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DEVELOPMENT OF ESTIMATES FOR HOUSEHOLD PRODUCTION OF NON-MARKET SERVICES IN OECD COUNTRIES FOR THE INDEX OF ECONOMIC WELL-BEING

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Abstract

With one notable exception, the production of non-market services produced and consumed by households is currently not included in the System of National Accounts. The activity, however, represents an important aspect of a country's material well-being. This research note contains a literature review on the different methods of valuing household production of non-market services. The research note also incorporates estimates of household production of non-market services for various OECD countries into the 2008 Index of Economic Well-Being (IEWB) to examine how it affects the countries' ranking in the Index. We find that including estimates of household production of non-market services into the consumption flow portion of the 2008 IEWB for OECD countries reduces the gap in total consumption flows per capita between the United States and the other OECD countries. The relative ranking of countries according to consumption flows per capita in the 2008 IEWB for OECD countries changes slightly after the inclusion of household production of non-market services.

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Executive Summary

Comparisons of economic performance are important for evaluating policy. Gross domestic product is the standard measure of material living standards, but can be inadequate for measuring well-being more broadly. The Index of Economic Well-Being (IEWB), a composite measure of economic well-being develop by the Centre for the Study of Living Standards (CSLS), assesses economic well-being in terms of equality, economic security, wealth stocks, and consumption flows. A complete measure of individual consumption flows should include household production of non-market services, but the IEWB currently fails to do this because these services are not captured by the System of National Accounts (with the exception of household production of owner occupied dwelling services).

This report provides an overview of the standard approaches used to estimate the value of household production. It also estimates the impact of including the value of household production in the measure of consumption flows on the IEWB for Organization for Economic Co-Operation and Development (OECD) countries in 2008, drawing upon previous research by the OECD and the CSLS.

There are two general approaches to valuing household production. The first, known as the output-based approach, involves directly measuring the output of household production of non-market services. In contrast, the input-based approach determines the final value of output by estimating the value of the inputs (labour and capital) used in household production. The input-based approach is more common in practice due to limited availability of data.

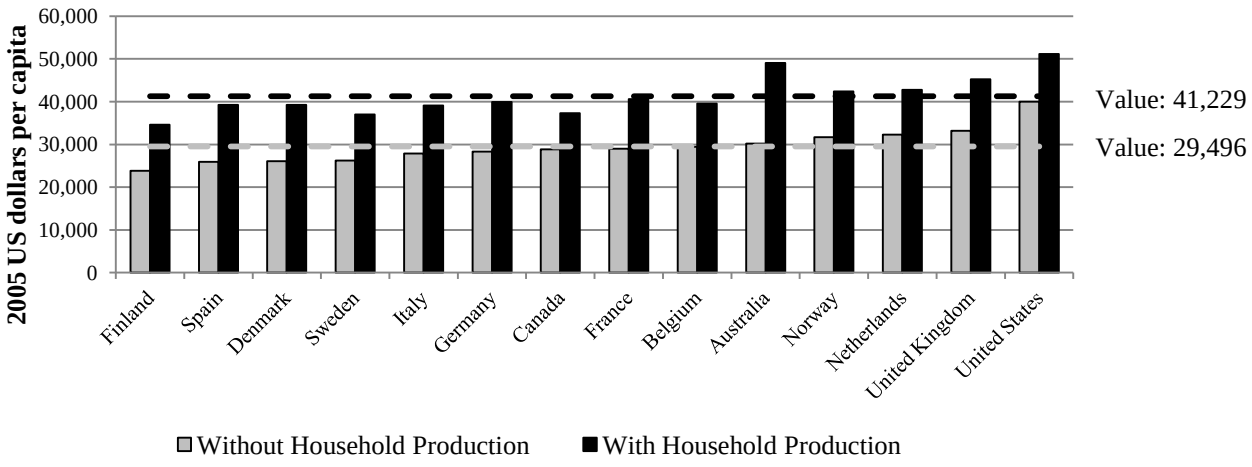
Within the input-based method, there are also several different ways of measuring inputs, particularly labour. For example, the opportunity cost and the replacement cost are the two major approaches to imputing the wage for each hour of household work. The opportunity cost approach assumes that performing unpaid work at home costs a worker the wage that worker would have received from performing that work in the market – the wage paid to household labour is thus assumed to be equal to the wage that individual receives in the market. Alternatively, the replacement approach values the work at the wage an individual would have to pay for the performance of similar work in the market. The wage under the replacement approach can be set at the wage of a specialist (time spent cooking a meal would be evaluated at the wage rate of a professional cook) or at the wage of a generalist (the wage paid to domestic workers).

OECD researchers (Ahmad and Koh, 2011) use an input-based approach, valuing labour using the replacement cost (generalist) wage, to estimate that household production in Canada was worth $7,689 (2005 US dollars) per capita in 2008. This was quite a bit below the average value of $10,750 among the 14 OECD countries considered in this paper. A significant part of

Canada's poor performance can be attributed to the relatively low estimated wage rate. Canadians spent slightly fewer hours on unpaid work than the average among the 14 OECD countries (3.29 hours per person per day compared to an average of 3.47 hours per person per day), while wages for household production were estimated at only $5.38 per hour in Canada compared to the average of the 14 OECD countries of $8.39. As a proportion of total household non-market production, Canada's unpaid work per capita per year (the contribution of labour to household production) was the lowest of the fourteen OECD countries at 70.1 per cent.

Including these estimated values of household production in the calculation of total consumption flows, a component of the IEWB, significantly increased total consumption flows. It also had an impact on relative rankings of countries. For example, Canada has the eighth highest consumption flows per capita if household production is not considered, but adding them reduces Canada's rank to twelfth, or third worst of the fourteen countries.

Total Consumption Flows per Capita in the IEWB for OECD Countries in 2008



Sources: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp.
Note: Dashed lines represent the average value.

The imputed wage rate is particularly important when considering how the countries' rankings change – Australia's high value of household production of non-market services seems to be driven by a high post-tax wage rate, while Canada's low value of household production of non-market services seems to be due to a low wage rate. The ranking changes somewhat if the opportunity cost approach for wage adjustment is used, demonstrating that the approach used to value household production matters.

While including household production seems to have a significant impact on the value of consumption flows, it is not clear how large the impact would be on the overall IEWB. The way consumption flows are scaled in the index makes analysis of the inclusion of household income inappropriate when only a one year period is considered. Ideally, household production would be incorporated into future calculations of the IEWB, but data limitations may make this impractical.

Development of Estimates for Household Production of Non-Market Services in OECD Countries for the Index of Economic Well-Being[1]

I. Introduction

One of the most frequently used barometers of economic success, gross domestic product (GDP), can serve as a good indicator of the level of material well-being within a country. However, GDP and GDP per capita are not fully adequate when the goal is to measure economic well-being. The Index of Economic Well-Being (IEWB) aims to measure economic well-being by also considering such domains as intra-country equality, economic security, wealth stocks, and consumption flows. These four domains reflect past and future economic well-being, and account for not only access to economic resources but also the distribution of that access among the population. A person's consumption of resources should include household production of non-market services, which despite constituting an important aspect of material well-being (Stiglitz, Sen, and Fitoussi, 2009), is not sold on the market and hence, with the exception of household production of owner occupied dwelling services, is not included in the calculation of GDP. [2]

Excluding household production of these non-market services can lead to distortions when estimating the level and growth of economic well-being. For example, services that shift from the unpaid sector to the market sector due to industrialization can lead to underestimation of material well-being before industrialization and overestimation of economic growth during the transition period. Likewise, volunteer work in charities can contribute to societal well-being but is not typically included in GDP. Analysis of these different components of household production can serve as indicators of socioeconomic characteristics, including income inequality, poverty rates, and gender inequality (Miranda, 2011).

As a result, several studies have estimated the value of household production of non-market services for various countries. However, by the nature of household production of non-market services, individuals do not receive direct compensation for these activities and therefore, the value of household production in monetary terms must be estimated. The accuracy of these estimates has improved with the increasing availability of detailed data, especially time use surveys, and many countries have begun to produce household production of non-market services satellite accounts. In particular, while estimates are already produced for Canada by

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[1] This paper was written by Kar-Fai Gee in 2011 under the direction of Andrew Sharpe for the requirements of the Directed Research Project at the University of Ottawa. The paper was updated in 2015 to reflect the updated IEWB for OECD countries. The author would like to thank Nadim Ahmad from the Organisation for Economic Co-operation and Development (OECD) and Matthew Calver from the Centre for the Study of Living Standards (CSLS) for their comments.

[2] Household production in this context refers to the value-added portion that is not already captured in the national accounts. While the goods component of household production should already theoretically be included, the services portion of household production is not captured in the existing SNA framework.

Statistics Canada, the Harmonized Time Use Survey now makes it possible to compile such estimates for European countries.

The purpose of this report is to review the valuation of household production of non-market services in OECD countries for the IEWB. The first part of this report will focus on the different methods used to estimate household production of non-market services in past studies. The theoretical strengths and weaknesses of each method will be discussed, as well as how relevant variables are estimated in practice. The second part will incorporate estimates of household production of non-market services for various OECD countries into the current IEWB to examine how it affects the countries' ranking in the Index.

II. Definitions

Household production of non-market services typically relates to those activities that can be performed for consumption within the household, such as cooking a meal for oneself, or non-household members, such as volunteering at a retirement home. The outputs from these activities are derived from unpaid labour, goods, services, and capital (Eurostat, 2003).

The relationship between unpaid work and leisure can be examined using the third person criterion: if a third person could hypothetically be hired to perform the activity, it is considered to be unpaid work. In this case, an activity, such as mowing the lawn, would accrue direct benefits to the hirer. On the other hand, reading a book is considered as leisure because the benefits accrue to the third party, the doer (Miranda, 2011). An activity can therefore be categorized as unpaid work or leisure, but not both. Activities that one enjoys doing but could also hire someone else to do, such as gardening, would be categorized as unpaid work and not leisure.

The amount of personal enjoyment should not be used to define the difference between leisure and unpaid work, because the level of enjoyment can vary from person to person and cannot be transferred to another person (Hill, 1979). When incorporating unpaid work into an index that also includes a leisure component, care should be taken to ensure that no activities are included in both leisure and unpaid work. Double-counting would place too much importance on those particular activities.

The SNA includes some elements of household production, such as the value of owner-occupied dwellings services. Some countries (e.g. Australia, Canada, Finland, Germany, and the United Kingdom) have constructed household production satellite accounts that do not include these elements to avoid double-counting or clearly identify the parts of household production that are already included in the SNA. This has also been the general practice in other studies (Ahmad and Koh, 2011; Budlender and Brathaug, 2002; Harvey and Mukhopadhyay, 2005).

III. Main Approaches to Valuating Household Production of Non-Market Services

There are two main methods of estimating the value of household production of non-market services: the output approach and the input approach. The output method, broadly speaking, seeks to directly value household production of non-market services by taking the difference between the market cost of purchasing a service and the cost of producing the same service. On the other hand, the input method calculates the output value by summing the values of the inputs to the production process, such as capital, labour and intermediate consumption. The two methods must use estimates for the value of outputs (output-based method) or for the inputs (input-based method) because they are not sold or bought on the actual market. The calculation of these estimates is central to the methodological discussions surrounding both approaches.

A. Output-based Method

Conceptually, the output-based method is in line with standard national accounting procedures by directly measuring the output of household production of non-market services. In this method, the gross value for household output is found by multiplying the quantity of outputs by an imputed market equivalent price. The gross value-added amount can then be calculated by subtracting intermediate consumption. Prior to the development of the 2008 SNA, Eurostat (2003) interpreted this value as the return to labour and operating surplus.

Two estimates are central to this method: those of the volume and the value of the outputs. Estimating both of these variables requires defining and dividing activities into categories with substantively different outputs. The level of disaggregation performed at this stage is frequently limited by data availability and may heavily influence the end results (Eurostat, 2003). Too few categories would result in estimates that heavily depend upon the output value and lack realistic comparability with the services on the market. It is also sometimes difficult to find a representative output to each activity, such as care services. Time outputs alone would not distinguish between the nature, quality and productivity of the services, while such metrics as the level of comfort or protection are ambiguous. Fitzgerald and Wicks (1990) accounted for this issue by measuring the output in hours and estimating the cost that it would take to hire someone to come to the house and perform the activity.

The aggregation of activities should also take into account the difficulties inherent in finding the cost of the nearest market equivalent. For example, most people cooking a meal would not produce the same quality of product as a chef at a five-star restaurant. Another problem arises when choosing between a number of similar alternatives, such as hiring a baby sitter or using a day care centre. Either alternative could be equally viable but would command different prices on the market, resulting in differing estimates that could heavily influence the final result. The value of the services can then be taken at either basic prices - before taxes and subsidies - or market prices. Most studies use the latter approach (Harvey and Mukhopadhyay, 2005).

Due to limited availability of data on the volume and quantity of services, as well as the percentage of intermediate consumption goods used for each output, the output-based method has not been used as much as the input-based method. To date, one of the largest studies using this method was performed by the Ministry of Social Affairs and Health in Finland, which released a 14 part study on different aspects of household work from 1980-1986. The Office for National Statistics in the United Kingdom has also used the output method for a household production satellite account measuring the years 1995-2000. Other, smaller studies have also used the output method, such as Harvey and Mukhopadhyay (2005), which covered outputs produced in Canada in 1992.

B. Input-based Method

The input-based method values the household production of non-market services by calculating the value of inputs used in each activity. The total value of household production of non-market services is then the sum of the value of all activities. Inputs to the production process include labour, intermediate consumption, and capital.

Due to its relative simplicity, the most popular version of this method only considers labour and ignores the other inputs. Some examples of this method in practice include Budlender and Brathaug for South Africa (2002), Statistics New Zealand (2001), and Statistics Canada (1995). However, by only considering labour inputs, this method limits its relevance to mainly labour market issues instead of more general economic issues (Eurostat, 2003). Furthermore, such estimates underestimate the true value of household labour engaged in non-market service activities.

There is extensive theory concerning the theoretical treatment of labour, capital, and intermediate consumption for the input-based method. The following sections will summarize the main estimation procedures.

i. Labour

Together with capital inputs, labour forms part of the value-added portion of the input-based method. Similar to the output-based method, the value of labour input is calculated by multiplying the volume of time inputs by an imputed value of time. However, it is important to understand how the data on the quantity and value of labour are collected to recognize potential weaknesses and biases.

a. Time Use Surveys

National time use surveys form the sole data source for the amount of time spent on various activities. Ideally, a census would precisely determine how each person spends their time. However, it is not practical to follow such an approach. Instead, statistics agencies ask a sample of the population to keep an account of their activities over a given period. Choosing the people, period of time assessed, and categories of activities form the main challenges for

developers of time use surveys. The choices made at this step govern the comparability of the survey to other time use surveys and the accuracy of their results. A survey that only measures time use on weekdays does not account for changes in time use on weekends, while a survey that only measures time use during the spring is not representative of time use throughout the year.

Nowadays, most surveys use the diary method to track time, where people are asked to write down their activity and the amount of time that they spent on it. Some surveys will provide the list of activities, while others will ask the respondent to describe the activities themselves. The former option will simplify the respondent's task, likely increasing the response rate, but this also obscures relevant details and the choice of category may be subjective. For example, playing with children may be considered to be child care or leisure, depending on the views of the person taking the survey. One of the main drawbacks is that of simultaneity, as the same unit of time cannot be used for two activities at once (Statistics Canada, 1995; Eurostat, 2003; Miranda, 2011). It is possible that a woman both cooks dinner and looks after her children at the same time, which are both economically productive activities, but only one activity can be chosen in the survey. Therefore, some activities could be systematically undervalued by time use surveys, especially those regarded by society to be relatively unimportant.

Once the data has been collected, the activities are aggregated into different categories. For example, food preparation can be divided by type of food, such as Asian or Indian cuisine, which produce different products and command different prices on the market. Time spent travelling to the grocery store can be considered its own separate category or combined with shopping. The difficulty at this stage lies in the lack of a comprehensive, standardized list of activities, which makes it difficult to compare surveys between countries or even across time in the same country. Ahmad and Koh (2011: Table 1 and Table 2) provided a breakdown of time spent by category according to the latest time use surveys for OECD countries.

Time use surveys have become increasingly widespread over the past 20 years and Miranda (2011: Appendix A1) summarized recent time use surveys in 21 countries. Time use statistics in Canada are gathered as part of the General Social Survey, while the United States uses the American Time Use Survey that is gathered by the Bureau of Labor Statistics. Several European countries were surveyed in the Harmonised European Time Use Survey that was administered by Eurostat and National Statistical Offices (NSO). The use of a single survey, despite slight differences between countries concerning the population and days covered, greatly simplifies the task of comparing data between European countries.

b. Value of Labour

The opportunity cost and the replacement cost approaches form the two main approaches of imputing an hourly wage. The difference between the two approaches of valuing wages lies at whether unpaid work is a cost to the person doing the activity, or represents savings to the household (Eurostat, 2003; Statistics Canada, 1995). In practice, it has been widely documented the opportunity cost method yields substantially higher estimates for the wage than the replacement cost (Eurostat, 2003; Statistics Canada, 1995; Ahmad and Koh, 2011; Landefeld, Fraumeni, and Vojtech, 2008).

Opportunity Cost Approach

The general principle underlying this approach is that people are rational actors who will only undertake an activity if they received a higher benefit than their next best alternative. In the context of unpaid work, the assumption is that unpaid work prevents the worker from performing paid work and as such, constitutes a cost to the worker that is equal to what the person could receive from working. For an unemployed worker, the wage is equal to the hourly wage that the person could have earned based on their socioeconomic characteristics.

The opportunity cost approach has been used in other contexts, including valuing the leisure component of the IEWB (Osberg and Sharpe, 2011). However, there are several problems with its application in household production of non-market services. Statistics Canada (1995) notes that the use of wages as the sole determining factor ignores other cultural or societal factors that could influence a person's decision. Furthermore, the implicit assumption that the person can always choose to allocate their time between unpaid or paid work may not hold during the weekends or during the nighttime, due to wage laws or labour market characteristics. Both Ahmad and Koh (2011) and Varjonen et al. (2014) also recognize that an identical meal produced by a teenager working at a retail store and a heart surgeon would be valued at vastly different costs, which is not entirely consistent with national accounting concepts.

For these reasons, the replacement cost approach has been used more frequently to date than the opportunity cost approach. Nonetheless, the opportunity cost is typically also included in order to provide an upper bound on the value of labour inputs.

Replacement Cost Approach

Conceptually, in this approach the households choose whether to perform the activities themselves or buy it from the market. Therefore, the wage imputed is the hourly wage that would be paid to the market for a worker to provide an equivalent service. The wages that are usually considered are the specialist wage, the generalist wage, or some combination of the two.

The specialist variant uses hourly wages for people employed in the same occupation. For example, a cook's wage would be the imputed wage for food preparation. However, Statistics Canada (1995) notes that this implies that the quality and productivity of the household worker matches that of the specialist, which is unrealistic. This effect can be lessened by multiplying the specialist wage by a factor to account for differences in quality and productivity (Landefeld, Fraumeni, and Vojtech, 2008). The problem of matching household activities to the proper profession is also difficult and ambiguous. These problems led Eurostat (2003) and Statistics Canada (1995) to recommend the use of the generalist method for the imputed wage.

The generalist approach acknowledges that most household work would be performed by domestic employees and not specialized workers, and therefore the wages should be based on the hourly earnings of domestic employees. Statistics Canada (1995) regarded this approach as being more realistic than the market specialist variant because domestic employees work in the same setting and with the same equipment as household workers, and will therefore have similar

productivity. While domestic workers do not generally perform such tasks as volunteer work or direct child care, Statistics Canada (1995) adjusted for this by imputing the average wage for those categories. Eurostat (2003) remarked that the majority of domestic workers may be employed by private households, which affects the accuracy of the market data.

In either the specialist or generalist approaches, the wages may be divided by socioeconomic characteristics and then applied to household members with those characteristics. Therefore, biases in the labour market will also be reflected in the valuation of unpaid work. According to Statistics Canada (1995), this properly reflects the economic reality facing households and should not be ignored or concealed.

Wage Adjustments

Wages can be considered before or after taxes and social security contributions, defined to be the gross wage and net wage respectively. Studies have used both approaches and there is no clear consensus as to which approach is more appropriate. In general, wage data are reported on the basis of gross wages. If the net wage method is used, taxes and social security contributions must be accounted for in some fashion. This data can prove to be difficult to obtain.

On a theoretical level, Eurostat (2003) contended that the choice depends on whether the households buy the services from the market or produce the services themselves. In the former case, the gross wage should be used because they would have to pay the gross wage. On the other hand, a person's disposable income is determined after accounting for taxes and social security contributions.

Statistics Canada (1995) argued that for opportunity cost approaches, the decision hinges upon whether households gain direct benefit from their contributions and those made on their behalf from employers. If not, then the wage should be calculated by subtracting the employees' contributions and income taxes from the gross wage. If households do perceive a direct benefit, then the employers' social contributions should be added to the gross earnings to arrive at the opportunity cost.

ii. Capital

Physical capital forms an integral part of the production process and can often act as a substitute for labour. For example, a person can use a car, bicycle or walk when grocery shopping. Using a laundry machine or hand washing can both be used to wash clothes. Therefore, the main concern is to account for the portion of capital investment that is consumed during household production of non-market services.

The value of consumer durables that are at least partially used in household production of non-market services need to be identified, as well as the share of activity that goes towards unpaid work. Landefeld and McCulla (2000) noted that the value of capital services must equal the opportunity cost of renting the asset elsewhere, or the rate of return and depreciation of that item. Ideally, for every type of consumer durable, there would be a value for the net stock, the

percentage of use that goes towards household production of non-market services, depreciation, and return to capital. However, this is difficult to achieve in practice due to the number of categories involved.

Due to these issues, physical capital has only been incorporated into a few national household production satellite accounts, though it has become more popular with the availability of capital use data. Landefeld and McCulla (2000) used Bureau of Economic Analysis estimates for the depreciation of consumer durables and estimates the rate of return based on the average return to net stocks.

iii. Intermediate Consumption

Intermediate consumption in the context of household production of non-market services may be considered as the value of materials that are consumed in the production process. For example, the eggs that are used to make an omelette, or electricity and soap used in a washing machine for a single load. Therefore, intermediate consumption does not form part of the value-added component of household production of non-market services (Ahmad and Koh, 2011)

However, few studies account for intermediate consumption. Ahmad and Koh (2011) noted that intermediate consumption is already accounted for in estimates of household final consumption. Furthermore, data on the share of household final consumption that is used in the production of non-market household services is scarce.

C. Comparison Between the Output-based and the Input-based Methods

The output-based method and the input-based method are both theoretically viable ways to estimate household production of non-market services. Each method has its own advantages relative to the other: for example, by measuring the output directly, the output-based method avoids the problem of simultaneity in time use surveys. On the other hand, data is readily available for the input-based method.

It is of interest to note that Fitzgerald and Wicks (1990) estimated household production, excluding volunteer work, in Missoula, Montana for the year 1985. Survey respondents were asked to fill out a questionnaire for the past six months on time use and output production (based on units that were defined in the survey). Activities without an easily defined output were measured on the basis of the number of hours spent and the cost of hiring someone to come to the house to perform the activity. The output-based method took into account these units and market equivalent prices to calculate a final estimate. The input-based method applied the opportunity cost wage approach to the time use survey and subtracted for intermediate consumption, but did not account for capital. Table 1 summarizes the results from a sample of 896 people out of a potential 55,000.

Table 1: Mean annual values of household production in Missoula, Missouri in 1985

Output category	Output value ($)	Labour value ($)	Output divided by labour value
A. Cleaning	919	840	1.1*
B. Childcare	436	166	2.6**
C. Meal preparation	2,756	1,666	1.7**
D. Clothing care	718	416	1.7**
E. Repairs	204	150	1.4**
F. Home produced food	28	84	0.3**
G. Miscellaneous	256	204	1.3
H. Output measured by hours	598	584	1.0
Total	**5,915**	**4,110**	**1.4**[n.a.]

Source: Table 1 in Fitzgerald and Hicks (1990)
Note: ** denotes statistically significant differences at the 1 per cent level; * denotes statistically significant differences at the 5 per cent level. Statistical tests were not performed by the authors for the total.

Based on **Error! Reference source not found.**, the output-based value was larger than he input-based value in all of the categories except for 'Home produced food'. Overall, the output-based value gave a 44 per cent higher valuation of unpaid household work. Harvey and Mukhopadhyay (2005) observed that the meal preparation time used in this study is too small, and adjusting it would make the input and output based estimates for 'Meal preparation' approximately equal.

Harvey and Mukhopadhyay (2005) also presented output-based estimates for Canada in 1992. The methodology accounts for compatibility with the SNA by trying to avoid certain activities that are already in the SNA GDP. For example, the user cost of dwelling for each activity was subtracted from the value of output because they are already accounted for in GDP. Similarly, certain outputs such as garden vegetables are already included in GDP and as such, were not added as an output. Their output-based estimates for Canada in 1992 were compared to Statistics Canada's estimates for the same period and are presented in Table 2. The replacement cost-generalist method recommended by Statistics Canada includes volunteer work and is approximately 39 per cent higher than the comparable value of unpaid work using the output-based method (326.9 billion versus 234.5 billion).

Fitzgerald and Wicks (1990) hypothesized that the difference between the methods is mainly a productivity issue: if households are more productive than firms, then the market wages would underestimate the household output, and vice versa. However, it is more likely that firms are more productive than households for most activities because of their access to greater stocks of physical capital. Furthermore, estimates found using the output method should be higher because they include returns to other factors than solely labour.

Table 2: Comparison of input and output based approaches for Canada in 1992

Method	Value (billions of 1992 CAN$)
Unpaid work estimates – input approach (Statistics Canada, 1995)	
Opportunity cost before tax	374.1
Opportunity cost after tax	221.1
Replacement cost – specialist	296.6
Replacement cost – generalist	234.5
Unpaid work estimates – output approach (Harvey and Mukhopadhyay, 2005)	
Output basis – meal preparation, housekeeping, clothing care, child care	289.6
Output basis – same activities as above, plus volunteer work and education	326.9

Sources: Statistics Canada (1995); Harvey and Mukhopadhyay (2005)

IV. Incorporating Estimates of Household Production of Non-Market Services in OECD Countries into the IEWB

Some indices of economic well-being have accounted for household production. One example is the Levy Institute Measure of Economic Well-Being: Estimates for Canada (Sharpe et al., 2011). This index used the replacement cost-generalist method for the base wage and adjusts for productivity using a performance index that incorporates normalized years of schooling, normalized household income, and normalized time availability of the individual. A weighted minimum wage represents a lower bound on the adjusted wage. The adjusted wage is then multiplied by the household's unpaid work hours per year.

On the other hand, the IEWB for OECD countries considers various aspects of a country's economic characteristics, such as consumption flows, wealth stocks, equality and economic security, to create a composite index that is meant to be comparable across countries. Therefore, when incorporating estimates of unpaid work, the estimates must be constructed in such a way as to be comparable across countries. Similar data must therefore be available for all countries, which significantly influences attempts to incorporate household production into the IEWB. This is available in Ahmad and Koh (2011), which contains estimates of unpaid work across OECD countries for 2008. These estimates will be used in the following sections to examine their effect on the overall IEWB.

A. Background on the Household Production Estimates of Non-Market Services

In order to estimate household production, Ahmad and Koh (2011) used the input-based method and the replacement cost-generalist variant of estimating wages, though the opportunity cost approach was also included to provide an upper bound. In both cases, only labour and capital were taken into account because they argue that intermediate consumption is already included in estimates of household final consumption, and data is not readily available on the intermediate consumption component.[3]

The labour input is calculated by the following equation:

Value of annual labour used in household production of non-market services in nominal currencies
=
Average hourly post-tax labour costs
*
Average hours worked per day
*
365 days (in 2008)
*
The population, 15 years and over

[3] For further discussion on the methodology and data sources, see Ahmad and Koh (2011).

The average hourly post-tax labour costs in the replacement cost approach use a general hourly wage calculated using market prices for relevant unregistered activities, such as unregistered domestic servants. The opportunity cost method uses average hourly wage for the whole economy. Both wages are then adjusted for taxes and social security contributions. The average hours worked per day was taken from national time use surveys.

The capital input is calculated using the following equation:

Value of capital services
=
Price index of consumer durables
*
End-of-period net stock of consumer durables
*
(Real rate of return + geometric rate of depreciation)

The net stock of consumer durables was found using final expenditures on GDP categories that provide capital services related to household production. An average geometric rate of depreciation for all consumer durables was estimated at 20% and the real rate of return for all consumer durables was set at 4% per year based on convention.

Given the scope of this study, some generalizations were made and acknowledged explicitly in the paper. They include the use of a general hourly labour cost for all activities, rather than constructing estimates using specialized labour in specific activities. While housework is the main component of household production of non-market services, the other activities account for 27 per cent to 57 per cent, which may influence the final results. Furthermore, the capital services used net stocks of consumer durables that may be used for other activities than household production of non-market services, which was not accounted for in the analysis. Finally, the authors use a single estimate of the rate of depreciation and the real rate of return for all consumer durables, without distinguishing for different items.

These considerations will have an effect on the final estimate but cannot always be corrected due to limited data availability in some OECD countries. Given that the goal is to construct comparisons of household production of non-market services across OECD countries, the "lowest common factor" approach to variables requires trading accuracy for comparability.

Overall, Ahmad and Koh (2011) find that the country with the largest amount of household production per capita in 2008 was Australia (Table 3). The high value may be primarily attributed to the value of unpaid work per capita, as it had the highest average hours of unpaid work per person and the highest average post-tax hourly wage. In particular, its average post-tax hourly wage was almost three dollars higher than the country with the second highest average post-tax hourly wage. On the other hand, low post-tax hourly wages were the driving force behind the low valuation of unpaid work in Canada, despite the relatively high value of capital services per capita.[4]

[4] The average post-tax hourly wage in Canada may be lower than the national minimum wage in 2000 because of adjustments across time and between countries, and the removal of taxes from the hourly wage.

Table 3: Components of household production for OECD countries in 2008

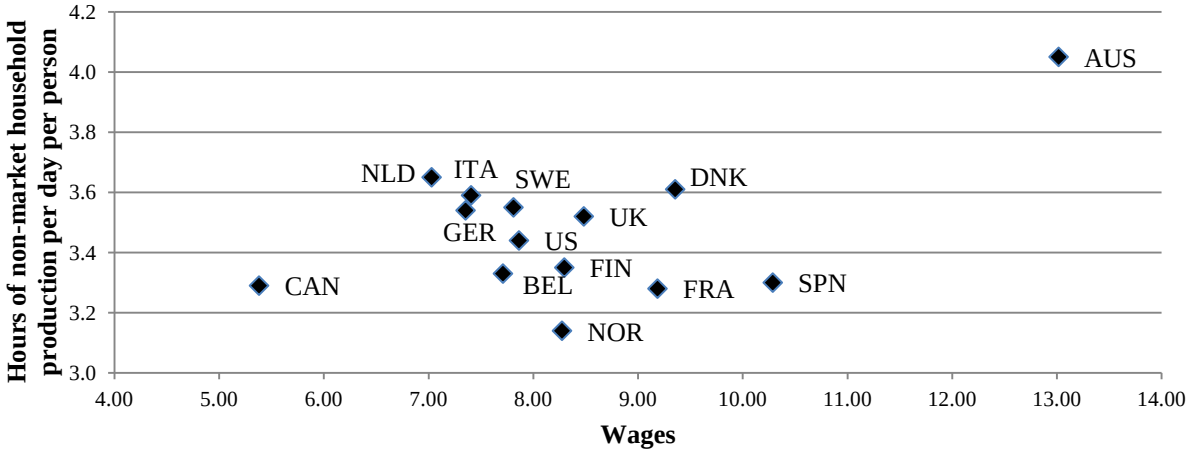
	Hours spent on unpaid work	Average post-tax hourly wage for the replacement cost – generalist method	Value of unpaid work per capita per year	Value of capital services per capita per year	Value of household non-market production per capita
	(Hours per day per person)	(2005 US Dollars per hour)	(2005 US Dollars)	(2005 US Dollars)	(2005 US Dollars)
Australia	4.05	13.02	15,482	1,591	17,073
Belgium	3.33	7.71	7,822	1,520	9,341
Canada	3.29	5.38	5,387	2,302	7,689
Denmark	3.61	9.35	10,059	2,264	12,324
Finland	3.35	8.30	8,440	1,502	9,942
France	3.28	9.19	8,959	1,567	10,526
Germany	3.54	7.35	8,237	2,371	10,609
Italy	3.59	7.41	8,416	1,772	10,188
Netherlands	3.65	7.03	7,696	1,894	9,590
Norway	3.14	8.27	7,673	2,116	9,789
Spain	3.30	10.29	10,481	1,527	12,008
Sweden	3.55	7.81	8,428	1,328	9,756
United Kingdom	3.52	8.48	8,899	2,230	11,129
United States	3.44	7.86	7,883	2,649	10,532
Average	**3.47**	**8.39**	**8,847**	**1,902**	**10,750**

Source: Ahmad and Koh (2011)
Note: Average represents the non-weighted average across all countries.

In all countries, the value of unpaid work per capita per year was much higher than the value of capital services per capita per year. As a proportion of total household non-market production, Canada's unpaid work per capita per year was by far the lowest at 70.1 per cent in 2008, while Australia had the highest at 90.7 per cent.

The value of unpaid work per capita can be decomposed into two main components: 1) the wage, and 2) the hours spent on household production of non-market services per person (Chart 1). People in all of the OECD countries except for Australia spent an average of 3.1-3.7 hours per day on unpaid work, while there was much more variation in the wage rate. Australia and Canada are the two main outliers in this graph due to their much higher and lower wages repectively ($13.02/hour for Australia and $5.38/hour for Canada). Most of the other countries had a wage rate between seven and ten dollars per hour.

Chart 1: Wages and hours spent on household production per person for OECD countries in 2008



Source: Ahmad and Koh (2011).
Note: Hourly wage refers to the average post-tax hourly wage for the replacement cost - generalist method.

B. OECD Estimates and the IEWB for Canada and the Provinces

There are two versions of the IEWB: One for Canada and the provinces (Sharpe and Osberg, 2011b), and the other for OECD countries (Sharpe and Osberg, 2011a). The most recent IEWB for Canada and the provinces includes unpaid work using data from Statistics Canada and extrapolating between 2005 and 2010. Statistics Canada only estimates labour inputs to household production and excludes capital services. However, there are notable differences even when only comparing labour inputs from both Ahmad and Koh (2011) and Osberg and Sharpe (2011a) (Table 4).

Table 4: Unpaid work for Canada in 2008

	Working age population	**Wage**	**Hours of unpaid work per day per person**	**Hours of unpaid work per year**	**Value of unpaid work**
	(Thousands of people)	(2008 CAN$ per hour)	(Hours per day per working age person)	(Millions of hours)	(Billions of 2008 CAN$)
OECD Estimate	27,718	7.17	3.29	33,285	239
IEWB Estimate for 2008	26,824	16.56	3.50	34,259	567

Source: Ahmad and Koh (2011); IEWB for Canada and the Provinces, from http://www.csls.ca/iwb/prov.asp.

The biggest difference lies in how the wage rate is calculated. While both studies use the replacement cost-generalist approach, they differ in a couple of ways. One factor is that the OECD uses a composite of labour costs based on market activities that are representative of the production of non-market services, such as unregistered domestic servants. On the other hand, Statistics Canada uses specialist wages for certain activities and a generalist wage based on registered workers for the other activities, which result in a higher average wage. The other factor is that the OECD study subtracts taxes and social security contributions from hourly wage, while Statistics Canada adds the employer's social contributions to the wage, which would also result in a higher average wage.

C. CSLS Estimates of the IEWB for OECD Countries

In the context of the IEWB, household production of non-market services is considered as another form of consumption flows because households and firms consume the services produced by unpaid work. Household production can be incorporated into the existing consumption flows portion of the IEWB as follows:[5]

A = Personal Consumption per capita
B = Index Equivalent Income
C = Adjusted Relative Cost of Leisure per capita
D = Government Final Consumption Expenditures per capita
E = Household Production
F = Life Expectancy Normalized to the US in 1980

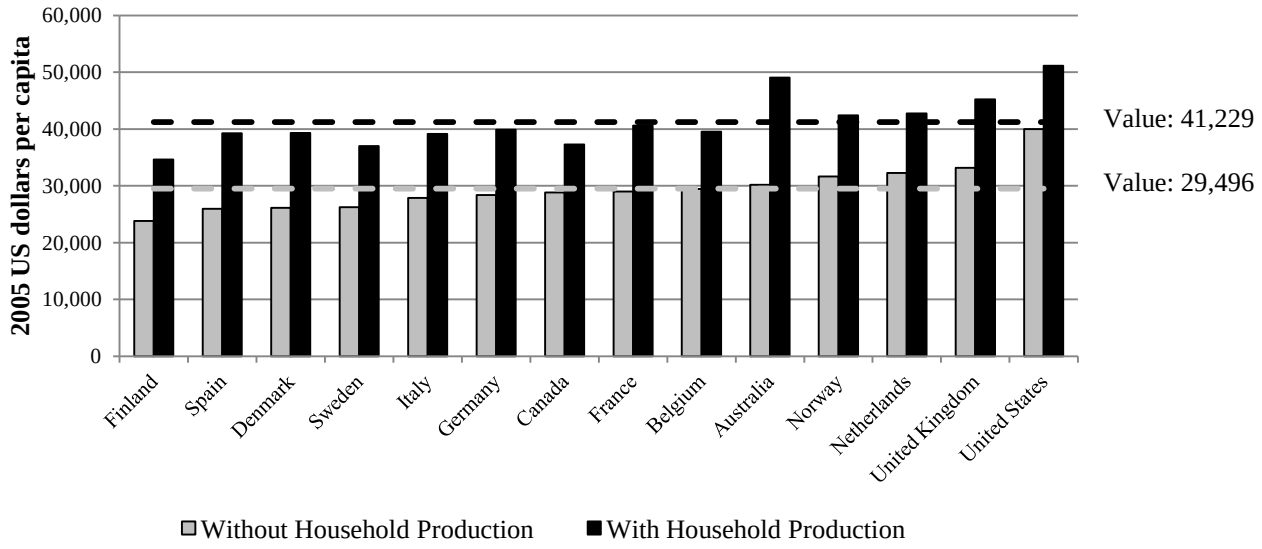
Total consumption flows per capita = (A*B + C + D + E) * F

Error! Reference source not found. illustrates the preliminary results of integrating the ECD estimates for the value of household production of non-market services into consumption flows per capita. Following the recommendations of other studies, the value corresponding to the replacement cost-generalist approach will be used.

By including household production of non-market services, every country improved its standing in total consumption flows per capita relative to the United States (**Error! Reference ource not found.**). The primary reason is that while the United States' value of household production of non-market services per capita was similar to those of the 14 countries surveyed, the share of household production of non-market services in total consumption flows was smaller than in any other country.

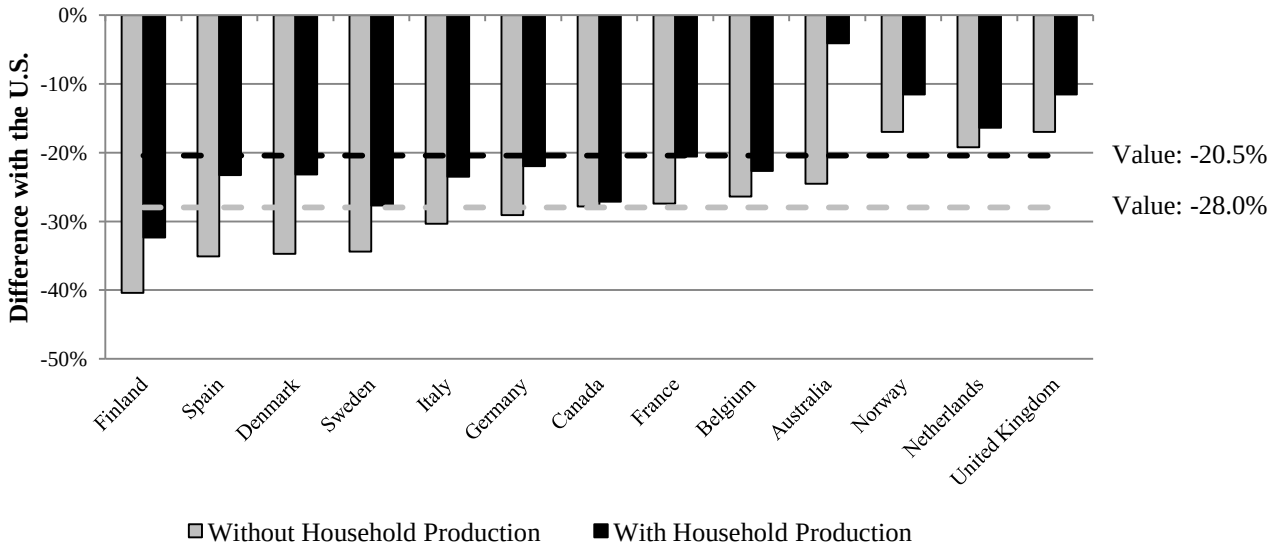
[5] For further discussion of the other components of consumption flows, see Osberg and Sharpe (2011a).

Chart 2: Total consumption flows per capita for OECD countries in 2008



Sources: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp.
Note: Dashed lines represent the average value.

Chart 3: Comparison of total consumption flows per capita with the United States in 2008



Sources: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp.
Notes: Countries with higher consumption flows per capita than the United States have a positive gap; countries with lower consumption flows than the United States have a negative gap. Dashed lines represent the average percentage rounded to the nearest tenth of a percent.

The inclusion of household production of non-market services changes the rankings for total consumption flows per capita, as seen in Table 5. The countries with the largest increases in rank were also those with the highest imputed wages – Australia, Denmark and Spain. On the other hand, Canada dropped four places, from eighth to twelth place.

Table 5: Country rankings of total IEWB consumption flows per capita with household production for OECD countries in 2008

	Without household production	With household production (replacement cost)	Difference in rank
United States	1	1	0
United Kingdom	2	3	-1
Netherlands	3	4	-1
Norway	4	5	-1
Australia	5	2	+3
Belgium	6	8	-2
France	7	6	+1
Canada	8	12	-4
Germany	9	7	+2
Italy	10	11	-1
Sweden	11	13	-2
Denmark	12	9	+3
Spain	13	10	+3
Finland	14	14	+0

Sources: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp.

It can also be useful to examine how total consumption flows change depending on the choice of the wage rate. Table 6 shows that there is some movement in the rankings depending on the approach. Furthermore, the use of the opportunity cost approach does increase household production of non-market service's share of total consumption flows per capita, as would be expected from its use of higher wages. As the only difference between the two approaches of calculating household production is the wage rate of labour inputs, the increase in share reflects the differences in the wages considered (wages of unregistered domestic workers for the replacement cost method, and the average worker for the opportunity cost method).

Ideally, a time series would be formed of total consumption flows per capita, augmented by household production of non-market services. However, this would be difficult due to data limitations.

Table 6: Effect of wage rate method on total IEWB consumption flows in 2008

	With household production (replacement cost)		With household production (opportunity cost)		Difference	
	Rank	Increase in total consumption flows per capita (per cent)	Rank	Increase in total consumption flows per capita (per cent)	Rank	Increase in total consumption flows per capita (percentage points)
United States	1	21.8%	1	38.8%	+0	+17.0%
Australia	2	38.5%	4	44.8%	+2	+6.3%
U.K.	3	26.6%	2	46.0%	-1	+19.3%
Netherlands	4	24.5%	5	39.9%	+1	+15.4%
Norway	5	25.3%	3	43.9%	-2	+18.6%
France	6	28.6%	6	41.1%	+0	+12.5%
Germany	7	28.9%	7	42.2%	+0	+13.3%
Belgium	8	25.6%	11	36.9%	+3	+11.4%
Denmark	9	33.5%	9	45.8%	+0	+12.2%
Spain	10	33.8%	14	39.6%	+4	+5.8%
Italy	11	28.8%	12	36.7%	+1	+7.9%
Canada	12	22.6%	10	39.1%	-2	+16.5%
Sweden	13	29.1%	8	45.6%	-5	+16.5%
Finland	14	31.1%	13	44.8%	-1	+13.7%

Source: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp.

When integrating total consumption flows into the overall index, it is important to note that the total consumption flows per capita are scaled prior to being inserted into the overall index. The use of a scaling factor complicates the analysis as the range depends on the minimum and maximum of the dataset. Normally, over an extended period of time, this is not a concern because the range is usually fairly large. However, if only one year is considered, the range is fairly small and so, relatively small differences will be magnified after being scaled. Therefore, it can be misleading to consider how household production of non-market services affects the overall IEWB when only one year of data is available. Consequently, we do not assess the impact on the overall IEWB in this study.

V. Conclusion

Household production of non-market services represents an important aspect of a country's material well-being. While GDP does not include most aspects of household production of non-market services, economic indices that try to measure economic well-being should take household production into account. In the context of the IEWB, household production of non-market services may be considered as a consumption flow because the services are used by society, even if there is no corresponding market transaction.

The lack of a direct market transaction resulting from household production of non-market services introduces a level of ambiguity that complicates the valuation of such services. Of the two main methods, the output method is the most theoretically sound. However, due to data limitations, the input method is more commonly used. This method consists of measuring the inputs of the production process, such as labour, capital, and intermediate consumption components. Each of these components, especially the method of determining the wage rate, can be measured using more than one method and there is no clear consensus as to which method should be used. Results can vary depending on the method employed.

An OECD report (Ahmad and Koh, 2011) estimated household production of non-market services for OECD countries. Incorporating these estimates into the IEWB for OECD countries in 2008 reduces the gap in total consumption per capita between the United States and other countries. However, the countries' relative ranking is sensitive to the imputed wage rate – Australia's high value for household production of non-market services seems to be driven by a high post-tax wage rate, while Canada's low value of household production of non-market services seems to be due to a low wage rate.

Ideally, the consumption flow portion of the IEWB would be updated to include household production of non-market services; however, data limitations make this task difficult. This would be an area to explore as more refined estimates become available in the future. Analysis of the effect of household production of non-market services on the overall IEWB would also be facilitated with the inclusion of more data on household production of non-market services.

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Appendix A: Household Production Per Capita in 2008 – Replacement Cost Approach

	Total Population	GDP Deflator	GDP PPP adjustment in 2005	OECD Estimate for the Labour Costs	OECD Estimate for the Value of Capital Services	Value of Labour	Value of Capital Services	Value of Household Production	Value of Household Production per Capita
	(Thousands of people in 2008)	(2005 = 100)	(US dollars)	(Millions of 2008 national currency)	(Millions of 2008 national currency)	(Millions of constant 2005 US Dollars)	(Millions of constant 2005 US Dollars)	(Millions of constant 2005 US Dollars)	(2005 US Dollars per person)
	A	B	C	D	E	F=D*(100/B)/C	G=E*(100/B)/C	H=F+G	K=H/A
Australia	21,728	115.2	1.374	532,333	54,715	336,385	34,575	370,960	**17,073**
Belgium	10,707	106.9	0.886	79,302	15,410	83,745	16,273	100,018	**9,341**
Canada	33,246	110.2	1.210	238,817	102,054	179,085	76,529	255,614	**7,689**
Denmark	5,493	109.0	8.863	533,829	120,165	55,255	12,438	67,693	**12,324**
Finland	5,313	106.9	1.006	48,208	8,580	44,844	7,981	52,825	**9,942**
France	64,324	107.3	0.888	549,396	96,109	576,285	100,813	677,098	**10,526**
Germany	82,120	102.9	0.840	584,718	168,311	676,459	194,719	871,177	**10,609**
Italy	59,242	107.0	0.874	466,069	98,135	498,583	104,981	603,564	**10,188**
Netherlands	16,440	106.5	0.861	115,997	28,542	126,522	31,132	157,653	**9,590**
Norway	4,769	123.8	9.500	430,376	118,672	36,592	10,090	46,682	**9,789**
Spain	45,983	109.7	0.739	390,689	56,939	481,934	70,237	552,171	**12,008**
Sweden	9,220	108.2	9.363	787,176	124,042	77,701	12,244	89,944	**9,756**
United Kingdom	61,824	108.7	0.617	368,906	92,433	550,189	137,855	688,044	**11,129**
United States	304,543	107.9	1.000	2,590,250	870,534	2,400,602	806,797	3,207,399	**10,532**

Sources: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp. PPP GDP deflator taken from Worksheet A19 of the IEWB for OECD countries. GDP deflator taken from Worksheet A7 of the IEWB for Canada and the provinces.

Appendix B: Household Production Per Capita in 2008 – Opportunity Cost Approach

	Total Population	GDP Deflator	GDP PPP adjustment in 2005	OECD Estimate for the Labour Costs	OECD Estimate for the Value of Capital Services	Value of Labour	Value of Capital Services	Value of Household Production	Value of Household Production per Capita
	(Thousands of people in 2008)	(2005 = 100)	(US dollars)	(Millions of 2008 national currency)	(Millions of 2008 national currency)	(Millions of constant 2005 US Dollars)	(Millions of constant 2005 US Dollars)	(Millions of constant 2005 US Dollars)	(2005 US Dollars per person)
	A	B	C	D	E	F=D*(100/B)/C	G=E*(100/B)/C	H=F+G	K=H/A
Australia	21,728	115.2	1.374	698,303	54,715	441,263	39,830	481,093	**22,141**
Belgium	10,707	106.9	0.886	144,912	15,410	153,031	17,396	170,427	**15,917**
Canada	33,246	110.2	1.210	636,099	102,054	477,002	84,335	561,336	**16,884**
Denmark	5,493	109.0	8.863	962,602	120,165	99,637	13,557	113,194	**20,607**
Finland	5,313	106.9	1.006	92,730	8,580	86,258	8,532	94,790	**17,840**
France	64,324	107.3	0.888	1,022,856	96,109	1,072,918	108,172	1,181,090	**18,362**
Germany	82,120	102.9	0.840	1,177,610	168,311	1,362,374	200,365	1,562,739	**19,030**
Italy	59,242	107.0	0.874	702,785	98,135	751,812	112,330	864,142	**14,587**
Netherlands	16,440	106.5	0.861	265,669	28,542	289,774	33,155	322,929	**19,643**
Norway	4,769	123.8	9.500	1,121,691	118,672	95,369	12,491	107,860	**22,617**
Spain	45,983	109.7	0.739	512,213	56,939	631,840	77,050	708,890	**15,416**
Sweden	9,220	108.2	9.363	1,725,291	124,042	170,300	13,248	183,548	**19,908**
United Kingdom	61,824	108.7	0.617	981,179	92,433	1,463,336	149,849	1,613,185	**26,093**
United States	304,543	107.9	1.000	6,925,596	870,534	6,418,532	870,534	7,289,066	**23,934**

Sources: Calculated using Ahmad and Koh (2011); Index of Economic Well-Being for OECD countries, from http://www.csls.ca/iwb/oecd.asp. PPP GDP deflator taken from Worksheet A19. GDP deflator taken from Worksheet A7 of the IEWB for OECD countries.