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ACCOUNTING FOR NONMARKET HOUSEHOLD PRODUCTION WITHIN A NATIONAL ACCOUNTS FRAMEWORK

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The satellite accounts illustrated in this paper reflect the household's role as a producer and an investor in durables as well as a consumer by modifying the NIPA's to (1) incorporate the value of nonmarket (unpaid) household work into GDP; and (2) treat expenditures on consumer durables as investment and measure the value of the services those durables provide. Additionally, an Input–Output (I–O) model highlights the household's functions as a producer and investor in much greater detail for the year 1992 by incorporating a household industry for each time-use activity and by showing the inputs to and outputs from each household industry's production.

1. INTRODUCTION

The U.S. national income and product accounts (NIPA's) are a system of statistics that present the value of the nation's output, the composition of that output, and the distribution of income generated in its production. Their purpose is to provide a coherent and comprehensive picture of the economic transactions that occur in an accounting period. As useful as this information is, however, the accounts' focus on the market and market transactions has led to criticism that the accounts fail to consider some important nonmarket forms of production. One long-standing criticism is that the accounts ignore household production, particularly, the unpaid work that takes place within the home.

Calls to include measures of unpaid work in economic accounts boil down to two types of concern. First, are the accounts comprehensive and theoretically consistent, or do they provide incomplete measures of production or measures that are dependent on certain circumstances? Second, do the accounts provide accurate and relevant data useful for answering economic questions, such as:

- To what extent is the growth rate of production and the increase in per capita income in a nation simply a reflection of the increasing participation of women in the labor force and the associated shift from nonmarket household production to market production?
- What are the primary inputs and outputs of households? How do household products compare in value to similar market goods and services? How labor- or capital-intensive are household production processes?
- How much do households consume? How much do they invest in durable goods?
- What are the relative rewards and trade-offs of market vs. nonmarket work?

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Satellite accounts such as the ones presented in this paper can provide the information necessary for the consideration of these questions. Comparable satellite accounts in other nations, and more thoroughly developed satellite accounts in the U.S., would also allow consideration of other policy-relevant questions such as:

- How much of the rapid growth in output and productivity in the Asian "Tigers" and other newly developing economies, featured in the current debate on competitiveness, is the result of a shift from subsistence and household production to market production?
- How much of the difference in GDP per capita between developed and less-developed nations is a reflection of differences in the proportions of nonmarket work in the economies being compared?
- To what extent are economic growth, unemployment, and family-care-related policies influenced by the fact that they are often viewed in the context of market-only output measures?
- Is the value of goods and services produced within the home significant enough to warrant policies that facilitate or even encourage persons to remain outside of the paid labor market?

1.1. *Background*

As early as the first construction and implementation of national income and product accounts, economic accountants have been concerned with the conceptual inconsistencies that can result from the exclusion of nonmarket, or unpaid, household production from the national economic accounts.

One of the consequences is illustrated by the textbook example of a cook or housekeeper who marries her (his) employer. Before the marriage, the cook's output and income are counted and included in gross domestic product (GDP) and gross domestic income (GDI). After the marriage, the same output is excluded and GDP and GDI fall. Two problems are illustrated by this example. The first is the inconsistency of GDP as a measure of economic activity. In this example, the measure of economic activity is affected by changes in institutional arrangements even though the true level of that activity has probably not changed. The second problem, related to the first, refers to the usefulness of GDP for analytical purposes. Since GDP is generally limited to market transactions, the usefulness of GDP as a measure of economic activity and growth is reduced.

These measurement issues have long been recognized as problematic in less developed economies, where a shift from subsistence to market production can result in an overstatement of recorded growth as measured by conventional estimates of GDP. More recently, these problems have arisen in Russia and Eastern Europe, as the shift from market production to black-market and nonmarket production has overstated the decline in recorded GDP for these countries.[1]

[1]At least part of the problem for these countries is the absence of source data to measure black-market activity. The NIPA's do cover and attempt to measure economic activity that is not reported to tax and other authorities. The exclusion of illegal activities is limited to criminal activities such as transactions involving illegal drugs, racketeering, and prostitution.

Similar problems arise in developed economies. The adjusted measures presented here suggest that in the United States, the growth in real GDP during the post-WWII era has been overstated as female labor force participation has nearly doubled from 31 percent in 1946 to 60 percent in 1997, with a related shift from home-produced to market-produced goods and services. The exclusion of non-market household production can also distort comparisons of output across nations: In less developed countries, a larger proportion of total production takes place within the home. If this unpaid work is not counted in both developed and undeveloped countries, the gap between measures of their output will be overstated.

The exclusion of household production from national accounts has occurred, in part, as a result of the difficulties encountered by economic accountants as they move from measuring market output to measuring nonmarket output. While accountants have clearly recognized the inconsistencies arising from the market-based boundary placed on the accounts, they have also doubted the ability of the tools they had at their disposal to develop a more complete accounting for economic activity. They worried that broadening the accounts would essentially be trading off an incomplete, but useful, tool for a broader, but significantly less useful, tool.

Although the debate about the valuation of household work in the national income accounting literature has been long-lived, it received much wider interest among economists and the general public during the 1970s when there was a surge of interest in social or welfare accounting. From this perspective, including measures of unpaid work was just one of several steps necessary to make GDP a better measure of welfare, and there were various attempts around this time to adjust GDP accordingly.[2] However, the application of the accounts to welfare analysis only increases the measurement difficulties noted above, and while these landmark studies provoked much debate and taught a useful lesson to economic students about the positive and negative externalities associated with GDP growth, their direct usefulness was limited by the seemingly endless scope, the range of uncertainty, and the degree of subjectivity involved.

In the 1980s, several groups advanced the argument that the accounts' exclusion of nonmarket household production obscures or even ignores the importance of women to the economy and therefore results in policies that neglect, ignore, or even damage the status of women in society. Though this argument has received increasing international attention in recent years, both the international System of National Accounts (SNA) and the NIPA's have a limited view of the production of households, primarily because the concept of production in the accounts has been inextricably linked to outputs of a type that can

[2]Richard and Nancy Ruggles (1970), John Kendrick (1976), Robert Eisner (1989), Dale Jorgenson and Barbara Fraumeni (1989), and a number of others developed expanded sets of national accounts that included a broader range of economic activities than the existing NIPA's. Other researchers went well beyond these expanded economic accounts to develop social welfare measures. One of the most important of these studies was the one by James Tobin and William Nordhaus (1973), which developed a measure of "Net Economic Welfare." This measure attempted to adjust the NIPA's to account for changes in leisure time, the disamenities of urbanization, the exhaustion of natural resources, the impact of population growth and other aspects of changes in welfare to produce indicators of economic well-being.

be delivered or provided to other institutional units.[3] In other words, the concept of production has been linked to the concept of a market where that output can be traded. While it is clear that households do produce goods and services, this production is not typically traded in the market, and has therefore been excluded from the accounts.

1.2. *Structural Features of a Satellite Account for Nonmarket Household Production*

The 1993 SNA suggested that the use of supplemental, or satellite, accounts could resolve the long-standing debate between those suggesting a broader production boundary and those insisting upon strict adherence to a market boundary. Such accounts can be used to explore statistical methods and estimates that would introduce undue complexity or uncertainty in the conventional accounts. To the extent that they build upon the existing accounts and are consistent with them, satellite accounts have the advantage that they can be used in conjunction with the many related accounts and sub-accounts in the NIPAs.

A satellite account can do two things: highlight or provide more detail on the transactions occurring in a given sector (such as an account showing detail on the transportation industry), or change the concepts underlying the accounts, perhaps by adjusting the production boundary (such as by treating R&D expenditures or natural resources as capital assets) or by using alternative valuation methods (such as illustrated in BEA's Integrated Economic and Environmental Satellite Accounts). 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.

1.3. *Conceptual Basis*

Before a satellite account can be constructed, its conceptual basis, or purpose, must be established, as this will guide the successive decisions about the account. Should the satellite account follow the lead of existing accounts and focus on the market-like production activities occurring within the home? Or should the account reflect the welfare produced within the home?

National income accountants have not been inclined—even in concept—to support the development of welfare-based accounts. In the few satellite accounts that have been constructed thus far, national income accountants have focused instead on the construction of market-based satellite accounts that are consistent with, but supplement and extend, existing accounts.

[3]In 1985, the United Nations International Women's Conference called for the unremunerated contributions of women to be recorded in national accounts; the 1995 conference reiterated and strengthened that call. In 1988, former New Zealand Parliament member Marilyn Waring published *If Women Counted*, a book that seeks to reverse the "invisibility, inaccuracy, and damage" of women in traditional economic theory, partly by calling for the inclusion of women's work in traditional economic accounting systems. In 1993, Congresswoman Collins introduced a bill in the U.S. House of Representatives that called for the conduct of time-use surveys of unpaid work, calculation of its value, and its inclusion in GDP.

This position has been primarily rooted in the dependency of welfare accounts on subjective judgements. The problems and issues associated with this dependency include the following: First, there are no conceptual boundaries inherent in the concept of welfare, and the production boundary in a welfare-based account depends solely on subjective distinctions between what does and does not contribute to welfare. Second, welfare-based accounts measure what "should be" rather than what is. For example, one approach, used in this paper, is to apply the wage of general-purpose housekeepers to the quantity of time spent in household production. From a welfare perspective, this wage will be inappropriately low given the importance to families and to society of the work performed in the home. However, an imputed wage based on a subjective notion of the output's worth will significantly reduce the usefulness of the data for analysis: It is precisely their ability to reveal market trends and suggest relationships—such as the movement of female labor from nonmarket to market work and the difference in the market value of substitutes for market and nonmarket work—that makes the accounts useful for economic analysis. Third, economic accountants have no comparative advantage in making the normative judgements necessary for welfare accounting. Their expertise lies instead in the provision of baseline data that describe what actually happened and to whom—rather than what should have happened, or which activities are "good" and "bad." Finally, in order to take advantage of the rich set of analytic accounting tools associated with the NIPA's—Input–Output accounts, regional accounts, international accounts, sectoral accounts, etc.—satellite accounts need to be consistent with existing market-based accounts. For example, willingness-to-pay estimates that include the consumer surplus value of nonmarket goods and services simply cannot be compared to or used in conjunction with market-based estimates of the actual prices that were paid for market goods and services.[4]

1.4. *Limited Scope*

One of the most important lessons learned from the social accounting of the 1970s was that satellite accounts should be focused on a specific set of issues. The estimates presented below are limited in scope in that they use market values and proxies thereof and use a market-like definition of output and classification of output, as used in previous studies.

Studies of household production have generally defined the unpaid, market-like output of households as the goods and services produced for own-consumption within the household that could be produced by a third person. Use of this definition limits the scope of the account in two important ways. First, the definition implies that household output that is not consumed within the household, but is also not sold on the market, such as the output of volunteer time, is excluded, at least conceptually, from the satellite accounts. This is an important issue, as one estimate puts the value of volunteer time in the United States at

[4]Properly constrained willingness-to-pay estimates that focus on the marginal unit consumed (at the point of intersection of marginal cost), rather than on the entire area under the demand curve, are consistent with the market prices used in GDP. However, accurate measurement of the value of a marginal unit of household output would require data on specific output units, which are scarce.

over $200 billion in 1995.[5] However, the separation of volunteer time is in keeping with the SNA's recommended separation of the household and nonprofit sectors serving households. Second, the third-person criterion limits the measurement of the output that *is* consumed within the household to that which could otherwise be purchased on the market or delegated to a third person.[6] For example, while the production of meals would be measured, any additional enjoyment resulting from the particularly caring nature in which the meals are prepared would not be included. Meal preparation can be transferred to a third-person in exchange for payment and is a market-like product. The care put into that meal, on the other hand, cannot be readily transferred and compensated (though any quality differences that are discernible to third parties should, in concept, be measured).

1.5. *Valuation Issues*

The NIPA's reflect two general approaches to the measurement of GDP. The first and preferred method is to value output directly, as the market value of final expenditures on goods and services. The second method is to value output indirectly, as the sum of the incomes and other costs incurred in its production. The NIPA's actually measure output in both ways: GDP is based on final expenditures, and Gross Domestic Income (GDI) is based on the incomes earned in producing that product (including profits). A complete set of household production accounts based on the NIPA framework would therefore require household production to be valued both directly and indirectly.

Within such a set of accounts, the household is viewed as a production unit that invests in physical capital and uses the services of this capital along with purchased inputs and their own labor services to produce final goods and services for the household, such as a deck, a prepared meal, or a recreational experience.[7] Within this framework, one would value the final product—the deck or a prepared meal—directly, by the application of market prices to the quantities produced and indirectly, as the sum of the costs incurred. However, since the producer and consumer are normally members of the same household, there are no observable market transactions whereby prices and quantities may be observed. Where such third party information is available for similar goods and services, proxy market prices are used to measure the value of the nonmarket output. The value of owner-occupied housing services, for example, is estimated based on actual market rents for structures with similar characteristics. Unfortunately, detailed data on the number of decks and meals produced within the home are not regularly available.[8]

[5] Independent Sector, 1996, p. 30.

[6] The third-party criterion was formulated as early as 1934 by Margaret Reid in her distinction between unpaid work and leisure (see Reid, 1934 and Ironmonger, 1996). Goldschmidt-Clermont (1993) points out that only the possibility to delegate, and not the possibility to hire, is a requirement of the third-person criterion.

[7] For a discussion of household production, see Lancaster, 1966 and Becker, 1965.

[8] Direct valuation studies have been done, however. Fitzgerald, Swenson, and Wicks (1996) used direct output data to estimate household production functions. Another approach to market valuation, especially for investments of household time and intermediate purchases in areas such as education, is to estimate the present discounted value of lifetime income generated by these investments. See Jorgenson and Fraumeni, 1989.

1.6. *Sum of the Costs Incurred Approach*

This absence of output data has led most analysts to value household output indirectly by summing the costs involved in producing it; that is, the sum of the intermediate materials (such as food); the labor services; and the capital services (the car used to shop for the raw materials, the refrigerator used to store inventories, etc.). The value of investment by the household is added to this consumption value to obtain the output produced by the household. (This treatment parallels BEA's treatment of government consumption expenditures and gross investment in GDP.)

Value of purchased goods and services. The value of goods and services purchased by households is already included in the NIPA's as personal consumption expenditures, a component of GDP. Therefore, all that is required to adjust GDP to include the value of household production is to add the value of labor and capital services (and to rearrange the NIPA estimates to treat expenditures on consumer durables as investment rather than PCE). On the other hand, to move beyond the adjustment of aggregate GDP to an in-depth, I–O analysis requires the disaggregation of PCE into intermediate purchases used as inputs into household production, and final purchases for consumption or investment.

Value of labor services. Two general methods for measuring the value of unpaid household labor services have been identified: The opportunity cost approach and the market cost approach.[9] The opportunity cost approach assumes that people allocate time so that the net returns to the various uses of time are equalized at the margin. Thus, the value of a marginal hour of household work can be assumed to equal the net return to a marginal hour of paid work. The market cost approach values hours of work by the wage rates paid in the market for similar work. There are two distinct variants of this approach: The housekeeper cost method uses the wage rate of general-purpose domestic workers; and the specialist cost method uses the wages of a variety of specialists, such as carpenters, cooks, etc.

Each of these methods has problems. The opportunity cost approach may lead to a serious inconsistency in the accounts, as the value of a given activity would depend more on the earnings potential of the individual in the market than it would on the activity itself. The approach is also complicated by the fact that time-allocation decisions are not based solely on financial considerations: The use of market wages to estimate net returns to time ignores the nonpecuniary components of net returns to time. Often, there are significant components of leisure or consumption involved in home production—woodworking, car repair, dog grooming, and gardening are as much hobby as work for some. Similarly, there are significant nonproduction benefits to spending time with and caring for one's own children. Thus, while *actual* net returns that include these nonpecuniary components may in fact be equalized across time uses, the use of market wages as indicators of these returns may lead to overstated estimates of the value of household production. Additionally, the assumption that net returns to time-use are equalized across uses may itself be flawed. For example, for most employees, rigidities in hours of work, for example, make it difficult to equalize the value of

[9] For discussions of wage-based methods of valuing unremunerated work time, see Goldschmidt–Clermont, 1993 and Murphy, 1982.

an hour's work at one's chosen profession with that of home production. For the unemployed or underemployed, the net return to an hour of housework is likely to be significantly less than the net return to an additional hour of paid work. For the voluntarily unemployed, the value of an hour of household work is uncertain. It is probably higher than paid work since they have rejected paid work. However, the use of potential market wages as a lower limit neglects the possibility that years out of the labor force may have negatively impacted potential earnings. For the household worker, who is paid in household goods and services rather than currency, the value of an hour of household production is worth less than the tradeable cash value of the same returns to paid time. Finally, the taxation of paid vs. unpaid work and other related tax considerations complicate the equalization of the net returns to time use.

The market approach is also problematic. First, using the wages of specialized workers ignores the dependence of the quality of the product on the skills of the person who performs the work. As noted above, the average homeowner is likely to be less productive than a professional specializing in a given area. The household worker usually performs a set of various tasks and, therefore, for many tasks has less experience and training than the professional, who devotes all his time to one type of task. Further, the household worker often does not have the specialized tools required for the job, and is subject to more interruptions and transitional tasks than the professional. That is, there are likely economies of scale and specialization that are not realized in the many types of tasks involved in home production. As a result, the quality of the home-produced good or service is often lower, or the time spent in producing a given quality of product is higher, than that involved in market production.

Conversely, using the housekeeper wage may understate the value of household labor services, as the value to a household member of working in the home may be augmented by the same nonproduction benefits discussed above. However, to avoid these difficulties—especially the valuation of the welfare gains associated with household work, such as leisure, recreation, and time spent with children—many national accountants have used the wages of general purpose housekeepers to provide a reasonable, market-based, lower-bound estimate of household labor services, and this is the method used in this analysis.

Value of capital services. Capital inputs—including housing, motor vehicles, tools, and household appliances—are also important inputs to household production. Where possible, these should be measured by actual rental prices or by market proxies of these rents. However, data on such rents are currently available only for housing and motor vehicle rentals and the value of the services flowing from the substantial stock of consumer durables must be estimated as the costs of providing services from this stock. In theory, the owner of a consumer durable will charge a rent at least equal to his opportunity cost during the period that he rents out the asset; that is (1) the depreciation, or decline in the value, of the asset during the period that it is rented, plus (2) the return that the owner of the asset could have earned if the asset had been invested elsewhere.

1.7. *Use of Imputed Prices*

Another valuation problem is the use of marginal prices observed in markets to value large non-marginal stocks of both market and nonmarket goods and

services—in this case, the use of wages observed in the relatively limited market for domestic services to value the entire output of the household production labor force. This problem, however, is not unique to the measurement of household production but is a long-standing problem in economic accounts. Observed marginal prices for capital equipment and structures are routinely used to estimate the market, or replacement value, of nations' entire capital stocks in balance sheets, and observed market rents are used to estimate the entire rental value of owner-occupied housing in income and expenditure accounts. Little attention is paid to the problems associated with the use of these observed prices largely because of the large information requirements—and in many cases impossibility—of running a general equilibrium model to obtain estimates of the price data needed and the low returns to such an effort. In general, the estimates obtained using imputed prices are likely to be unbiased and may be reasonably close to what would be the "actual" market price. In any event, given the other uncertainties involved in estimates of the value of household production, the range of outcomes presented below are likely to provide, within a reasonable order of magnitude, an estimate of the contribution of household production to economic activity.

1.8. *Household Production Satellite Account Estimates, 1946–97*

As outlined above, the estimates presented here adjust GDP to reflect the household as a producer and an investor in durables, as well as a consumer, by incorporating the value of their nonmarket household production and treating their expenditures on consumer durables as investment. Also, the additional return to government capital is added to the NIPA estimate of its depreciation in order to capture a more complete measure of the services of government capital.

Previous studies have made these and other adjustments.[10] However this analysis expands on these studies by disaggregating household production into its respective components, or "industries," in an I–O framework, thus allowing consideration of the relation between households and other industries and the economy as a whole. The I–O satellite account is discussed below.

1.9. *Entries and Adjustments*

Summary Tables 1 and 2 present the entries of the satellite GDP account and reflect the following modifications to the conventional GDP account.[11]

Household labor and capital services. The inclusion of the nonmarketed services of household labor and capital represents an addition to both GDP—the value of output—and GDI—the incomes earned. This double-entry feature of the accounts—adding the same values to the product and income sides—balances GDP and GDI and fully accounts for the distribution of incomes earned in production.

[10]See Eisner, 1989. Eisner made many additional adjustments to the NIPA's that are not considered in this analysis, including reclassifying some government expenditures as intermediate rather than final, and some business expenditures as final instead of intermediate; and adding the value of human capital formation.

[11]The full time series for 1946–97, is available from the authors on request.

TABLE 1

EXISTING AND ADJUSTED MEASURES OF GDP, RATES OF CHANGE, AND CONTRIBUTIONS TO GROWTH: 1946 and 1997

	Existing Measures				Adjusted Measures			
	1946 (1)	1997 (2)	Average Annual Rate Of Change (%) (3)	Contribution to Growth (%) (4)	1946 (5)	1997 (6)	Average Annual Rate Of Change (%) (7)	Contribution to Growth (%) (8)
Gross Domestic Product	222.6	8,110.9	7.3	100.0	333.3	10,997.5	7.1	100.0
Personal consumption expenditures and investment	144.3	5,493.7	n.a.	67.8	258.3	8,386.0	7.1	76.2
Personal consumption expenditures	144.3	5,493.7	7.4	67.8	234.7	7,385.1	7.0	67.1
Nondurables	82.7	1,600.6	6.0	19.2	82.7	1,600.6	6.0	14.2
Services	45.8	3,220.1	8.7	40.2	152.0	5,784.5	7.4	52.8
Housing	14.2	829.8	8.3	10.3	14.2	829.8	8.3	7.6
Services of consumer durables	n.a.	n.a.	n.a.	n.a.	10.9	613.0	8.2	5.6
Depreciation of consumer durables	n.a.	n.a.	n.a.	n.a.	9.2	503.8	8.2	4.6
Return to consumer durables	n.a.	n.a.	n.a.	n.a.	1.8	109.2	8.4	1.0
Nonmarket services	n.a.	n.a.	n.a.	n.a.	95.3	1,951.4	6.1	17.4
Other	31.6	2,390.3	8.9	29.9	31.6	2,390.3	8.9	22.1
Consumer durables	15.8	673.0	7.6	8.3	n.a.	n.a.	n.a.	n.a.
Investment	n.a.	n.a.	n.a.	n.a.	23.6	1,000.9	7.6	9.2
Residential	n.a.	n.a.	n.a.	n.a.	7.8	327.9	7.6	3.0
Consumer durables	n.a.	n.a.	n.a.	n.a.	15.8	673.0	7.6	6.2
Gross business investment	31.3	1,256.0	7.5	15.5	23.5	928.1	7.5	8.5
Nonresidential fixed investment	17.3	860.7	8.0	10.7	17.3	860.7	8.0	7.9
Change in business inventories	6.2	67.4	4.8	0.8	6.2	67.4	4.8	0.6
Residential	7.8	327.9	7.6	4.1	n.a.	n.a.	n.a.	n.a.
Net exports	7.1	−93.4	n.a.	−1.3	7.1	−93.4	n.a.	−0.9
Government consumption expenditures and gross investment	39.9	1,454.6	7.3	17.9	44.4	1,776.8	6.9	16.2
Services of government capital	n.a.	n.a.	n.a.	n.a.	15.2	450.5	6.9	4.1
Depreciation of government capital	10.7	128.3	n.a.	1.5	10.7	128.3	5.0	1.1
Return to government capital	n.a.	n.a.	n.a.	n.a.	4.5	322.2	8.7	3.0
Less: Consumption of fixed capital: consumer durables, government, and business	23.4	848.5			32.5	1,352.3		
Equals: Net Domestic Product	199.2	7,262.4	7.3	n.a.	300.8	9,645.2	7.0	
Other Aggregates								
Labor income	114.0	4,282.7	7.4	n.a.	209.3	6,234.1	6.9	n.a.
Personal income	179.0	6,784.0	7.4	n.a.	285.2	9,348.4	7.1	n.a.
Personal savings	14.9	120.9	4.2	n.a.	30.7	793.9	6.6	n.a.
Private Investment	31.3	1,256.0	7.5	n.a.	47.1	1,929.0	7.6	n.a.
Gross savings	30.2	1,406.3	7.8	n.a.	46.0	2,079.3	7.8	n.a.

TABLE 2

IMPACTS ON COMPONENTS, ON EXISTING GDP, AND ON COMPONENT SHARES, 1946 AND 1997

	Component Increase from Adjustments (%)		Impact of Adjustments on Existing GDP (%)		Component Shares of Existing GDP (%)		Adjusted Components Share of Adjusted GDP (%)	
	1946	1997	1946	1997	1946	1997	1946	1997
Gross Domestic Product	49.7	35.6	49.7	35.6	100	100	100	100
Personal consumption expenditures and investment	79.0	52.6	51.2	35.7	n.a.	n.a.	77	76
Personal consumption expenditures	62.7	34.4	40.6	23.3	64.8	67.7	70.4	67.2
Nondurables	0.0	0.0	0.0	0.0	37.2	19.7	24.8	14.6
Services	231.9	79.6	47.7	31.6	20.6	39.7	45.6	52.6
Housing	0.0	0.0	0.0	0.0	6.4	10.2	4.3	7.5
Services of consumer durables	n.a.	n.a.	4.9	7.6	n.a.	n.a.	3.3	5.6
Depreciation of consumer durables	0.0	0.0	4.1	6.2	n.a.	n.a.	2.7	4.6
Return to consumer durables	n.a.	n.a.	0.8	1.3	n.a.	n.a.	0.5	1.0
Nonmarket services	n.a.	n.a.	42.8	24.1	n.a.	n.a.	28.6	17.7
Other	0.0	0.0	0.0	0.0	14.2	29.5	9.5	21.7
Consumer durables	0.0	0.0	−7.1	−8.3	7.1	8.3	n.a.	n.a.
Investment	n.a.	n.a.	10.6	12.3	n.a.	n.a.	7.1	9.1
Residential	n.a.	n.a.	3.5	4.0	n.a.	n.a.	2.3	3.0
Consumer durables	n.a.	n.a.	7.1	8.3	n.a.	n.a.	4.7	6.1
Gross business investment[a]	−24.9	−26.1	−3.5	−4.0	14.1	15.5	7.1	8.4
Nonresidential fixed investment	0.0	0.0	0.0	0.0	7.8	10.6	5.2	7.8
Change in business inventories	0.0	0.0	0.0	0.0	2.8	0.8	1.9	0.6
Residential	0.0	0.0	−3.5	−4.0	3.5	4.0	n.a.	n.a.
Net exports	0.0	0.0	0.0	0.0	3.2	−1.2	2.1	−0.8
Government consumption expenditures and gross investment	11.3	22.2	2.0	4.0	17.9	17.9	13.3	16.2
Services of government capital	n.a.	n.a.	6.8	5.6	n.a.	n.a.	4.6	4.1
Depreciation of government capital	0.0	0.0	0.0	0.0	4.8	1.6	3.2	1.2
Return to government capital	n.a.	n.a.	2.0	4.0	n.a.	n.a.	1.4	2.9
Other Aggregates								
Household's PCE and investment share of GDP	n.a.	n.a.	n.a.	n.a.	64.8	67.7	77.5	76.3
Private Investment's share of GDP	n.a.	n.a.	n.a.	n.a.	14.1	15.5	14.1	17.5
Household investment's share of private investment	n.a.	n.a.	n.a.	n.a.	0.0	0.0	50.1	51.9
Nonmarket services and services of consumer durables share of PCE	n.a.	n.a.	n.a.	n.a.	0.0	0.0	45.3	34.7
Labor Income's share of national income (GDP)	n.a.	n.a.	n.a.	n.a.	51.2	52.8	62.8	56.7
Personal saving rate (% of Personal Income)	n.a.	n.a.	n.a.	n.a.	8.3	1.8	10.8	8.5
Personal saving as % of GDP	n.a.	n.a.	n.a.	n.a.	6.7	1.5	9.2	7.2
National saving rate (gross savings % of GDP)	n.a.	n.a.	n.a.	n.a.	13.6	17.3	13.8	18.9

[a]The apparent negative impacts of the adjustments on business investment are solely a result of the reclassification of consumer durables from business to household investment.

As part of GDP, the value of nonmarket household services (unpaid household labor) and capital services (services of consumer durables) are added to the retitled category, "Personal consumption expenditures and investment." While not explicitly shown here, unpaid household labor is also added to compensation of employees (which could be retitled "Compensation of employees and household workers") and included in estimates of personal income, national income, and GDI.

Other changes in the satellite account. The other major difference between the existing NIPA's and the satellite account illustrated here is the treatment of purchases of consumer durables by households as investment, rather than as current consumption. The reclassification itself does not affect GDP or GDI in the year the reclassification occurs, but the capitalization of these durables affects these measures as well as Net Domestic Product (NDP) in subsequent years. The reclassification would also affect the Personal Income and Outlay Account and the Gross Saving and Investment Account by raising estimates of personal and national saving. In addition to highlighting a key component of investment spending, such a change would explain a significant share of the differences between U.S. and foreign saving and investment rates as the U.S. spends a higher proportion on consumer durables than other nations.[12] Though not shown in this presentation, on the income side the value of the services of this capital would be added to the rental income of persons, increasing personal income and savings. There is also a new line adding the value of the additional return to government capital to the consumption of fixed capital (CFC) of government, summing to the services of government capital; these lines would also be included on the income side.

1.10. *Estimates and Their Impact*

Summary Tables 1 and 2 show the impacts on GDP over time of incorporating the value of household nonmarket services and the services of consumer durables and government capital. The incorporation of household production reduces the growth of overall GDP in current dollars over the entire period from a 7.3 percent annual rate to a 7.1 percent annual rate.[13] This flatter growth results from the recognition in the accounts that while market production grew faster as women entered the labor force, home-based production grew at a slower rate. That is, relative to the existing NIPA estimates, the inclusion of household production, the services of consumer durables, and the additional return to government capital increases GDP by 50 percent in 1946 but only by 36 percent in 1997.

Household nonmarket services. More specifically, the inclusion of household nonmarket services raises GDP by 43 percent in 1946 and by 24 percent in 1997. This reflects the increase in women's civilian labor force participation rates from 31 percent in 1946 to 60 percent in 1997; men's civilian labor force participation rates over the same period declined from 83 percent to 75 percent. It also reflects

[12] See Lipsey and Kravis, 1989.

[13] 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.

the changing opportunity costs of market vs. nonmarket work. In 1946, the average compensation for household workers was 56 percent that for employed workers ($1,413 vs. $2,543), by 1997 this had dropped to 38 percent ($15,215 vs. $40,249). This shift, along with the increasing ratio of women's to men's earnings and innovations in household production technology (see below), raised the relative returns to market work and lowered the cost of third-party housekeeper services and the use of capital in household production.

Services of consumer durables. The inclusion of the services of consumer durables raises GDP by 5 percent in 1946 and by 8 percent in 1997, reflecting the increased reliance on improved technology and household appliances as labor shifted from the home to the marketplace. The household capital–labor ratio, as measured by the chained-dollar net stock of consumer durables per full-time employee (FTE) engaged in household production, increased at an annual rate of 4.4 percent between 1946 and 1997. In contrast, over the same period, the capital–labor ratio in the labor force, as measured by the chained-dollar net stock of nonresidential fixed capital per FTE engaged in production, increased at an annual rate of only 2.9 percent. This substitution of capital for labor in household production also reflects a somewhat lower rate of increase in the price of consumer durables relative to other capital goods. Between 1946 and 1997 the price of consumer durables rose at a 2.7 percent annual rate, as compared to 3.6 percent for nonresidential fixed capital.

Government capital. The inclusion of an additional return to government capital increases GDP by 2 percent in 1946 and by 4 percent in 1997. This increase reflects the increasing ratio of government capital to GDP—and a significant share of government capital's increasing contribution to GDP reflects government investment in areas that support household production. As stocks of defense capital declined relative to total government capital stock, the stock of educational buildings and hospitals, as well as highways and streets, sewer systems and water supply facilities increased throughout the period.

Income measures are similarly affected. Labor income—the sum of wage and salary disbursements and other labor income in existing accounts—is increased by 84 percent in 1946 by the inclusion of household production but only by 46 percent by 1997. Personal income grew at a 7.1 percent annual rate using the more comprehensive measure of income as compared to a 7.4 percent rate in the NIPA's.

Savings and investment are both boosted by the inclusion of household production and the recognition of household investment. The growth rate of personal saving increased from 4.2 percent annually to 6.6 percent annually over the period, as the reclassification of consumer durables to investment reduces current personal outlays and therefore increases savings. Private investment increases over the period, and household investment comprises a little over 50 percent of the adjusted measures of private investment. The faster growth of savings diminishes the fall in the personal savings rate (personal savings as a percent of personal income) and in personal saving as a percent of GDP: The adjusted measures decline by 2 percent each, rather than by 7 percent and 5 percent, respectively. While component shares of GDP and national income may have changed significantly, the rank order of importance of major components to total GDP has not

changed as a result of the recognition of household production. For instance, despite the reduction of government expenditures from 18 percent to 16 percent of GDP in 1997, government remains the second largest contributor to GDP.

1.11. *Satellite–Input Output Account for Nonmarket Household Production, 1992*

The information provided by the time series, despite the underlying conceptual and methodological difficulties, is useful in providing answers to some of the questions presented in the introduction—especially those that consider household production relative to other sectors or U.S. production relative to other countries. The other questions, however—those that consider the sources of household income and savings, the impacts of time-saving technologies, or the tradeoffs between home-based and market production, require more in-depth information about the household itself. For this type of analysis, the total production of the household must be broken down into its component parts, and those components further broken down into the materials and labor used in their creation. This type of examination calls for an Input–Output analysis of the household, as illustrated below. The impacts of these entries and adjustments are summarized in Table 3.

1.12. *Entries and Adjustments*

The entries and adjustments reflected in the shaded sections of Table 3 below correspond to those made in the 1946–97 time series (this table is abridged to show only the relevant adjustments; conventional industries are not explicitly shown but are counted in the totals).[14] Rows are added to incorporate the commodities produced and consumed by households; the entries in these rows show that these commodities are consumed only by households—they are not sold as intermediate inputs to any other industries. Rows are also added to incorporate the value added by the nonmarketed services of unpaid household labor (which corresponds to employee compensation), the services of consumer durables, owner- and tenant-occupied housing, and the additional return to government capital. (The services of housing are included in conventional GDP as a component of PCE; their treatment in this analysis is only a reclassification, not an adjustment.)

Columns are added to incorporate household industries, each of which corresponds to a specific time-use activity. The entries in these new columns show that household industries "purchase" value added components—labor and capital, as well as intermediate inputs from other industries, but not from other household industries. (In the abridged table, household industry purchases of intermediate inputs are aggregated in the row "total intermediate inputs." These inputs consist of the reclassification of several conventional PCE categories as intermediate expenditures rather than consumption—that is, as household industry purchases of raw materials for production. (They have been deducted from PCE; instead, their value is reflected in final uses as components of the value of products purchased for "household own consumption.") A comprehensive picture of household activities requires an additional column to reflect "other household

[14]The detailed table is available from the authors on request.

TABLE 3

ILLUSTRATION OF AN EXTENDED INPUT–OUTPUT ACCOUNT FOR HOUSEHOLD PRODUCTION

	INDUSTRIES														FINAL USES (GDP)					
	H.H. Food Prep.	H.H. Cleaning	H.H. Laundry	H.H. Management	H.H. Animal, plant	H.H. Repair	H.H. Yard work	H.H. Child care	H.H. Health care	H.H. Shopping	H.H. Services	H.H. Travel	Other H.H.	All Other Industries	Total Intermediate	H.H. Own Consumption	H.H. Market (PCE)	H.H. Investment	Other Final uses	GDP	Total commodity output
COMMODITIES																					
H.H. food prep.																717.32				717.32	717.32
H.H. cleaning																333.05				333.05	333.05
H.H. laundry																89.87				89.87	89.87
H.H. management																348.52				348.52	348.52
H.H. animal, plant																55.78				55.78	55.78
H.H. repair, maint.																80.16				80.16	80.16
H.H. yardwork																79.79				79.79	79.79
H.H. childcare																526.91				526.91	526.91
H.H. healthcare																700.96				700.96	700.96
H.H. shopping																184.16				184.16	184.16
H.H. services																790.94				790.94	790.94
H.H. travel																259.64				259.64	259.64
Other H.H.																1,021.70				1,021.70	1,021.70
All other commodities	419.34	44.00	1.35	243.69	6.16	2.36	12.69	309.16	632.88	2.77	705.76	111.78	103.76	4,588.74	7,184.44		524.17	691.28	2,084.43	3,299.88	
Total intermediate inputs	419.34	44.00	1.35	243.69	6.16	2.36	12.69	309.16	632.88	2.77	705.76	111.78	103.76	4,588.74	7,184.44						
VALUE ADDED																					
Compensation of employees														3,655.13							
Unpaid household labor	257.53	250.01	76.57	90.67	42.92	67.29	58.04	188.55	58.88	156.89	73.67	127.89	n.a.								
Services of consumer durables	18.51	17.95	5.50	6.51	3.08	4.83	4.17	13.52	4.23	11.26	5.29	9.18	422.08								
Housing services	21.74	21.09	6.46	7.65	3.62	5.68	4.90	15.89	4.97	13.23	6.21	10.79	495.85								
Services of government capital														389.93							
Other value added														1,850.53							
Total value added	197.98	289.05	88.52	104.83	49.62	77.80	67.10	217.761	68.07	181.39	85.18	147.86	917.93	5,895.59						8488.68	
Total industry output	717.32	333.0	89.87	348.52	55.78	80.16	79.79	526.9	700.96	184.16	790.94	259.64	1021.70	10,484.34							15,673.13

activities." Though these activities, such as sleep and leisure, are not productive according to the definition applied here, they do use intermediate inputs and are not purchased in the market.

Finally, columns are added to disaggregate conventional personal consumption expenditures (PCE) into PCE and investment. Intermediate expenditures are deducted from PCE, as noted above, and expenditures on consumer durables are moved to a new column for household investment. The remaining PCE expenditures are renamed household market consumption to highlight the distinction between this sum and conventional PCE. Finally, a column for Household Own Consumption reflects the household's own use of its output.

As in conventional I–O tables, the sum of total intermediate purchases and value added by all industries equals the total output of all commodities. Similarly, the sum of value added across all industries equals the sum of GDP across all commodities.

1.12. *Estimates and Their Impact*

Incorporating these satellite estimates increases the I–O estimate of GDP for 1992 by 36 percent (the same percentage increase as the time series estimate for 1992). The additional value added by nonmarket household industries makes up the bulk of this increase.

Households, as reflected by PCE, have historically made up the largest portion of GDP. However, this expanded view reveals that households contribute more than their final consumption. For instance, the output of the household commodity "food preparation" is $717 billion in 1992, compared to $253 billion of PCE on prepared meals in the marketplace. Similarly, PCE on "Cleaning, storage, and repair of clothing and shoes" is only $11 billion in 1992, while household laundry output is valued at $90 billion—a conservative figure given that it does not include any intermediate inputs other than utilities (as the I–O commodity "cleaning and toilet preparations" cannot be further disaggregated, the entire category, including expenditures on laundry cleaning products, was attributed to the household cleaning industry rather than the household laundry industry). $2,596 billion or 62 percent of the conventional PCE estimate of $4,209 billion in 1992 was actually spent on intermediate goods used in the household production process. Another $618 billion of housing services is actually household value added and $471 billion spent on consumer durables is actually investment (investment also includes investment in new construction, classified as business investment in the conventional accounts). Only $524 billion or 12 percent of the conventional estimate of final consumption expenditures is actually final 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.

1.13. *Uses of Household Production Accounts*

The prototype satellite account estimates presented here build on the efforts of previous researchers to more comprehensively reflect the household as a producer. In extending previous analyses, the time series estimates of household

production presented in this paper suggest that the growth of post-war GDP in the United States has been overstated by ignoring household production. The extension of earlier analyses to a more detailed Input–Output framework illustrate how a satellite account could be useful to the analysis of consumer spending, and the impact of changes in specific industries, prices, or of taxes on the household, other industries, products, and incomes. Further, the nominal estimates presented here provide an overview of the rough order of magnitude, and degree of uncertainty, associated with such measures. They also provide an overview of the conceptual, methodological, and source data issues involved in constructing a set of satellite accounts.

Household production accounts can be used in either analytical studies or policy evaluation. Most of the analytical issues relate to the functioning of the economy and our view of long-term growth, productivity, production, distribution, and capital formation. Most of the policy issues relate to "gender" policy, involving questions about the distribution of wages, jobs, and opportunities.

The incorporation of household production in satellite accounts would aid analysts of both the household and the market economy by increasing the comparability of statistics across different countries as well as within the same country at different points in time. Household production accounts—along with R&D, natural resource, human capital, and other satellite accounts—would improve estimates of the sources of economic growth and productivity. Extensions to industry, regional, and income accounts would facilitate tracing the impacts on industries, regions, or households of changes in the prices of household vs. market production of goods and services or of changes in taxes and subsidies. Additionally, presentation of the accounts in Input–Output tables would increase the potential for identifying the derived demand for both public and private goods by households.

Indeed, household production accounts would be one of the cornerstones of extended families of satellite accounts. As national accountants move beyond market prices to willingness-to-pay measures of environmental improvements or other magnitudes that involve tradeoffs between marketed goods and nonmarketed or other public goods, expanded income accounts based on market and nonmarket inputs including time and income constraints will become essential. Without such constraints, augmented estimates of GDP could be several *multiples* of existing GDP and would also exceed any reasonable time- or income-constrained estimate.

Other uses of such accounts include examinations of gender policy issues, which have been classified as either direct or indirect.[15] Direct policies include those designed to encourage a more equal distribution of both unwaged and waged work between men and women; subsidized education; childcare programs intended to facilitate the entry of women into the labor force; tax incentives designed to reward one-earner households; and incentives designed to encourage the purchase of inputs into household production such as residential housing and consumer durables. Indirect policies include tax laws with unintended effects on

[15] For a discussion of gender policy, see Swiebel, 1999.

household production, such as the high marginal tax rate faced by spouses entering the labor force and the so-called marriage tax.

These policy uses raise interesting questions regarding the choice of valuation in the construction of household accounts. For example, household production accounts based on the value of household wages could be used to develop a lower-bound estimate of the benefits of moving women into the labor force. Using the household production satellite accounts as a baseline, one could estimate the impact of increasing female labor force participation and the attendant effects on an expanded definition of capital formation and productivity. Alternatively, assessing the desirability of subsidized childcare, for example, would call for an examination of the foregone benefits of having a childcare worker care for a child as opposed to its parent. Measurement of these benefits might take the form of an examination of the lifetime income of children cared for by their parents vs. those cared for by professional care-givers, (controlling for education and other factors). Such an approach might be patterned after the work done by Jorgenson and Fraumeni.

All of these alternatives are rather elaborate extensions of the satellite accounts that probably require separate longitudinal, behavioral, and epidemiological research. However basic satellite accounts such as those presented here may prove useful in providing baseline estimates of the aggregate, industry, regional, and distributional impacts of alternative policies that can be used in conjunction with one-off studies of the external benefits and costs of the policies that are being studied.

2. Data Sources and Methodology

Estimates of the value of household nonmarket services are based on time series estimates of population by gender and labor force participation from BLS and compensation of household employees from BEA, and point estimates of time-use activities. Estimates for 1946–81 are from Robert Eisner's time series, which utilized a number of University of Michigan time-use studies and are consistent with the estimates for 1982 forward.[16] The estimates for 1982–84 and 1986–97 are based on the 1985 University of Maryland time-use survey as summarized by Robinson and Godbey. As the main source of differences in overall time-use over time are the differences in time-use and employment rates across genders, the major source of changes in the *value* of time-use are explained by changes in male–female employment and relative wages over the period. It is unlikely—given the relatively slow changes in time-use within these groupings—that the estimates would be significantly affected by more frequent data on time use.

BEA estimates of the depreciation of consumer durables and government capital are added to estimates of the average returns to net stocks (the ratio of personal interest and dividend income to Federal Reserve estimates of household

[16]See Eisner, 1989 and Robinson and Godbey, 1997. A detailed methodology is available from the authors on request.

sector assets and the return to 10-year Treasury bonds to government capital stocks, respectively).

In the I–O analysis, the allocation of these totals to household industries is generally straightforward. All expenditures on consumer durables are reclassified to investment, and expenditures on other goods such as "livestock and livestock products" are reclassified to intermediate purchases and to a specific household industry based on the nature of the good. The allocation to household industries of utilities, consumer durables, housing and government capital is based on the assumption that they are used in accordance with the time spent in each activity. This allocation of utilities based on time-use ignores the different capital intensities of various activities. Future work would focus on estimating the service values of specific consumer durables rather than the allocation of the total service value of all durables.

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