the inputs into household production would not provide a satisfactory estimate of the price index for the outputs, except possibly in the very short term.<sup>12</sup>

As already noted, the problem is the same as that of measuring inflation and real growth for government nonmarket output. However, the problem

12. However, Diewert has shown that even in the longer term, an acceptable estimate of a COLI could be obtained if there were no technical progress and if household time were valued appropriately; see Diewert (2001, 233).

is even more acute for household production, because the values of the labor inputs have to be imputed, whereas the values of the labor inputs into government production can be measured by the compensation of employees actually paid.

It is only possible to make a satisfactory estimate of the rate of inflation or real growth of nonmarket output from input data if there is an independent estimate of the rate of growth of productivity. However, there is little to no hard evidence about changes in productivity for household production. It may be conjectured that household productivity has been rising over the long term, because as the general standard of living rises, households tend to equip themselves with more and better quality household-fixed assets, while the technology of household production is also likely to be improving over time. Estimating the rate of inflation or growth of the output from household production from the rates of inflation or growth of the inputs cannot be acceptable if no account is taken of household productivity growth.

It may be concluded that there is not much possibility of constructing a satisfactory price index for the consumption of own production within households, regardless of whether the price changes are estimated on the basis of movements in equivalent market prices or whether they are imputed from changes in input prices. Certainly, it is unlikely that such an index could be compiled on a regular monthly basis and used for policy purposes.

No price or volume indexes are provided in the satellite accounts for U.S. household production referred to previously. Landefeld and McCulla (2000) comment as follows: "Given the absence of output price data for household production, no real inflation adjusted estimates are presented here. The use of wage rates or other input costs to deflate household production would result in low or zero productivity in the household sector and bias real growth in household relative to market production" (300). Goldschmidt-Clermont and Pagnossin-Aligisakis (1999) conclude that "valuation will have to be output based, *i.e.*, it will have to start with the physical measurement of household output and value it at market prices. . . . Unfortunately, very little experience is available, as yet, with this approach at national levels" (528).

## 11.5 Summary and Conclusions

The chapter shows that there is a serious but neglected problem concerning the estimation of cost of living indexes. The problem is that most of the goods and services from which consumption households derive utility are produced by the households themselves. No prices are generated in the process. They are not the same goods and services that households purchase and for which statistical offices collect prices.

In the last two decades, satellite accounts for household production have

been constructed for a number of countries, which make it possible to obtain a fairly clear picture of the scale and nature of household production for own use, both for own consumption and own gross fixed capital formation. The accounts have shown that a surprisingly large proportion of the goods and services purchased by households and classified as final consumption expenditures in national accounts, household budget surveys, and CPIs are not in fact consumed directly.

This research has been motivated largely by interest in the quantities produced and consumed, not by their prices. Living standards and welfare are determined by the quantities. Moreover, the status of the quantities and the prices that determine the imputed values of the relevant flows are quite different. In fact, only the prices are hypothetical and imputed. The quantities are real and therefore observable and measurable. Imputed values are therefore generally acceptable to analysts or policymakers primarily interested in volume changes, because they reflect changes in actual quantities. However, analysts interested in actual price movements are unlikely to regard price indexes based largely on movements in hypothetical imputed prices as acceptable.

Moreover, systematically imputing the prices in a price index is scarcely feasible. It may not be possible to find equivalent market prices for many goods and services produced on own account, because they are intrinsically different from those purchased on the market. For example, child care provided by the parents is a unique product that is not the same as nursery care. Meals prepared at home are not the same as restaurant meals. Driving one's own car is different from taking a taxi, and so on. There are substantial qualitative differences between own-produced products and superficially similar products sold on the market. It is likely to be impossible to adjust for such differences satisfactorily.

In any case, a price index that is calculated mainly from imputed prices would not be acceptable to most users. A CPI is a key statistic for policy purposes that can have important financial implications, as it is widely used for indexation purposes. It has to be objective, transparent, reliable, and credible.

In practice, CPIs measure changes in the market prices of the goods and services included in household final consumption expenditures as defined in national accounts and household expenditures surveys. Such an index can be interpreted as a consumer price index that measures changes in the prices of goods and services that households purchase with the intention of using them directly *or indirectly* for purposes of consumption—that is, to satisfy their personal needs or wants. Market prices are readily available for them and can be collected as frequently as desired.

The difficulty with a pragmatic approach of this kind is that such an index is likely to have an upward bias when compared with a COLI. The goods

and services included in a COLI should be those from which consumption utility is derived, as distinct from the goods and services purchased in retail outlets. Goods or services that are used as inputs into household production should not simply be treated as if they were final consumption goods and services. Consumer price indexes that are meant to target COLIs but that in fact make extensive use of input prices are likely to have an upward bias, given that the technologies used in household production are continually improving.<sup>13</sup> As recent studies have shown that most of the goods and services purchased by households are used as inputs rather than consumed directly, this is not a trivial problem.

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13. As already noted, Diewert (2001) has shown that input prices can be used in the estimation of a COLI in a model that integrates household production and consumption but only when there is no technical progress.



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