HOUSEHOLD SATELLITE ACCOUNT FOR FRANCE METHODOLOGICAL ISSUES ON THE ASSESSMENT OF DOMESTIC PRODUCTION

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We estimate in a household satellite account (HHSA) the value of French domestic production in 2010 and 1998, using the input method and following Eurostat's recommendations. In line with previous studies, we find that extending the system of national accounts (SNA) frontier of production to domestic activities (house chores, cooking, care . . .) has a sizeable effect on key macroeconomic indicators (+33 percent GDP, −5 p.p. GDP growth, +50 percent disposable income, +58 percent consumption, and −10 p.p. of purchasing power growth). We conduct a sensitivity analysis to various methodological issues which have not yet been settled by an international benchmark. Quantitatively, the two most important issues are the boundary of household production—we favor a relatively narrow definition—and the use of a gross or a net wage—we prefer gross wage-. However, estimates are much less sensitive to otherwise greatly debated issues such as which substitute wage to use.

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1. INTRODUCTION

From their daily domestic work, households produce services they directly consume. No monetary transaction takes place to record this process. Whether a family has dinner at home or in a restaurant, they consume a meal which has been cooked. The same goes for the shirts they clean and iron themselves instead of taking them to the dry cleaner: in both cases, a service is produced and consumed, thus participating in the material well-being of the household. But in one case, there is a market transaction, and the consumption is recorded by a system of national accounts (SNA), whereas in the other case, it goes unrecorded because of a lack of market transaction.

As the Sen-Stiglitz-Fitoussi report on the measurement of economic progress recently pointed out (Stiglitz, Sen, and Fitoussi, 2009), this is not without consequence for international comparisons of households' consumption across

countries that differ in their reliance on the market for the provision of household services (the USA v.s. European countries v.s. developing countries, for instance). This caveat is not new to economists: some of them have worked on the valuation of hours of unpaid work recorded by time use surveys (TUS) in the last decades and pioneer works date back to the 1930s. It is not new to national accountants either: the SNA in its 1993 edition (IMF, Eurostat, OECD, United Nations, and World Bank, 1993) exposes the limitations of its production boundary, in particular with respect to household production, but for conceptual and technical reasons it consigned the measurement of domestic production to a satellite account.

An attempt to overcome such limitations of the SNA is the recent development of household satellite accounts (HHSA). It consists in additional tables, compatible with the SNA framework, describing the economic transactions (monetary or not) related to domestic production. The HHSA affects households' production and consumption, but also their income. It also marginally impacts their investment. These modifications may have marked consequences on their savings ratio and the purchasing power of their disposable income. Also, care must be taken not to disrupt the fragile balance of the SNA; in particular not to create monetary counterparts to non-monetary transactions or not to record only one side of a transfer between two categories of agents.

The present paper is an attempt at implementing such principles in the design of a household satellite account for France in 2010 and 1998. Quantitatively, our estimates confirm previous works on the magnitude of domestic production with regard to GDP and consumption. In line with previous studies in many developed countries, we find that remodelling the frontier of production to include domestic activities (house chores, cooking, care . . .) has a sizeable effect on key macroeconomic indicators (GDP +33 percent, disposable income +50 percent, consumption +58 percent, savings ratio –4 percentage points in 2010 and respectively +31 percent, +49 percent, +56 percent and –4 p.p. in 1998). The proportion of the three inputs of household production and its distribution by functions (housing, food, care . . .) are very similar in 2010 and 1998 and these household productions are much larger than expenditure on market equivalents. In addition, macroeconomic evolutions are markedly impacted: the purchasing power of gross disposable income is much less dynamic in HHSA than in SNA (+17 percent against +27 percent) and GDP growth is scaled down by 5 points (from 20 percent in SNA to 15 percent in HHSA).

The estimation of HHSA aggregates is very sensitive to methodological choices. A vast strand of literature exists on these issues. In the wake of work done in the 1990s, a European task force made a first set of recommendations in 2003 (Eurostat, 2003). Still, a consensus has yet to emerge on several points. These points, and their relative importance for international comparisons of HHSA, are the object of this paper.

A crucial matter for harmonisation is the frontier between domestic work (a productive activity but excluded from the SNA) and leisure (non productive). In its broadest definition, domestic work can be twice as large as it is in a more restrictive sense. Because its components are more consensual and less subject to an overestimation of productivity, we favor the narrowest definition of domestic production (hereafter *core perimeter*).

A greatly debated question is the choice of the wage to value time spent on various domestic activities. The *generalist substitute* method levels out any composition effect of domestic productions. In practice, such a composition effect seems marginal and hard to disentangle from the statistical noise between successive time use surveys. We therefore believe that this does not constitute an obstacle to the use of the generalist substitute method. Also, using the *specialised* or *generalist* substitutes has a secondary effect on the estimates. In both cases, whether the wage is net of taxes and social contributions or gross is a key issue. Their inclusion raises other difficulties, in particular for the interpretation of the savings ratio and thus is a key issue for harmonisation.

The evaluation of services provided by household durables is also a difficult issue. First it raises the question of identifying domestic capital among consumption in durable goods; and then measuring the services of this new capital. A simplified perpetual inventory method (PIM) can be used, but remains highly conventional. This aspect of HHSA is to be improved in the future.

Some other accounting questions can be solved by weighing up the pros and the cons of sophistication: a parsimonious HHSA should not modify taxes and subsidies on production or changes in inventories, nor arbitrarily distribute ancillary functions of domestic production to principal functions. It can however easily avoid double counts of *production for own final use* already recorded by the SNA.

The remainder of this paper is organized as follows: section 2 reviews the literature on HHSA; section 3 deals with the definition and valuation of hours of unpaid work, and quantifies the effects of related methodological choices, for 2010; section 4 deals with several issues specific to the national accounts and the HHSA, exemplified on the year 2010 as well; finally section 5 presents our estimation of the HHSA for France in 2010 and 1998.

2. DOMESTIC PRODUCTION AMOUNTS TO 30 TO 50 PERCENT OF GDP IN MOST STUDIES

An Old Debated Question

The measurement of domestic work and domestic production is an old debated question in national accounts as recalled by Vanoli (2002). In the related literature, one may find references dating back to the nineteenth century (Charlotte Perkins Gilman [Women and Economics 1898]), or to the 1930s and 1940s such as Margaret Reid (Economics of Household Production, 1934), Wassily Leontief (The Structure of the American Economy, 1941), cited in (Ironmonger, 2000) or S. Kuznets, L. Epstein and W. I. King, H. Kirk, W. C. Mitchell cited by Chadeau and Fouquet (1981), Alfred Marshall (Principles of economics: An introductory volume, 1920), Arthur Pigou (The Economics of Welfare, 1932) in (Abraham and Mackie, 2006) or Lindahl *et alii* (1937), Wesley C. Mitchell *et alii* (1921), Kuznets (1941) in (Vanoli, 2002). This question is also a matter of history (Folbre and Wagman, 1993) since the prevalence of market over informal economy is relatively recent in economic history.

Hawrylyshyn (1976) reviews some of the early quantitative studies on domestic work, from the second half of the twentieth century. They mostly deal

with the USA, but pioneer quantifications were performed in Nordic countries as well (Denmark, Norway, Sweden). Over the last 30 years, many authors have investigated this issue, mainly through time use surveys and the valuation of hours worked for domestic production. We found references to 27 national or regional economies[1] where at least hours of domestic work have been converted to monetary equivalents. Chadeau (1992) reviews such work in seven countries; Goldschmidt-Clermont and Pagnossin-Aligisakis (1995) and Goldschmidt-Clermont and Pagnossin-Aligiasakis (1999) do so in 14 countries.

Over the last 15 years or so, the focus has shifted from the valuation of productive time to the construction of households satellite accounts as suggested by the SNA (IMF, Eurostat, OECD, United Nations, and World Bank, 1993). In addition to the long debated questions that have already been raised by hours worked and their valuation, the production of HHSA yields specific issues. The interested reader will find them expounded in (Eurostat, 2003), (Varjonen and Aalto, 2006) for the European Input approach, in (Abraham and Mackie, 2006), (Nordhaus, 2006) for the US Input approach and (Holloway, Short, and Tamplin, 2002) for the UK's Output approach.

Similarities of the Estimates Despite Methodological Differences

The valuation of time in different countries and at different dates usually concurs to the same (blurry) picture of domestic work.

Hours of unpaid work are at least equal to hours of paid work (Chadeau, 1992), (Goldschmidt-Clermont and Pagnossin-Aligisakis, 1995), and (Roy, 2012). The value of this time can be estimated using various sets of assumptions and methodologies. These choices account for an important share of the estimates' dispersion in the literature (Chadeau, 1985). In his review, Hawrylyshyn (1976) corrects such methodological differences and finds that "housework is about a third of GNP". Chadeau (1985), Chadeau (1992) or Goldschmidt-Clermont and Pagnossin-Aligiasakis (1999) find ratios closer to 40 percent.

Beyond working time, domestic production has been estimated in several countries. Accounting for this production in household consumption (as households are both producers and consumers of domestic production) substantially modifies the national accounts figures. For six countries, in the 1970ss-80s, using the specialist substitute method, Chadeau (1992) finds that, prior to any adjustment, domestic work alone would increase household consumption by 57 percent to 83 percent. Goldschmidt-Clermont and Pagnossin-Aligisakis (1995) find for Finland, Germany and Bulgaria in the late 1980s-early 1990s, that once domestic production is accounted for it is equal to 60 percent of total consumption.

Using the HHSA framework, Landefeld and McCulla (2000), Holloway, Short, and Tamplin (2002), Eustat (2004), Varjonen and Aalto (2006), Ruger and Varjonen (2008), Landefeld, Fraumeni, and Vojtech (2009), and Hamunen, Varjonen, and Soinne (2012) have estimated domestic production for the USA,

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[1]Australia, Austria, Basque Country, Bulgaria, Canada, Finland, France, Germany, Hungary, Italy, Israel, Japan, Luxembourg, Madrid, Mexico, Nepal, Netherlands, New-Zealand, Norway, Portugal, Russia, Slovenia, South-Africa, Sweden, Switzerland, United-Kingdom, United-States, but unfortunately we could find less than half of the referenced papers.

TABLE 1

HHSA Estimates in Five Countries: Effects on Key Macroeconomic Aggregates

Country	Source	Year	Revisions			Income and Savings ratio		
			GDP	Cons.	GFCF	Income	SNA$^\Delta$	non-SNA$^\Delta$
USA	a	1946	+50%	+63%	+50%	+59%	8.3%	10.8%
USA	b	1965	+39%	+49%	+50%	+49%	8.6%	11.5%
USA	a	1997	+36%	+34%	+54%	+38%	1.8%	8.5%
USA	b	2004	+27%	+26%	+48%	+32%	1.8%	4.2%
Finland	c	2001	+40%	+59%	+60%	+81%	–1.2%	0.2%
Finland	d	2006	+39%	+55%	+47%	+77%	–1.8%	–0.3%
Basque Country	e	1993	+49%	+74%*	–	–	–	–
Basque Country	e	1998	+39%	+64%*	–	–	–	–
Basque Country	e	2003	+33%	+56%*	–	–	–	–
UK	f	2000	+63%*	+95%*	+98%*	+93%*	4.2%	–6.9%*
Finland	g	2001	+36%	–	–	–	–	–
Germany	g	2001	+43%	–	–	–	–	–

*: our calculations, –: not available

$^\Delta$: SNA refers to production and other concepts as defined by the System of National Accounts, while non-SNA refers the extension of these concepts for the purpose of the households satellite account.

a: (Landefeld and McCulla, 2000), b: (Landefeld, Fraumeni, and Vojtech, 2009), c: (Varjonen and Aalto, 2006), d: (Hamunen, Varjonen, and Soinne, 2012), e: (Eustat, 2004), f: (Holloway, Short, and Tamplin, 2002), g: (Ruger and Varjonen, 2008).

GFCF: household gross fixed capital formation, Cons.: household final consumption includes individual consumption except for Basque Country.

Finland, the Basque Country, the UK and Germany, respectively. Table 1 gathers some of their results showing the impact of HHSA on key macroeconomic aggregates. Accounting for all the inputs of domestic production has a sizeable effect on major macroeconomic aggregates. For the USA and the Basque Country, this effect diminishes with time. According to the authors, this can be explained by a greater access of women to the labor market. Also, accounting for domestic production can have a marked impact on savings ratios in both directions: British household savings ratio would be negative, while Finnish one would be closer to zero.

Inputs for domestic production as described by the HHSA come in quite similar shares across countries (see Table 5 in Appendix 7). Net value added is equal to approximately three fourth of production while capital consumption is the smallest of the three components. However, the comparison between (Ruger and Varjonen, 2008) and (Varjonen and Aalto, 2006) for Finland in 2001 shows that international comparisons going beyond orders of magnitude are fragile: Ruger and Varjonen (2008) revise initial estimates of the German and Finnish HHSA so as to make them comparable, which significantly modifies the estimates both in absolute and relative terms.

Gross Value Added by function of domestic production are broadly similar in the UK, the Basque Country and Finland (see Table 6 in Appendix A), but it is impossible to say which part of the differences stems from national specificities or from the methodology. In particular, with their output method, Holloway, Short, and Tamplin (2002) have an extensive approach to childcare and accommodation for the UK. However, the accommodation function is similar across countries

which hides the fact that for the UK, figures cover both SNA (imputed rents) and non-SNA[2] production for own use. Care covers twice as much gross value added than in the other two countries. Also, the small fraction of food production in UK households could reflect the stereotypical lack of interest in food by the British, but can also be explained by the way ancillary functions (transportation in particular) are reallocated to other principal functions.

From these comparisons we can draw the following conclusion: our estimation should be broadly in line with others, but in detail, comparisons cannot be made without specific adjustments. The corollary conclusion is that there is a great need for a benchmarking method from which historical and international comparisons can be made.

3. The Accounting and Valuation of Hours of Domestic Work

3.1. *Time-Use Surveys: Towards Harmonisation*

We use the latest two French time use surveys, whose fieldwork took place during the years 1998 and 2010 respectively. They are representative of the non-institutional population of mainland France, and in 2010, of three overseas *départements*. In 1998, all members of a household above 14 were interviewed and each of them had to fill in one time-use diary. This yielded 15,450 diaries, completed by just as many individuals belonging to 7950 households. In 2010, one individual was selected in each sampled household, among its members aged 11 and above. His/her spouse or partner, if there was one, was also interviewed. This time, respondents were given two diaries to fill in, one for a weekday and one for a weekend day. The 2010 sample eventually consisted of 12,000 households, 18,500 interviewed individuals, 27,900 diaries. In 2010, the activity list comprises roughly 100 basic activities, in compliance with Eurostat's Guidelines on Harmonised Time Use Survey (Eurostat, 2008). The diary and activity list were improved between 1998 and 2010. In particular, the location/means of transportation was added to the description of each activity. This makes some distinctions possible in 2010, but not in 1998. For example, car use can be measured directly in 2010, but hypotheses have to be made to estimate it for 1998. Other issues for the comparison of 1998 and 2010 are addressed in section 5.

Household Surveys and National Accounts have Different Scopes

In 2010, the sum of the weights of the respondents with a diary is 54,4 million, when the total population of France was 64,6 on Jan 1, 2010. The difference consists of: the inhabitants of French Guyana; the children under 11; the residents of institutions such as care homes, boarding schools, prisons; and the students on campuses. The amount of unpaid domestic work carried out in France during 2010 estimated from time use data will therefore exclude Guyana, and using it as our estimate implies making two additional hypotheses:

[2]Non-SNA refers to the concepts of production and other operations for the purpose of households satellite accounts as opposed to SNA referring to the definitions in the system of national accounts.

1. The amount of domestic work carried out by children under 11 is negligible, which seems to be a realistic assumption, in a developed country like France at least,
2. Residents of institutions do little domestic work. This assumption is standard in this literature and seems acceptable since by definition, most of these institutions provide cooking, cleaning, etc. for their residents.

When computing growth rates between 1998 and 2010, we do so on the scope covered by the 1998 survey: mainland France, and people aged 15 and above. Results in level are based on 2010 on the corresponding scope people aged 11 and above in mainland France and three overseas *départements*.

Since their onset, time use surveys have been at the heart of an international community of researchers, and they are fairly comparable across countries, as regards their activities coding list in particular. At the European level, most countries follow Eurostat's Guidelines (Eurostat, 2008). Thus the data exist to compute comparable estimates of hours of unpaid work. The crux of the problem is to agree on which activities to include in domestic work.

3.2. *Defining Domestic Work*

3.2.1. The Definition is Debatable, We Test Three Possibilities

The question is not so much to give a theoretical definition of domestic work, as it is to decide where to set the boundary between productive and unproductive activities. Our view is that a consensus cannot be reached solely from any set of criteria. Yet, estimates are very sensitive to the definition of domestic work, so that the agreement on a boundary is one of the keys to making international comparisons possible.

We favor a restrictive definition (*core* perimeter) of domestic work for three main reasons: all its elements are commonly accepted as productive, it is *a priori* the easiest to measure across countries, and it is less subject to an overestimation of productivity (see 3.3 and 4.2), a key issue for the input method.

Drawing the frontier of production across the grey zone. The *third party criterion* is usually the cornerstone of the definition of domestic production: "If an activity is of such character that it might be delegated to a paid worker, then that activity shall be deemed productive" (Reid, 1934, p. 11) cited by Ironmonger (2000). Being too inclusive, this criterion has been completed with the reference to social norms: "the third party criterion comes up against borderline cases which must be resolved by reference to normal social practice and standards" (Chadeau, 1992).

However, there may remain ambiguous cases and these criteria should be seen as general guidelines more than golden rules. If sexual intercourse is identified as an important activity for well-being (Stiglitz, Sen, and Fitoussi, 2009), it is chastely eluded in the literature on HHSA. However, it meets both criteria suggested by Reid and Chadeau. It can be delegated to a third party outside the household (sometimes to the detriment of the institution of marriage). Prostitution also exists (legal or tolerated) in most countries. However, we find it hard to argue that unpaid sexual intercourse within the household should be deemed productive.

Here, national accounting encounters anthropological issues that we are bound to leave unresolved within the scope of this paper. Following the third party criterion to the letter, we could have included sexual intercourse in our most extensive perimeter since it is part of the "*grey zone*". In practice, we totally lack the data to conduct this thought experiment.

The point of this far-fetched counterexample is: the SNA frontier of production is conventional and imperfect, the frontier of domestic production will be just as much. Comparability comes at this cost: somehow arbitrary, but unified conventions.

Including the grey zone *could double the duration of domestic work.* House chores, cooking, taking care of a dependent adult, driving children to their football class . . . are commonly accepted as *productive* activities. On the other hand, breathing, sleeping and eating are undebated examples of *non-productive* activities. But beyond these core physiological activities lies a wide *grey zone* of daily actions that can be considered productive or not. The literature on domestic work traditionally relies on two criteria to sort productive and non productive activities, without solving all the conflictual cases. In order to highlight the impact of methodological choices on estimates of household production, we define three possible perimeters of domestic work, from the most restrictive (the *core* definition) to the most inclusive (the *extensive* definition) (see Table 2). The *extensive* perimeter is almost twice as large as the *core* perimeter, both in terms of duration and imputed value. The choice of a particular perimeter also has implications for the other inputs of domestic production (see 4.3 and Appendix C for a synthesis of these implications).

1. The *core* perimeter consists of only those activities that every study in the literature agrees to be productive: chores such as cleaning, doing the laundry, the dishes, etc.; cooking; material care to and driving children and disabled persons; household management. All these routine tasks can be delegated and many households use market substitutes for them,

TABLE 2

AVERAGE WORKING TIME PER PERSON FOR THREE POSSIBLE PERIMETERS OF DOMESTIC WORK IN 2010

Perimeter	core (I)	intermediate (II)	extensive (III)
Included Activities	cooking, dish washing, household upkeep, cleaning, child and adult care, laundry, household management, driving children or others	(I) and shopping, home repair, gardening, playing with children	(II) and driving oneself, walking the dog
Daily	2 h 07	3 h 04	3 h 53
Weekly	14 h 50	21 h 30	27 h 14
Share of volunteer work	3.7%	3.8%	5%
Women's Share	72%	64%	60%

Coverage: individuals aged 11 and over, France (excl. French Guyana and Mayotte).
Source: Insee, Time Use Survey 2010.

2. The *median* perimeter adds to the first list a number of activities that belong to the *grey zone*, either because they border on leisure (*productive leisure* such as gardening, home repairs and decoration, fishing and hunting, picking berries . . .) and are probably performed less efficiently than in a professional context, or because their utility lies (at least partly) in the process itself and their delegability can be questioned (productive leisure, playing with children). Shopping is also classified here because in our data, we cannot distinguish everyday grocery shopping, a productive chore, from *window shopping* or shopping for pleasure,

3. The *extensive* perimeter furthermore contains travelling by car for oneself and walking the dog.

The activities included in the three perimeters, and the issues raised by their inclusion within the production boundary, are further discussed in Appendix B.

3.3. *The Valuation of Time*

In the literature, three methods for valuing domestic work coexist: the *generalist substitute*, the *specialised substitute*, and the *opportunity cost* methods.

In the *generalist substitute* method, hours worked are valued using the hourly wage of a worker performing all tasks indifferently (e.g. *housekeeper*). In the *specialised substitute* method, each hour worked is valued using the hourly wage of a worker performing that task specifically (resp. *cook*, *housecleaner*, *handyman* . . .). In the *opportunity cost* method, hours worked are valued using the market hourly wage of the person performing the task (e.g. dentist wage when he is cooking). We adapt the *specialised substitute* to avoid an overestimation of productivity.

We also test two *generalist substitute* methods for a sensitivity analysis: the minimum wage and the housekeeper wage.

We disregard the *opportunity cost* method. Disregarding it is standard in the literature on household satellite accounts, but we have an additional reason to do so: this method is a welfare economics method, while we perform a national accounting exercise.

Also, we assess the sensitivity of time valuation to the treatment of imputed taxes and social contributions.

3.3.1. We Use the Least Qualified Specialist Wage

We value the time spent on each activity at the wage of the *specialised substitute* one would have to hire to do the job (Table 7 in Appendix B). This method is one of the methods suggested by Eurostat (2003). Of course, very few people have all the skills of a cook, a plumber, a childminder and a teacher at the same time, so this valuation might somewhat over-estimate the productivity of household work. But two elements allow us to mitigate this criticism. First, people tend to self-select out of the tasks they are very unproductive at. Very few economists do their own plumbing at home, for example. Second, the tasks that make up the greater part of unpaid work are not the most skilled ones: food preparation, housecleaning, childcare. Nevertheless, there may remain some differences due to capital intensity and increasing returns to scale. In order to account for this, we choose the least qualified and least capital intensive job as our specialist substitute

every time we have a choice: we value cooking time at the wage of a kitchen aide, not at that of a chef, and cleaning at the wage of a domestic cleaner, not an industrial one.

3.3.2. We Favor the *Core Perimeter* Which Is Less Subject to an Overestimation of Productivity

As mentioned in 3.2.1, we favor the core perimeter of domestic work for three main reasons: all its elements are commonly accepted as productive, it is *a priori* the most easily measurable across countries and it is less subject to an overestimation of productivity. Indeed, contrary to the core perimeter, the median perimeter includes many productive activities which can be performed for their own sake: gardening, sewing, knitting, handy-work . . . When considered as leisure by the households, using a market wage to value the hours worked will most surely overestimate the value of the output. An example of this overestimation is given by the *production for own final use* already accounted for in the national accounts, with an output method. In 4.2, we compare these figures with those derived from the input method using the TUS (see Table 4). The output method might be somewhat imprecise and conventional since it is not accurately measured each year, but the input method clearly overestimates the productivity of households in their kitchen garden or when they fish, hunt, pick-up mushrooms . . . For this reason, we favor the most restrictive perimeter of domestic work which contains mostly off-putting tasks that a majority of people would consider chores (apart from cooking in some countries): dish washing, house cleaning, laundry . . .

3.3.3. We Do Not Consider the Valuation of Time Through the Opportunity Cost Method

The *opportunity cost* method is fraught with well-known difficulties, it implies imputing a potential market wage to all individuals outside of the labor market, e.g. at-home parents, retired persons . . . The usual argument to disqualify this method is the following: if one values domestic productive time with the market wage of the person performing the house chore then a dentist would implicitly be a much better cook than a bus driver: there is *a priori* no reason for this outcome to be right. However, it does not suffice to disqualify the opportunity cost method. Essentially, the market wage represents the opportunity cost only in the simplest microeconomic allocation of time model, where workers can freely allocate marginal amounts of time between market work, domestic work and unproductive activities (leisure). One could then argue that a refined model could allow to more appropriately measure the opportunity cost than equalizing it to the market wage.

Beyond the difficulty of building such a model, our argument is more straightforward: the frontier between national accounts and welfare economics is drawn in such a way that the opportunity cost method is beyond the scope of the present exercise[3] (see also [Landefeld and McCulla, 2000] for more details).

[3]This should not be seen as an endorsement of the current distinction on our part; we leave to more experienced national accountants/economists this remodelling task, if need be.

TABLE 3

Substitute Wage in € Per Hour in 2010

	core perimeter	median perimeter	extensive perimeter	generalist substitute	minimum wage
Super gross	15.84	15.80	16,04	14.53	10.43
Net	9.57	9.55	9.65	9.01	6.95

Source: Insee, Time Use Survey 2010, DADS 2010—our calculations.

3.3.4. Wage Sensitivity Analysis

Generalist or specialised substitute (−8 percent). The generalist wage method consists in valuing all the hours of domestic work at the same rate. It is one of the methods suggested by Eurostat (2003): using the wage of a *generalist housekeeper*. This method might be preferred for an international benchmark since the data for the *specialised substitute* method are not available in every country (see [Varjonen, Niemi, Hamunen, Pääkkönen, and Sandström, 1999] Appendix 2). It is also the method used by Landefeld and McCulla (2000) and Landefeld, Fraumeni, and Vojtech (2009) on US data.

However, the generalist wage method does not solve the issue of international comparability: even where the data do exist, the choice of the reference wage is not clear-cut and references are made, depending on the publication, to ISCO-88 categories 3221 (medical assistants), 3231 (nursing associate professionals), 512 (housekeeping and restaurant services workers), 5121 (housekeepers and related workers), 513 (personal care and related workers), 9131 (domestic cleaners and helpers), ISCO-08 category 5322 (home-based personal care workers) or simply 51 (personal services workers). With our data set, based on the French PCS classification, we would use *domestic services and cleaning workers* for the generalist substitute (PCS 563c *Employés de maison et personnels de ménage chez des particuliers*, which includes ISCO-08 5152 *Domestic housekeepers* and 9111 *Domestic cleaners and helpers*). Their hourly wage is equal to 14.5€ while the average wage of the specialized substitute lies between 15.8 and 16.0€ depending on the perimeter (see Table 3). The method of the generalist substitute scales down by less than 1.5€ the hourly wage, i.e. by 8 percent, the valuation of domestic work. The choice of a substitute wage is thus not the first priority to limit methodological discrepancies in comparison with the definition of domestic work and the treatment of social contribution and working time, at least in the French context.

Gross or net wages: a critical choice (−40 percent). Whether or not one should include all taxes and social contributions within the valuation of hours of unpaid work is a matter of perspective. If the main interest is household production, the imputed wage would include taxes and social contributions. If the main interest is household income, the imputed wage would be net of taxes and social contribution.

We choose to use *super gross* hourly wages (i.e. including all taxes and social contributions whether paid by the employer or the employee). The main reason

for this choice is that it is coherent with the national accounts concept of *compensation of employees* (the total remuneration, in cash or in kind, payable by an enterprise to an employee in return for work done by the latter during the accounting period).

Using net wages (before income tax) would induce a 40 percent decrease in the valuation of domestic work. Thus, the decision to use one wage or the other is not marginal quantitatively, and it should be a priority in the agenda towards international harmonization. It is also not benign for the interpretation of the savings ratio (see 4.9).

Moreover, the conversion from net to super gross wage raises its own conceptual issues. In France, paid domestic work is subject to tax rebates and subsidies. In particular, compensation paid by households to domestic personnel are partly subsidized by the general government for some specific domestic work (help for the elderly, disabled people but also care of young children). Under some conditions, up to 50 percent of the compensation paid can be deducted from the employers' income tax. This tax rebate is treated as imputed subsidies by the ESA 2010. Should we include specific subsidies and tax rebates in imputed wages? For sake of simplicity, we chose not to.

The minimum wage (−34 percent). France has an hourly minimum wage (SMIC) below which workers cannot legally be paid. By construction, this wage is lower than average wages recorded by our administrative data (DADS). Although the SMIC is an almost spontaneous reaction for a French economist, using it to value hours of unpaid work will not allow for international comparisons as not all countries have a minimum wage, and existing ones are not even comparable. In some countries, the minimum wage is very low compared to the mean wage, and very few people are actually paid at the minimum wage. In other countries such as France, the minimum wage is set at a level closer to the median wage, it can be considered as a *living wage*, and a significant proportion of the workforce actually earns it (around 15 percent).

In 2010, the minimum wage was 10.43€/h super gross and 6.95€/h net. It is noteworthy that due to regressive social contribution rebates on small wages, the difference between the valuation with the minimum wage and the specialist substitute is smaller in net (−28 percent) than in super gross (−34 percent, see Table 3).

In both cases, using this wage for the valuation of domestic work does not seem relevant, at least not for the purpose of international comparisons.

The generalist substitute method levels out any composition effect across time (<1 percent). With the specialized substitute method, wage differences should reflect differences in the productivity of each task. The generalist wage method has the major drawback of leveling out the various skills required for different domestic tasks and may be disqualified for this reason.

For instance, if women now spend less time doing the laundry and more time helping their children with homework, we would like for the hourly wage of domestic production to account for such a shift in productivity. Using the same wage for all domestic tasks would prevent us from registering any composition effect of this kind.

An evaluation of this structural effect can be performed for 2010 by computing the average hourly wage using times from both 1998 and 2010. The structural effect is as low as 0.4 percent for the core perimeter as a whole but can be larger (close to 2 percent) for some functions.

Thus this is not a strong case against the generalist substitute method.

Working time v.s. paid time (+22 percent). Our source for hourly wage (DADS) uses paid time as a reference but TUS record worked time. The difference between these durations are paid holidays, sick leave, maternity leave, national holidays . . . periods during which workers are paid but not productive. As a consequence, our hourly wage from DADS is equal to $w = \dfrac{Annual\,wage}{Annual\,paid\,time}$ which we multiply by TUS's worked time, a duration conceptually shorter. On aggregate for the market industries there is a 22 percent wedge between these two durations in 2010: 22 percent of paid time is actually not worked. As a first approximation, we could thus assume that our valuation of domestic work underestimates by approximately 22 percent the true value of domestic work because it ignores non-worked paid time. However, we can not assess whether there are some specificities linked to the particular occupations we consider (the working time and paid time of domestic cleaners paid by the hour are probably closer to one another, for instance). Before engaging in complex correction, the choice of an international benchmark on this matter could be guided by the available data.

4. From TUS to HHSA

4.1. *The Output and Input Approaches are Two Polar Ways of Measuring an in-between Reality*

Alternatively to the input method used here, the output method has been used for domestic production. As the UK's experience shows (Holloway, Short, and Tamplin, 2002), it is quite complex, whereas the input approach, based on previous experience on Time-Use Surveys, seems more practical to implement (both in terms of method and available data). Previous experiences and TUS availability are the main reasons for our choice of the input method. This choice is thus open to criticism and orientates the scope of domestic production we consider, in particular when it comes to capital (see 4.7).

However, there seems to be a consensus on the fact that the output method would, theoretically, be the first-best estimation procedure. Yet one may argue otherwise: the output and input approaches are two polar ways of measuring an in-between reality.

When a market exists, prices theoretically measure the willingness to pay of the marginal buyer for a good or service. The price embeds information beyond the cost of producing the said good or service. Typically, when the right logo is printed on a T-shirt, the value of the product increases by much more than the printing cost. What is relevant from the national accounts perspective is that prices are public and allow for a better description of the transactions.

On the one hand, using the output method and applying market prices to domestically produced goods and services implies that the willingness to acquire these products does not depend on their producers: market and domestic products are essentially identical. It is thus implicitly assumed that households are constrained to produce domestically in some way (financially, because of time, through social norms . . .) but otherwise they would purchase their domestic production from the market.

On the other hand, the input method implies that the decision to domestically produce is deliberate so that market and domestic products are essentially different. In the absence of any price to measure the specific value of these products, the best value we can (objectively) impute to domestic production is the valuation of its inputs.

Both methods are subject to a problem of quality evaluation. The output method raises the difficulty that market prices embed characteristics which do not apply to domestic production (allowing firms to price with a mark-up). The input method poses similar difficulties on wages as a measure of productivity.

In both cases, one may be tempted to go beyond these objective measures to capture the true willingness to pay for domestic production. Indeed, one can argue that nothing compares with dad's chocolate cake, while nothing is worse than wearing grandma's hand-knit pullover at school, implying that their value is neither the price of their market equivalent nor their production cost. For the present exercise we did resist this temptation, which is quite consensual and justified by similar reasons as those invoked for not considering the *opportunity cost method*: we are working within the theoretical framework of national accounting, not welfare economics.

4.2. *Avoiding Double Counts of Output for Own Final Use (5 Percent of Production)*

There are some double counts between the SNA household account and the TUS estimates (see also Appendix B). Specifically, food products, either grown, picked, hunted, fished, bred, milked, vinified, distilled or brewed are already counted, both in *Output for own final use* (P12) and *final consumption expenditure*. Also, major construction work and maintenance of dwellings are counted both in *Output for own final use* and *GFCF*.

In these cases we favor the existing national accounts estimation of *P12* and we do not count the corresponding time from the TUS data. This choice has a limited impact for construction work (see Table 4), but the input method appears to overestimate the productivity of households in their kitchen garden or when they fish, hunt, pick mushrooms . . . probably because these are both productive and leisure activities. We choose to trust the output-based estimation, in spite of its own limitations. Provided that the output method was perfectly accurate, the overestimation avoided by not valuing the agricultural production of households with the input method would amount to 49 billion €, i.e. 5 percent of domestic production in the *core perimeter*.

TABLE 4

LABOR INPUT FROM TUS AND OUTPUT FOR OWN FINAL USE IN BILLION (€)

HHSA	Activity	Gardening $\left(\frac{1}{2}\right)$	Breeding	Fishing, hunting	Gathering	Construction
	Hours*wage	26.6	6.3	11.9	0.8	2.9
SNA	B1 = P12-P2			2.5		2.3
	P12			3.4		4.9
	P2			0.9		2.6

For construction (incl. major maintenance of dwellings), the SNA figures are close to the imputed value of time from the TUS. For domestic production of food products, valuing time with low qualified specialists' wages is 20 times larger than the output estimation from the SNA account.

Source: Insee, National Accounts—Base 2005, Time Use Survey 2010, DADS 2010—our calculations.

4.3. *Reclassified Consumption Expenditure (25 Percent)*

In France, household consumption expenditure is built using the *Nace rev2* nomenclature for the balancing of the Supply and Use Table (SUT). It is also published using the COICOP classification. We use the Nace to isolate intermediate consumption and gross fixed capital formation (GFCF) because it is available in greater detail.

. . . into Intermediate Consumption (23 Percent)

Table 14 in Appendix E lists the goods and services we reallocate into intermediate consumption. The value of intermediate consumption ranges from 255 billion € to 315 billion €, depending on the chosen perimeter (Table 11 in Appendix C). The definition of domestic production therefore has a limited impact on the value of intermediate consumption : ±60 billion €. It amounts to one tenth of the effect of the choice of the perimeter on the valuation of time (Table 10 in Appendix C). From the *core* to the *intermediate* perimeters, productive leisure activities such as gardening, sewing and knitting account for 12 billion € of additional intermediate consumption. From the *intermediate* to the *extensive* perimeters, the fraction of car use counted as domestic production jumps from 11 percent to 97 percent. Consequently, the proportion of car-related expenditures that falls into intermediate consumption dramatically increases (+47 billion €), explaining most of the difference between perimeters as regards intermediate consumption.

. . . into GFCF (2 Percent)

Table 15 in Appendix E lists the goods and services we reallocate into GFCF. It is shorter than the one used with the input method in Finland (Varjonen and Aalto, 2006) or the USA (Landefeld, Fraumeni, and Vojtech, 2009). The reason for this is explained in 4.7: we assume that durables which do not take part in an active production process are not productive. In the same way as for intermediate consumption, capital is also impacted by the perimeter of domestic production, mainly through the way car use is counted as productive. GFCF ranges from 18 billion € for the core perimeter to 84 billion € in the extensive perimeter (see

Table 11 in appendix C). This effect is however small, compared to that of the valuation of time (Table 10 in Appendix C).

Because CFC for each function is a moving average of the corresponding GFCF with specific weights defined by the perpetual inventory method (see section 4.8) and as the trends in GFCFs are small, CFCs have the same order of magnitude as GFCFs.

4.4. *No Change in Taxes and Subsidies on Production*

We do not change the taxes and subsidies on production as they currently appear in the SNA household account. The reason for this is twofold: first, we are reluctant to reclassify transactions which have a counterpart outside the Households Account (here in the General Government Account); second, it would not be significant. Luckily for us, there is no longer a tax on car use in France, taxes on dwellings are already properly accounted for and there are only marginal subsidies, if any, that are conditional on engaging in domestic production of some kind (childcare for instance). We could have reallocated some individual consumption of general government to subsidies, when it was on products used as intermediate consumption for domestic production (e.g. food bank). In addition to representing only a small amount, this choice would raise similar issues as volunteer work: everything else being unchanged, this reclassification from *transfers in kind* to *subsidies* would modify the gross disposable income without changing household final consumption expenditure. Savings would be impacted, without a direct link to domestic production, consumption, or actual saving behavior.

4.5. *Household Production as Its Own Intermediate Consumption (Neutral on Value Added and Final Consumption but +4 Percent on Production)*

We could call it the *driving to the shop to purchase food to cook dinner* problem. The question is: how much of a specific domestic production do you engage in, not for its own sake, but as a means to another one? Our convention on this matter is chosen for the sake of simplicity.

Eurostat (2003) suggests estimating domestic production in five principal functions: housing, food, clothing, care and volunteer work. Ancillary functions (transportation, shopping, management) should be allocated to their true final purpose (driving to the shop to purchase food to cook dinner = food preparation).

Unfortunately, allocating ancillary work to principal functions is not always possible with our data (*shopping* and *transportation*). Since any judgemental breakdown from our part would have a sizeable impact on the relative sizes of domestic production functions, we choose to treat these two ancillary functions as if they were an end to themselves.

This convention is neutral on the total value added and final consumption. It also enables better international comparisons than when allocations are made differently across countries, and allows others to use their own breakdown, when more data is available. Moreover, counting the ancillary functions *Transportation* and *Shopping* as intermediate consumption in the other functions would increase domestic production by 4 percent in the *core perimeter* and 33 percent in the *extensive perimeter*.

4.6. *No Changes in Inventories*

The standard framework already accounts for changes in inventories of households as users. We see no reason to modify this estimation even though some goods were reclassified from final to intermediate consumption.

Productive households may also generate *other inventories* and *work in progress*. Under this category, work in progress for construction and other major maintenance of dwellings are already accounted for. In the remaining possibilities, as most of domestic production falls into the services category, we could only think of such things as unfinished knitting by December 31 and jars of jam. Hopefully, our judgemental estimation of such changes in inventories (0) is not too far from reality.

4.7. *New Frontier—on the Capital Side (+9 Percent Production)*

Defining the frontier of domestic production from the sole point of view of time use surveys could be misleading (Ironmonger, 2000). Indeed, dwellings produce rents (real or imputed) without any hours worked. Similarly, one could consider that owning (or more restrictively using) any durable is similar to producing a rental service for oneself. Instead, *we do not include production resulting from capital alone in our estimate of domestic production*, that is when sole ownership or use for recreational purposes could be said to be productive (TV, sofa . . .). We only consider durables which take part in a deliberate production (cooking, cleaning, driving . . .).

This choice is open to debate and made mainly to stress that we think the alternative to estimate capital services for all durables through the perpetual inventory method (PIM) would be unsatisfactory. In the present estimation, consumption of fixed capital (CFC) is by far the smallest of the three inputs so that defined as it is, domestic production is satisfactorily estimated despite the flaws of the PIM. Considering all the durables as productive capital would scale-up GFCF and CFC to approximately 100 billion € resulting in an 9 percent increase (respectively 2 percent) of domestic production in its *core perimeter* (resp. *extensive perimeter*).

In the principal function *housing*, we mainly consider house chores, decorative gardening and small house repairs. The services provided by a *fully furnished* dwelling are not included. The output method does not raise this kind of issue because it does not require the identification of productive capital (Holloway, Short, and Tamplin, 2002).

4.8. *The Robustness of the Perpetual Inventory Method (PIM)*
 (±0.1% of Production)

Our approach to capital depreciation is in-between that of Landefeld and McCulla (2000), who break down the total services provided by durables in proportion of hours of unpaid work, and Fraumeni (1997) or Jalava and Kavonius (2009), who specify depreciation rates for each durable. We do not develop a complete set of depreciation factors for each durable reclassified in GFCF, but borrow from the capital accounts 3 sets of such factors, which are compatible with the PIM:

- (AN.11131) *transportation equipment*: average duration seven years, maximum 21 years
- (AN.111321) *computers*: average duration five years, maximum ten years,
- (AN.111322) *communication equipment*: average duration ten years, maximum 20 years.

Investment is grouped for each of the domestic production functions and as a sensitivity test, the three sets of coefficients are applied.

Depreciation factors are not chosen for the similarity of the assets with reclassified durables, but because the average and maximum durations seem reasonable assumptions for domestic appliances nowadays. However, for cars and other transportation-related investment, coefficients for transportation equipment should be the favored assumption. They should be chosen from an industry which uses mainly cars to avoid other transportation equipment.

Figure 1 shows the sensitivity of the estimated *CFC* for food services to the choice of a depreciation rate of durables. It is the function with the highest sensitivity to the depreciation factor: in 2010 when the average duration of capital goods is assumed to be five years, CFC is 6.2 percent below its value when the assumed duration is ten years.

Our estimation using the PIM is not very precise, however an uncertainty of 5 percent on CFC weighs only 1 billion € whereas the total value of domestic production is larger than 900 billions. It is only a fraction of the suspected
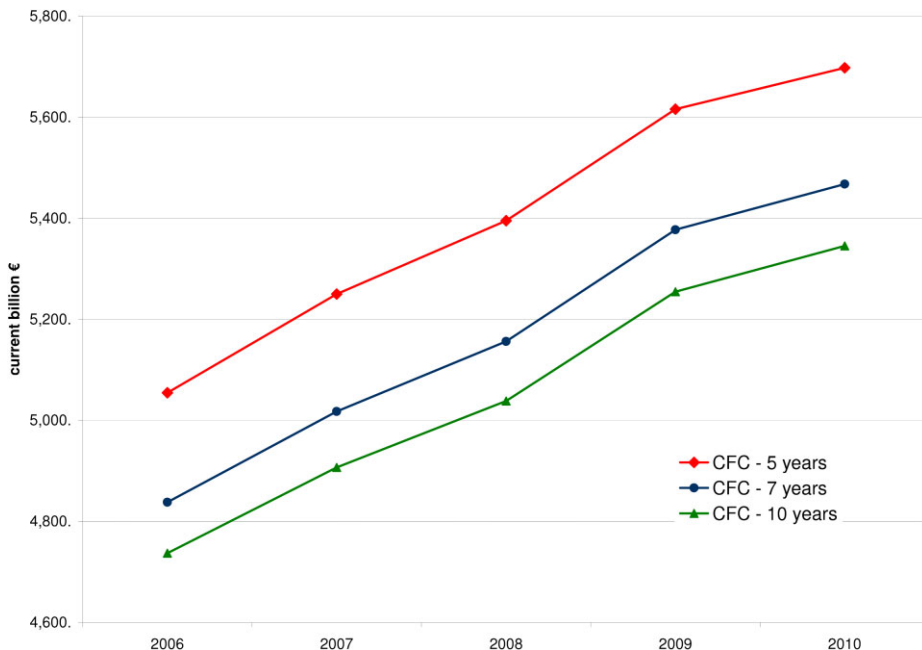

Figure 1. *Consumption of Fixed Capital (CFC)* of durables used for domestic production of food services

Source: Insee, National Accounts—Base 2005—our calculations.

uncertainty on the valuation of time spent in productive leisure such as gardening (see 4.2).

If all durables were reclassified into investment, a 5 percent uncertainty on CFC would still weigh only 5 billion € on total domestic production. Hence, our choice not to consider capital production more extensively may be thought of as drastic. However, we wish to make it clear that if a lot has been done empirically and conceptually in the treatment and harmonization of TUS, for a complete input approach of domestic production, more needs to be done on the treatment of capital. Valuing the service of capital through time of use multiplied by rental cost would *a priori* be a good start but many alternatives are available (OECD, 2009).

4.9. *Implications for the Interpretation of the Savings Ratio and Purchasing Power of Disposable Income*

The key figures for economic analysis extracted from households accounts are the savings ratio and the purchasing power of disposable income. The construction of a HHSA raises questions on both concepts and their value must be handled with great caution.

4.9.1. Purchasing Power of Disposable Income

This figure is directly impacted by all the choices made to value domestic work: perimeter, substitute wage, imputed taxes and contributions, worked time or paid time (see 3.3.1). These methodological choices can greatly affect the imputed disposable income derived from domestic production (equal to the value added derived from this activity). This additional income is not marginal (648 billion €) in the total disposable income (SNA plus domestic production, see Table 12). It is almost as high as household *gross wages and salaries* (768 billion €).

In addition, to estimate the purchasing power of this total income (SNA + non SNA), it is possible to measure price inflation of domestic production from consumption prices and wages. On the core perimeter, from 1998 to 2010, the purchasing power of gross disposable income grew by 27.2 percent according to the SNA definition, but by only 17.2 percent in the HHSA. This growth differential is due to the fast increase of hourly wages (+51 percent over the period against +20 percent for consumption prices).

In this respect, the input or output method for the construction of a HHSA will provide quite different results. The output method will mechanically limit the price differential between market and domestic production. However, without a clear model in mind for household preferences and constraints (see section 4.1), it is impossible to say whether our quantitative results are an argument in favor of one or the other method.

Minor effects can be expected in these figures deriving from the chain-linking of the HHSA over 12 years while SNA accounts are chain-linked on an annual basis.

4.9.2. Savings Ratio (11.5 Percent or 13.2 Percent)

The SNA's estimate of the savings ratio is 15.9 percent in 2010. Our estimate in the HHSA is 11.5 percent. The way the treatment of imputed taxes and social

contributions affects the savings ratio is not straightforward. Let C^{HHSA}, GDI^{HHSA} denote total consumption and gross disposable income as we measure them, that is SNA plus non-SNA, including imputed taxes and social contributions. Let $\tau^{imputed}$ denote these taxes. If one is interested in the value of domestic production/consumption, taxes and contributions should be included in both concepts as they are included in the value of market production. However, if one is interested in the potential income from domestic production, one may consider net wages $GDI^{HHSA} - \tau^{imputed}$, that is subtract imputed taxes from the *mixed income* in the distribution of income accounts but keep production and consumption as estimated with gross wages.

In this case, the savings ratio would be negative: -1.6% $\left(\dfrac{GDI^{HHSA} - \tau^{imputed} - C^{HHSA}}{GDI^{HHSA} - \tau^{imputed}} \right)$. Although this savings ratio seems the most economically relevant, it yields severe accounting and communication issues. Subtracting the imputed taxes and contributions from the mixed income would modify the net lending/net borrowing of households while no monetary transaction is recorded. It is then necessary to create a specific correction to make the HHSA neutral on the financial accounts. This correction is mandatory because the financial account describes the detention of money, stocks and financial assets in general, and they can not be affected by transactions in kind: one cannot *save* domestic production. But, this correction leaves the door open to abusive policy recommendations as part of the production simply vanishes in the sequence of accounts.[4]

In line with national accounting practice and for the sake of simplicity, we choose not to make such a correction and leave imputed taxes and contributions in the mixed income. This convention is somehow related to the accounting of imputed rents: imputed income equals avoided expenditures. With our choice to use super gross wages the savings ratio is equal to 11.5% $\left(\dfrac{GDI^{HHSA} - C^{HHSA}}{GDI^{HHSA}} \right)$. The alternative is to use net wages in the production account, in which case the savings ratio is equal to 13.2 percent $\left(\dfrac{(GDI^{HHSA} - \tau^{imputed}) - (C^{HHSA} - \tau^{imputed})}{GDI^{HHSA} - \tau^{imputed}} \right)$.

4.9.3. The Invisibility of Volunteer Work (+3 Percent of Production)

Introducing the value of volunteer work into the HHSA is not straightforward. The value of this work can logically be added to the production of NPISHs. It does not appear in household consumption expenditure but only in household final consumption: household savings are neutral to NPISHs production. However, if imputed wages from NPISHs to households were counted, they would have no counterpart in consumption and be added to both *gross saving* and *net lending or net borrowing*. This would have to be corrected as there is no monetary transaction in domestic production which could justify a modification of the *net*

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[4]We published a prior version of this work in French (Poissonnier and Roy, 2013). Although we did not subtract imputed taxes from the mixed income, some reactions, both from journalists and the general public, were that we implied a recommendation to tax domestic production.

lending or net borrowing of the original household account. To correct for this inconsistency, one would have to assume that part of NPISH production (the amount corresponding to household wages due to volunteer work) is in fact consumed directly as household consumption expenditure.

Given the small share of volunteer work in total domestic work, we found it less confusing not to include it in the HHSA but to value this time separately.

5. A households satellite account for France in 1998 and 2010

This section primarily comments the results for the core perimeter in 2010 and evolutions since 1998. Tables for both years and the three perimeters are displayed in Appendix C. The complete satellite account for 2010 is displayed in Appendix D.

5.1. *The Production Account (+33% of GDP) and Its Distribution by Functions*

Following the input approach, we add up the three inputs of home production (labor, intermediate consumption and *consumption of fixed capital* [CFC]) to obtain an estimated value of this production.

We value this production at 904 billion € in 2010 and 590 billion € in 1998. The corresponding gross value added amounts to 649 and 416 billion € which corresponds to a revaluation of GDP (in current prices) of +33 percent and +31 percent respectively.

This result is in line with other estimates ranging from 27 percent in the USA in 2004 to 63 percent in the UK in 2000 (see also Table 1).

From 1998 to 2010, domestic production has increased by 54 percent, of which 42 p.p. are attributable to a price effect. This amounts to a 3 percent annual inflation, mainly driven by wages and similar to the growth rate of the hourly minimum wage over the same period.[5] Over this period, GDP grew by 20 percent in volume. Once domestic production is accounted for, this growth is five points smaller. This result is in line with the expectations of early promoters of household production estimations (Vanoli, 2002) but striking as one would expect the transfers from non-market to market activities to be less sizeable in the recent years. The difference in the growth rate in volume term of SNA (+20 percent GDP) and non-SNA production (+4 percent gross valued added of household production) suggest that these transfers are still massive.

For both years, the production function of households is quite similar to that in other countries (see also Table 5 in Appendix A): labor (or net value added) accounts for 70 percent of total production while CFC is the smallest of the three inputs (2 percent).

Household production can be broken down into 4 principal functions and 2 ancillary functions, plus volunteer work.[6] The ventilation of domestic production in functions is quite similar in 1998 and 2010. Two noteworthy changes to the TUS between 1998 and 2010 impact our results. In the 1998 survey, transportation by

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[5]http://www.insee.fr/fr/themes/tableau.asp?ref_id=natnon04145.
[6]We do not distribute ancillary functions to principal functions (see 4.5 for a discussion of this choice), and *volunteer work* is treated separately (see 4.9).

car was not distinguished from other means of transportation. Hence the change in volume growth of this function must be interpreted with care as we have assumed the share of travelling by car in total travelling to be constant. Significant changes were also made in the coding of volunteer work and some ambiguities were corrected in 2010. The results regarding volunteer work are also to be treated with caution.

The distribution by functions can be compared with satellite accounts in other countries (see Table 6 in Appendix A). As for the Basque Country (Eustat, 2004) and Finland (Hamunen, Varjonen, and Soinne, 2012), *food* and *housing* account for the bulk of domestic production while *clothing* accounts for less than 10 percent of the total. Compared to Holloway, Short, and Tamplin (2002) for the UK, we define *care* and *transportation* more restrictively, which can explain the smaller share of these functions in domestic production. Indeed, with our *extensive* definition of domestic production, transportation accounts for a much larger share of production (27 percent instead of 5 percent initially, larger than the UK's estimate of 17.7 percent) as almost all car journeys are assumed to be productive in this perimeter (see 3.2.1). Besides, volunteer work is a minor function: 3 percent, in-between the figures for the UK and Finland.

5.2. *Consumption is Increased by 58 Percent, Income by 50 Percent and the Savings Ratio is Lower by 4 Percentage Points*

The inclusion of home production substantially changes the picture of the economic activity of households. Indeed, it implies a 631 billion € net increase in consumption, which can be compared with individual consumption expenditure as it is currently computed in national accounts (1085 billion €): incorporating home production raises final consumption by 56 percent. As gross disposable income also increases (by 50 percent), correlatively, the savings ratio (savings on gross disposable income) goes down from 15.9 percent to 11.5 percent.

In 1998, the situation is very similar despite the opposite position in the business cycle.[7] Consumption is scaled up by 56 percent, gross disposable income by 49 percent and the savings ratio scaled down by 4 points from 15.2 percent to 11.1 percent.

As a consequence, growth rates in current prices between 1998 and 2010 are rather similar whether measured with SNA conventions or with our HHSA. Consumption increased by 51 percent in the SNA (respectively 53 percent in the HHSA) and gross disposable income by 19 percent (respectively 13 percent in the HHSA). However, price differentials between domestic and market consumptions are sizeable and reflect the differentiated growth of nominal wages and consumption prices: SNA consumption prices increased by 20 percent over the period while domestic production prices increased by twice as much (42 percent). Consequently, the purchasing power of gross disposable income grew by 27 percent according to the SNA but only 17 percent in the HHSA.

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[7]1998 within the boom prior to the burst of the dotcom bubble, 2010 in the middle of the great recession.

5.3. *Home Made Consumptions are Much Larger Than Their Market Equivalents*

Even within the *core perimeter*, consumption of home-produced services dwarfs its market equivalents for every function considered both in 2010 and 1998. Home food production represents 459 billion € in 2010, eight times the consumption of meals in restaurants and eateries (59 billion €). The gap is even wider for household upkeep—253 billion € v.s. only 6 billion € for the employment of gardeners, cleaners and housekeepers—and for clothing—61 billion € of home production (laundry, ironing, mending . . .) v.s. less than 2 billion € of corresponding market services (dry cleaning). Finally, one could think that France having a lot of public transportation, a relatively high level of female labor force participation and an active policy of childcare, market consumption of transportation and care could be large relative to the amount of household production of these services. Yet we find that the value of transportation provided by households (within the *core* perimeter, i.e. excluding self-transportation) is more than 40 percent higher than consumption of transportation services whether it is by plane, train, taxi, bus . . . (38 v.s. 27 billion €). As regards care, home production (92 billion €) tops household final consumption of *Social work activities* (67 billion €) as recorded by the SNA, i.e. including general government and NPISHs contributions. Comparisons in 1998 provide an identical picture.

It would be interesting to compare these results across countries with various levels of public transportation, of women labor force participation and with different levels of socialization of care. However, since transportation and childcare are precisely two major *grey zones* in the definition of home production, such comparisons cannot be made until an agreement is found over a common delineation of their boundaries. Being able to compare the relative contribution of the private sector, the public one and households to the provision of transportation and care, across economies that are organized differently, would be a particularly valuable outcome of such an agreement.

6. CONCLUSION

One century ago, economists were estimating the value of a housewife using the cost of a housekeeper. Time use surveys then allowed for more precise and less sexist appraisals of domestic work. We are now linking these estimations with national accounts. On the one hand, a lot has been said and done in this literature, on the other hand more harmonization is needed before we can enlighten policy makers with estimates of domestic production following a shared methodology reproduced every five or ten years.

Our estimates on France in 2010 show that these methodological issues can be ranked: agreeing on a frontier of domestic production and on a net or gross wage rate are the two decisions that have the greater quantitative impact on the results. We chose the most restrictive perimeter of domestic production because we believe it to be the less disputable, and gross wages in accordance with the SNA definition of employee compensation, but these choices are obviously still open to debate.

As for the other methodological choices (specialist or generalist wage, capital depreciation rate . . .), they seem quantitatively less urgent, at least for

comparisons between industrialized countries. We tried to advocate that they should be made under two main guiding principles. The first one is a practical argument of simplicity: whenever possible, the most parsimonious solutions and the ones that imply the least changes in the existing SNA figures should be favored. The second one is that when working within the framework of national accounting, one should rely on pre-existing national accounting concepts and principles.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix A: Additional tables for international comparisons

Table 5: HHSA in 4 countries: inputs of non-SNA domestic production

Table 6: HHSA in 3 countries: ventilation of non-SNA domestic Gross Value Added by functions (in percent)

Appendix B: Activity, time and wage

Table 7: Correspondence between TUS activities and occupation in 2010, with corresponding time and wage

Appendix C: Comparisons on the main issue: the frontier of production

Table 8: Houshehold domestic production account for three definitions of production in France

Table 9: Three definitions of domestic production in France (by function)

Table 10: Three definitions of domestic work and their valuation using the least qualified specialised substitute in France

Table 11: Three definitions of intermediate consumption and capital (GFCF and CFC) for domestic production in France

Appendix D: The complete sequence of accounts

Table 12: The complete sequence of household accounts and the household satellite account in France in 2010

Appendix E: Details on reclassified consumption

Appendix E.1: Final consumption and production for own use common to SNA and HHSA

Table 13: Goods and services kept in final consumption and production for own use

Appendix E.2: Final consumption reclassified into intermediate consumption

Table 14: Goods and services reclassified from final to intermediate consumption

Appendix E.3: Final consumption reclassified into GFCF

Table 15: Goods and services reclassified from final consumption to gross fixed capital formation