

Household production, consumption and CPIs

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## Household Production, Consumption and CPIs

*Most of the so-called ‘consumer’ goods and services purchased by households whose prices are used to compile CPIs are not directly consumed by households. Some of the goods purchased are used up as intermediate inputs into household production for own consumption. Some others are actually fixed assets that are used to provide inputs of capital services into future household production. Estimates for the USA suggest that only about an eighth of the goods and services conventionally classified as consumers’ expenditures may be directly consumed as they are. Most of the final goods and services from whose consumption households derive utility are produced by the households themselves. The set of goods and services that provide utility is not the same as the set classified as consumers’ expenditures, although the two sets overlap to some extent. Cost of living indices should presumably refer to the first set whereas CPIs actually refer to the second set.*

### *Introduction*

CPIs measure changes in prices for goods and services classified as consumers’ expenditures in national accounts and household budget surveys. The prices at which consumers’ expenditures are valued in national accounts are the purchasers’ prices paid by households<sup>1</sup>. They are market prices including any taxes and delivery charges. However, the prices are actually collected from the sellers and are not from households.

Many of the so-called ‘consumer’ goods and services classified as consumers’ expenditures are not in fact directly consumed by households. Many are used to provide inputs into the production of other goods and services from which households actually derive utility. A simple example is provided by the production of meals. Foodstuffs such as raw meat, vegetables, rice, flour, sugar, salt, *etc.* whose purchase will have been classified as consumers’ expenditure are used as intermediate inputs into meal production. There may be other kinds of intermediate inputs such as gas or electricity, also classified under consumers’ expenditures. The production also requires inputs of labour services and the capital services of household fixed assets acquired in earlier periods, such as kitchen equipment. Utility is eventually derived from consuming the output, the meal, not the various inputs.

It might be thought that only a small proportion of the consumer goods and services purchased by households’ would be used for production, and that most would be directly consumed. However, a recent study of household production and consumption in the United States by Landefeld and McCulla (2000) of the *U. S. Bureau of Economic Analysis* suggests the reverse. They conclude that only “12 percent of the conventional estimate of final consumption expenditures [in the U.S. in 1992] is actually final

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<sup>1</sup> See the 1993 *System of National Accounts*, or 1993 *SNA*, paragraph 6.215.

consumption; adding household own-consumption to this remaining market consumption yields a new estimate of consumption, 91 percent of which is made up of own consumption.”

Most of the household production for own consumption considered in this paper falls outside the boundary of production as conventionally defined in national accounts. It does not enter into GDP. There is considerable interest in knowing by how much GDP would be increased if it were to be included. Landefeld and McCulla estimate that “the inclusion of household nonmarket services raises GDP by 43 percent in 1946 and by 24 percent in 1997.” As it is believed that most, although by no means all, of the unrecorded production may be carried out by women, the national accounts and GDP are continually being criticised for understating the contribution of women to production and their role in the economy.

The accounting literature has focused on the quantity side of household production and consumption and rather than the price side. There is good reason for this. The quantities of goods and services produced and consumed can be observed and recorded. They are real and do not have to be imputed. The quantities produced and consumed have a significant impact on household welfare. On the other hand, the outputs are not bought or sold so that there are no prices to be observed for them. If the output is to be valued it has to be at imputed shadow prices. Statistical agencies tend to be reluctant to include hypothetical imputed prices in official price indices that are to be used for policy and indexation purposes<sup>2</sup>. CPIs measure changes in observed market prices.

Household production and consumption is a grey area. The first part of this paper is therefore devoted to clarifying some basic concepts and definitions.

### *Consumption and consumption expenditures*

Consumption is a basic economic concept whose meaning is often taken to be self evident. However, it may mean quite different things in different contexts. In the *1993 SNA*, consumption and production are both treated as types of economic activity. Consumption is an activity in which goods and services are used up. Production is an activity in which an economic unit uses intermediate and primary inputs of labour and capital to produce outputs. More precisely, household final consumption is an activity in which members of households use goods or services to satisfy to satisfy their needs, wants or desires.<sup>3</sup> By definition, a final consumption good or service provides utility to the person or household that uses it. A final consumption good or service cannot be defined, or identified, by its physical characteristics alone, as many goods or services may be used for different purposes. Many goods may be used as intermediate inputs into production as well as for final consumption. A utility function may be associated with

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<sup>2</sup> One important exception is that the imputed prices of housing services produced and consumed by owner occupiers are often included in CPIs.

<sup>3</sup> In paragraph 9.42 of the *1993 SNA* an individual consumption good or service is defined as “one that is acquired by a household and used to satisfy the needs and wants of members of that household.”

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the activity of final consumption. It expresses utility as a function of the quantities of goods and services consumed. Its form depends of the tastes and preferences of the person or household concerned.

The term ‘household consumption’ is also used in a different sense to refer to the quantities, or values, of the goods and services consumed by households. As it is not possible to change long established usage, there is always a potential ambiguity between consumption as an activity and the goods and services consumed by that activity<sup>4</sup>. In a specific context, however the meaning is usually quite clear. On the other hand, a clear distinction must be drawn between ‘consumption’ (in either sense) and ‘consumption expenditures’. More generally, it is necessary to distinguish consumption from acquisitions of consumption goods and services.

Household consumption expenditures may be defined as expenditures incurred by households to acquire goods and services that they intend to use for purposes of household final consumption. They are one of the major flows in national accounts. Most countries also conduct periodic household budget surveys to collect information about household consumption expenditures that may be used to obtain expenditure weights for CPIs.

As already explained, the set of goods and services that make up household consumption expenditures is not the same as the set of final goods and services consumed by households in the same period, although the two sets may overlap. Many of the goods and services purchased by households may be used as intermediate inputs into household production rather than being consumed directly as they were bought. Some of the goods purchased may also be fixed assets that are used to provide capital services in future periods. Most of the goods and services that make up household final consumption are produced by the households themselves and are not purchased on the market.

The *1993 SNA* draws a distinction between households’ *consumption expenditures* and their *actual final consumption*. This is a different kind of distinction from that between household expenditures and household consumption as just described. It concerns the consumption goods and services acquired by households as social transfers in kind such as health or education services that are provided free, or at reduced prices, to individual households by governments or non-profit institutions. Households’ actual consumption is defined as their consumption expenditures plus the social transfers in kind they receive. The expenditures on social transfers in kind are incurred by the governments or non-profit institutions which supply them to households.

In many countries, a significant part of households’ utility may be derived from consuming social transfers in kind, mostly services such as health, education or housing. There are no market prices to be observed or collected for these transfers which tend to fall outside the scope of CPIs in practice. If a CPI is confined to the expenditures that

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<sup>4</sup> There is a similar ambiguity between ‘production’ as an activity and ‘production’ meaning the output from that activity.

households incur themselves, and if it is meant to target a COLI, it has to be conditional on the amounts of social transfers in kind received by households in the reference period.

### *Households as consumer units*

Households are autonomous economic units or “institutional units” as defined in the *1993 SNA*. A household is defined in the *1993 SNA* (paragraph 4.132) as “a small group of persons who share the same living accommodation, who pool some, or all, of their income and wealth and who consume certain types of goods and services collectively, mainly housing and food.”

A more detailed definition of a household is that used in population censuses, namely:

“either (a) a one person household defined as an arrangement in which one person makes provision for his or her food or other essentials for living without combining with any other person to form part of a multi-person household.

or (b) a multi-person household, defined as a group of two or more persons living together who make common provision for food or other essentials for living. The persons in the group may pool their incomes and have a common budget to a greater or less extent; they may be related or unrelated persons or a combination of persons both related and unrelated.”

A household is therefore primarily a consumption unit. However, some members of households obviously also engage in other kinds of economic and non-economic activities including

- production,
- gross fixed asset formation,
- other activities.

### *Household production*

Production is an activity or process, organised and managed by some economic unit, in which inputs are used to produce outputs. It may be represented a production function in which outputs are a function of the inputs, the form of the function depending on the technology used. In order for a productive activity to be organised on a market basis it must be possible for some or all of the outputs to be traded and for some of the inputs to be provided by units other than that managing the production.

Members of the same household may engage in three quite different kinds of production.

- One or more members of the household may own and operate an unincorporated market enterprise such as a farm, a factory, a shop, a medical or dental practice, a

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law practice, and so on. Some of the output may be retained for the household's use.

- One or more members of the household may engage in *own account production*: that is, production whose output is retained by the household for its own consumption or capital formation. Households may produce intermediate goods such as vegetables or other agricultural goods and also final consumption goods such as bread and cakes, preserved food, cooked meals or clothing. They may also produce capital goods (fixed assets) for their own use. Some households construct their own dwellings or extensions to their dwellings. These assets are used subsequently in production. Households also tend to produce a range of services for their own consumption: for example, the cleaning and maintenance of household equipment and the dwelling, the care and education of children, and the care of the sick or infirm.
- One or more members of the household may also work outside the household as paid employees by providing labour services to be used as inputs into processes of production organised and controlled by others.

In principle, the activities and accounts of unincorporated enterprises should be separated from the households that own them, but it can often be difficult to disentangle the transactions made by the owner of a small enterprise from those made by the same person as a member of the household. The goods and services purchased for business use by a member of a household in his or her capacity as the owner of an unincorporated enterprise are outside the scope of a CPI index.

The goods and services that are produced for own final consumption within households account for most of the consumption that takes place within households. The *SNA* recognises all goods production within households as falling within the production boundary and contributing to GDP. However, the *SNA* excludes, *by convention*, the production of all household services for own use, with one major exception namely the production of housing services by owner occupiers.

### *Household gross fixed capital formation*

In the *1993 SNA* (paragraph 10.33), gross fixed capital formation is defined as the value of acquisitions less disposals of fixed assets. Fixed assets are in turn defined as durable goods that are used repeatedly or continuously over a long period of time (by convention at least a year) for purposes of production. They provide inputs of capital services into processes of production. Durability is a necessary but not sufficient condition for a good to be a fixed asset. A good such as coal, or a can of food or drink, may be highly durable, in the sense that it can be held in stock for a very long period of time without deteriorating much, if at all, but it can be used once only.<sup>5</sup> A fixed asset is

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<sup>5</sup> John Hicks introduced the terminology 'single-use goods' and 'durable-use goods' to emphasize that fixed assets and consumer durables are durable *in use*. He pointed out the single-use goods include some highly durable goods, such as coal, as well as non-durable goods in the sense of goods that are liable to

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therefore a durable-use good used by a *producer* repeatedly or continuously *in production*. It provides a stream of inputs into production which it is customary to describe as a flow of ‘capital services’.<sup>6</sup>

It might be useful to try to divide the durable goods acquired by household into two categories, namely *consumer durables* and *household fixed assets*. A *consumer durable* could be defined as a durable from whose use a person derives utility directly, such as a TV, audio equipment, communications equipment, leisure and sports equipment. A *household fixed asset* is defined as a durable that households use to produce other goods and services from which utility is derived. Household fixed assets include household machinery and equipment such as lighting, heating and cooling equipment, cookers, ovens, refrigerators, freezers, washers, dishwashers, *etc.* and also vehicles. However, both national accounts and CPIs recognize only one type of household fixed asset, namely a dwelling. Owner occupiers use dwellings to provide a flow of capital services into the own account production of various kinds of household services. In reality, however, the production of these services also requires the capital services provided by some other kinds of fixed assets mentioned above, such as lighting, heating and cooling equipment, cookers, ovens, refrigerators, freezers, *etc.* These are types of fixed assets that are separate from the dwelling even though they may sometimes be built into it. Their services are used together with the capital services of the dwelling itself to produce final consumption goods or services in the form of protection, shelter, lighting, heating, cooling, comfort, *etc.*

One interesting example of a final consumption good is light. Light is consumed directly by persons and artificially produced light has had a considerable impact on their utility and way of life. Light has the advantage that its quantities can be measured objectively and precisely. Households today produce electric light by a process that requires intermediate inputs of electricity and light bulbs and the consumption of the capital services of household fixed assets in the form of light fixtures, wiring and other equipment incorporated in the dwelling. William Nordhaus (1994) has argued convincingly that the price of a unit of light must have fallen over the last century and a half as a result of revolutionary changes in the technology of producing light. Its price must have moved very differently from the prices of the various different kinds of inputs from candles to halogen bulbs and electricity that may be used to produce it. The inputs are the kinds of goods that are covered by CPIs.

In practice, it may not be feasible to draw a clear distinction between consumer durables and household fixed assets. Even durables such as TV, video and audio equipment may require inputs of electricity and housing services to be enjoyed. The

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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.” Hicks (1942: pp. 27 – 30).

<sup>6</sup> Irving 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).

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distinction may also not be necessary. On balance, it seems preferable to treat all household durables as household fixed assets.

Because national accounts and CPIs recognise only one kind of fixed asset, the acquisition of a dwelling is the only kind of gross fixed capital formation that can be undertaken for purposes of household production for own consumption. Expenditures on all other kinds of household fixed assets are, by convention, classified as consumption expenditures as if they were purchases of intermediate inputs into household production.

### *A household production account*

In order to get a better fix on household production, it is useful to set up an illustrative production account. Consider the production of a food product such as bread, cake or a cooked meal. The account takes the same format as would the production account for an enterprise engaged in food manufacturing. If the inputs and outputs were independently priced, the total values of the inputs and outputs would not be identical and an operating surplus or deficit would have to be included as a balancing item. Alternatively, the value of the outputs might be imputed as the sum of the production costs. These valuation issues are considered further below.

INPUTS	OUTPUTS
<i>Intermediate inputs</i>	Bread, cake or other output
Foodstuffs used as ingredients	
Electricity, gas or other fuel; water	
Other inputs	
<i>Inputs of labour and capital services</i>	
Labour inputs	
Capital services from fixed assets	
Kitchen equipment	
The dwelling	
<i>Total</i>	= <i>Total</i>

The first group of intermediate inputs consists of foodstuffs such as flour, eggs, sugar, spices *etc.* These could have been purchased on the market or produced within the households, especially if the household has own account agricultural production. If they have been purchased on the market they would have been recorded under household final consumption expenditures in the national accounts and also in household budget surveys. Here, they are seen to be intermediate and not final consumption. Similarly, the electricity could have been purchased on the market or produced for own use by the household's own generator. Alternatively, the oven could have been fired by wood collected by the household.

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As several different kinds of productive activities may be carried on within the same household, some of the intermediate inputs, like the foodstuffs or fuel in the example, may themselves have been produced within the household. When there are successive stages of production, they can be vertically integrated for accounting purposes. In the resulting consolidated production account, outputs subsequently used as intermediate inputs into later stages would be cancelled out, leaving as inputs only intermediate inputs purchased on the market and the primary inputs of labour and capital. Similarly, on the output side, only the outputs that are used for final household consumption or capital formation would remain. In the case of completely self sufficient household, such the Swiss Family Robinson on a desert island, there would be no purchases on the market so that the account would reduce to the familiar GDP identity in which the value of the primary inputs of labour and capital equals the value of the final output used for consumption or gross capital formation.

### *Some estimates of the magnitude of consumption of own production*

Interest in production for own consumption as a household activity stretches back several decades. On the theoretical side, it was stimulated by Gary Becker's influential paper on "*A Theory of the Allocation of Time*" (1965) and by Kelvin Lancaster's "*A New Approach to Consumer Theory*", (1966). On the empirical side, surveys of time use are being undertaken in an increasing number of countries.<sup>7</sup> In these surveys, members of households are required to keep detailed diaries of the various ways in which they spend their time throughout all 24 hours of the day. On the basis of this information it is possible to estimate the amounts of time spent on the production of goods and services for own consumption within the household. It is then possible to make estimates the value of the outputs produced for own consumption. These surveys usually do not record the quantities of goods and services produced, although exceptionally they may do so. In general, the output values are not estimated from the prices of similar products on the market but indirectly from the costs of producing the outputs. Even valuing the inputs presents serious problems, especially the valuation of the labour inputs.

Several interests drive the research into household production and consumption. First, there is interest in knowing by how much conventional GDP as defined in the SNA may understate the total output and value added in the economy. Estimates reported by Goldschmidt-Clermont and Pagnossin-Aligisakis (1999) in their survey of investigations undertaken in fourteen countries suggest that the inclusion of household production within the SNA production boundary would increase GDP by amounts ranging from about 25% to 55%. As already noted, estimates for the USA by Landefeld and McCulla, (2000, p. 300) increase GDP by 43% in 1946 and 24% in 1997.

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<sup>7</sup> 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 Joachim Merz and Manfred Ehling, (1999).

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The estimates reported by Goldschmidt-Clermont and Pagnossin-Aligisakis (1999) indicate that for 13 out of the 14 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 production that falls within the national accounts production boundary. Again, in 13 out of 14 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. As a result, the contribution of women to the economy is not fully reflected in GDP and there have been repeated criticisms of the *SNA* on this account.

These examples are sufficient to show that household production makes a considerable contribution to the total production and consumption taking place within the economy. In the present context, the question is what are the implications of these very substantial flows of consumption goods and services for CPIs, or more generally for price and quantity measures for household consumption.

From a CPI viewpoint, a major question is what proportion of the goods and services actually consumed by households are produced within the household and what proportion are purchased in shops or other outlets to be consumed directly without further processing? Is the consumption of own production a peripheral issue for CPIs or is a central one? Recent estimates for the USA provide some answers.

One problem is that some of the production activities carried on within households may not have market counterparts. Similarly, some of outputs produced by may be different from commodities traded on markets. Researchers into household production and consumption have to devise their own classifications of both the activities and their outputs.<sup>8</sup> Good classifications are a pre-requisite for useful analysis and the lack of agreed classifications in this area is an obstacle.

Landefeld and McCulla (2000) construct a set of satellite household production accounts for the USA<sup>9</sup> which include an input-output table for household production. For this purpose, they define a set of industries and commodities covering all the various kinds of productive activities carried out within households<sup>10</sup>. The activities consume

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<sup>8</sup> In a recent study, Gronau and Hamermesh (2006, p.4) propose the following eight outputs in addition to sleep : lodging, appearance, eating, childcare, leisure, health, travel and miscellaneous.

<sup>9</sup> Satellite accounts are outside the central framework of the national accounts but conceptually linked to them. As Landefeld and McCulla state, p. 292: "A satellite account can do two things: highlight or provide more detail on the transactions occurring in a given sector ... or change the concepts underlying the accounts. Perhaps by adjusting the production boundary ... or by using alternative valuation methods. A satellite account for nonmarket household production can do both. First, it can show greater detail than the existing accounts on the marketed output of households. Second, it can extend the definition of production to include the nonmarket production of households." Thus, although the satellite accounts are closely linked to the regular NIPA accounts produced by BEA, they are intended to supplement, and complement, the regular accounts by providing information that cannot be shown by sticking rigidly to the existing accounting rules, conventions and classifications.

<sup>10</sup> The household activities and commodities are as follows: food preparation, cleaning, laundry, household management, animal and plants, repair, yard work, child care, health care, shopping, services, travel and other.

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intermediate inputs purchased from outside the household, labour services provided by members of the household and capital services provided by the fixed assets<sup>11</sup> owned by the households. The outputs 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>12</sup> compared with household food expenditures of \$ 253 billion on prepared meals in the market place. 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 data in the Table 1 are derived from the input-output table given on p. 303 of Landefeld and McCulla's (2000) paper. They refer to the US in 1992.

Table 1  
*Breakdown of household consumption expenditures  
by type or use*

	\$ billion	%
<b>Total personal (household) consumption expenditures,</b> (as recorded in the NIPA), <i>of which</i>	<b>4,209</b>	<b>100</b>
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 output of household production)	618	15
Goods and services directly consumed by households without further processing	524	12

Only 12% of the goods and services purchased in shops or other outlets by US households for purposes of consumption in 1992 were directly consumed by households without further processing. The remaining 88% were used either for capital formation or as intermediate inputs into the production of other goods and services that were actually consumed by households.

<sup>11</sup> As proposed in this paper, household durables are treated as household fixed assets.

<sup>12</sup> Goldschmidt-Clermont and Pagnossin-Aligasakis (1999, p. 521) report that in all of their countries except one, "food preparation requires the largest share of non-SNA time."

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A breakdown of the value of the total final consumption of US households in 1992 is given in Table 2. The difference between the value of total final consumption and total consumers' expenditures in Table 1 is mainly attributable to the value of the labour services contributed to household production, although the difference is also affected by various reclassifications as well.

Table 2  
*Breakdown of total final consumption between consumers' expenditures and household value added*

	\$ billion	%
<b>The value of total household final consumption</b>	<b>5,713</b>	<b>100</b>
<i>of which</i>		
Personal (household) expenditure on good and services consumed directly without further processing	524	9
Total value of consumption goods and services produced within households, <i>of which</i>	5,189	91
Total personal (households') expenditures on goods and services used as intermediate inputs into household production for own consumption	2,596	46
Total gross value added in household production <i>of which</i>	2,593	45
Labour services	1,449	25
Capital services provided by household fixed assets including dwellings	1,144	20

Thus, only 9% of the final consumption of households consisted of consumers' expenditures that went directly into final consumption without further processing. The remaining 91% were produced by the households themselves. Half their value is attributable to the value of the consumers expenditures used as intermediate inputs, the other half being the gross value added within households. 56% of the value added consists of labour inputs and 44% of capital service inputs. Neither durables nor houses are treated as being consumed directly, both being treated as providing flows of capital services into household production.

Data in satellite accounts cannot be expected to achieve anywhere near the same standards of accuracy and reliability as those in the regular national accounts, or NIPA.

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The construction of satellite accounts is typically a research type activity, at least in the early years. In the case of household production, it is particularly difficult to value some of the flows because they are non-market and do not have prices of their own. These valuation problems are considered further below. Nevertheless, the relative orders of magnitude of the various flows in Tables 1 and 2 are likely to be broadly correct. They present an strikingly unfamiliar picture of household consumption.

As Landefeld and McCulla point out, there are various uses for satellite accounts of this kind. They can be used to analyse the functioning of the economy, long term growth of production and productivity, and the distribution of income and welfare. For example, the inclusion of own account consumption produced within the household typically reduces the degree of inequality between households. There are also “gender” issues because of the important role played by women in household production. However, in addition, the results have implications for CPIs.

### *Estimating price indices for consumption of own production*

Estimating price indices for the outputs of own account household production presents both conceptual and practical problems. As noted earlier, many of the goods or services are different from those purchased by households and their characteristics are not easily defined. There is no generally accepted detailed classification of the outputs produced or the activities that produce them. There is also little or no information about the quantities produced in most countries. Furthermore, there are no prices to be observed or collected because the goods and services are not bought and sold. It is worth noting that similar problems arise for the consumption of own production by governments.

If, despite these difficulties, it were decided to try to estimate price indices for the goods and services produced and consumed by households, there are two main options. One is to try to find equivalent market prices and the other is to estimate price changes for the outputs on the basis of the price changes for the inputs. They are the same two options that exist for the production of government output for own consumption.

As already noted, many of the outputs produced within households may not have exact market equivalents so that there may be no market prices that could be used to value household output. Where market production does exist it may be so tiny compared with the non-market production within households that there must be doubts about the validity of valuing the latter at the prices of the former. For example, child care may be purchased but it is doubtful whether the market prices charged are suitable for valuing child care within households. There may be important differences in quality between the market and non-market production that are difficult or impossible to allow for. In any case, the use of ‘marginal’ market prices to value substantially larger non-market flows is questionable, because it is impossible to know what the market price would be if there were to be a massive shift from non-market to market production. Although price indices measure prices changes rather than price levels, the same reservations apply about the

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validity of using price changes for a relatively small market production to estimate price changes for the much larger non-market production.

An alternative would be to try to estimate the output price changes from the input price changes. It is possible to obtain a reasonable approximation to the current value of the non-market output produced in a single period of time by summing the costs of production. This is a method widely used in national accounts. The cost side of a production account has the following components<sup>13</sup>:

- Intermediate consumption
- Inputs of labour services (compensation of employees)
- Inputs of capital services (depreciation plus capital, or interest, costs)
- Taxes on production
- Net operating surplus.

In practice, there are unlikely to be any taxes on production. The net operating surplus may also be assumed to be zero for both household and government non-market production. Thus, the estimated value of the output reduces to the sum of the three inputs: intermediate consumption plus labour and capital services.

The growth in real non-market output over time may be estimated by a weighted average of the growth of the three inputs adjusted for changes in total factor productivity, if known. This is the method usually used in national accounts to estimate the growth of the non-market output of government. In principle, it could also be used to measure the growth of household non-market output, although it would be more difficult to obtain the requisite information about the growth of inputs into household production than into government production.

Similarly, in principle, it would also be possible to estimate the change in the price of household output for own consumption as weighted average of the price changes of the input price changes adjusted for productivity changes. However, in practice, the only one of the inputs for which it is possible to obtain a reliable price index would be intermediate consumption, as most of the intermediate inputs consist of goods and services that are available on the market. It may also be possible to estimate an acceptable price index for the capital services provided by household fixed assets, although this is not done at present.

However, it would be difficult to obtain satisfactory estimates of the price changes for the inputs of labour services into household own account production. The situation is different from government services because the labour inputs into government production are actually market flows whose value is measured by the compensation of employees actually paid to government employees. However, the labour inputs into

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<sup>13</sup> In the 1993 *SNA*, interest costs are not recognized so that the costs of capital services are reduced to depreciation only. This understates the value of the capital services and also total costs of production. The *SNA* is likely to be revised in due course to include the full cost of capital services in the production account.

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household production are themselves non-market. Indeed, the valuation of labour inputs into household production is one of the more controversial topics in household production accounting.

To be consistent with general SNA principles, the labour services should be valued using the market wage payable to employees doing the same kind of work. However, a case can also be made for valuing at opportunity costs: that is, what the person could have earned by taking paid employment. Valuing at opportunity costs is not favoured in the studies on household production because it makes the value of the labour inputs depend on who does the work rather than 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, while if they take on a second job 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 like it. Certain types of work may be undertaken as a form of leisure activity. For example, many people undertake do-it-yourself activities ranging from gardening to constructing extensions to dwellings because they derive satisfaction from the work itself and 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 TV or sports activities.

Finally, there is little or no hard evidence about changes in total factor productivity for household production, even though it may be conjectured that there have been increases over the long term. If the general standard of living is rising, households will tend to be equipped with more and better quality household fixed assets. The technology of household production is also likely to be improving over time. Labour productivity in household production is therefore likely to be continually rising. However, this does not necessarily imply that output prices rise more slowly than the prices of the intermediate inputs and capital service prices. More empirical research is needed.

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

No price or volume indices are provided in the satellite accounts for US household production referred to above. Landefeld and McCulla (2000, footnote p.300,) 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.” Goldschmidt-Clermont and Pagnossin-Aligisakis (1999, p. 528) 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.”

### *Summary and conclusions*

Personal, or household, consumption is an activity in which members of households use goods and services to satisfy their needs and wants. The set of goods and services that households consume in this way is not the same as the set purchased by households for purposes of consumption and recorded as consumer expenditures in national accounts and household budget surveys. There may be only a small overlap between the two sets. Many of the goods and services recorded under consumers expenditure are actually intermediate in nature. They are used as intermediate inputs into the household production of the final goods and services that households actually consume. Some other goods recorded under consumers expenditures are actually household fixed assets whose acquisition constitutes gross capital formation, not consumption.

The economic theory underpinning CPIs is based on the theory of consumer behaviour in which rational utility maximising individuals react by adjusting the relative quantities they consume in response to changes to changes in relative prices. However, the theory also has to explain exactly what is meant by ‘consuming’ and specify exactly what are the goods and services that are consumed. These questions are neither trivial nor self evident.

As just noted, there are two different but overlapping sets of good and services for which price indices might be calculated. The first set consists of the goods and services purchased by households that are conventionally classified as consumers expenditure. The second set consists of the goods and services that household actually consume and from which they derive utility. CPIs measure price changes for the first set. However a cost of living index, or COLI, should presumably refer to the second set, the goods and services from households actually derive utility. In this case, a COLI may be defined as the ratio of the minimum costs that households have to incur in order to maintain a given level of utility. Only some of the costs consist of current consumers expenditures, the rest consisting of the costs of the labour and capital services needed to produce the final consumption goods and services consumed by households. It might be possible to approximate to such a COLI by calculating a price index for the set of goods and services that household actually consume, but as explained in the paper it would be difficult to estimate such an index in practice.

Even when the domains of both indices are identical, a price index can only be expected to approximate to a COLI. Close approximations may be obtained by using superlative indices. However, the appropriate domain for a COLI does not appear to be the set of consumers expenditures covered by a CPI. If the domains of the two indices are different, a CPI and a COLI may be expected to diverge on this account. . Further research is needed to investigate whether this may be expected to introduce a systematic bias into the movements of a CPI compared with those of a COLI.

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