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## Income and Expenditure Accounts Technical Series

# Distributions of Household Economic Accounts, estimates of asset, liability and net worth distributions, 2010 to 2017, technical methodology and quality report

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# Distributions of Household Economic Accounts, estimates of asset, liability and net worth distributions, 2010 to 2017, technical methodology and quality report

## 1 Overview

The global economy has undergone significant structural shifts in recent years due in part to the 2008 global financial crisis and rising levels of globalization. The impact of macroeconomic shifts on households has become a major focus for policymakers as inequality and financial stability become common themes on the international stage. Statistics Canada and other statistical agencies can help expand the body of scholarly research on this topic by publishing more comprehensive, relevant, and detailed data on national financial inequality.

Statistics Canada has undertaken the development of new data sets that describe household net worth distributed according to various characteristics of households in order to more specifically define who holds wealth in Canada. This new data will provide policymakers and academics with new tools to examine inequality and its impact on our society. This new data is referred to as the Distributions of Household Economic Accounts (DHEA). The DHEA data will bring together the detail available from micro-data sources with the SNA concepts covered by macro-data which have more complete coverage and are internationally comparable. The main micro-data source is the Survey of Financial Security (SFS), a household survey that collects information on assets, debts, and wealth (net worth). The SFS is not an annual survey, and so a different methodology is required in survey years and in non-survey years.

This paper presents in detail the methodology used to develop distributions of household net worth for the reference years 2010 to 2017. It begins with a description of the international framework of the OECD Expert Group on Disparities within the National Accounts (EG DNA) which provides recommendations on producing distributional information aligned with System of National Accounts concepts; followed by Statistics Canada's implementation of each step. These include the adjustments to the National Accounts totals; a description of the micro-data sources; the methodology for the derivation of indicators in survey years and non-survey years; and a description of the potential sources of error. A large section of the paper focuses on the methodology for years in which survey data is not available. In these years, modelling is required to derive wealth distributions. The modelling approach will be described as well as the various adjustments required to ensure internal consistency of the tables and consistency with the macroeconomic totals.

This is the beginning stage of progress for an integrated framework of distributions including income, consumption, saving and wealth. The estimates produced using this methodology are subject to revisions as the methodology is refined.

## 2 Introduction

Statistics Canada regularly publishes macroeconomic indicators on household assets, liabilities and net worth as part of the quarterly National Balance Sheet Accounts (NBSA). These accounts are aligned with the most recent international standards and are the source of estimates of national wealth for all sectors of the economy, including households, non-profit institutions, governments and corporations along with Canada's wealth position vis-a-vis the rest of the world. While the NBSA provide high quality information on the overall position of households relative to other economic sectors, they lack the granularity required to understand vulnerabilities of specific groups and the resulting implications for economic well-being and financial stability.

There is a growing recognition, both in Canada and internationally, that building distributional dimensions into household macroeconomic indicators is becoming increasingly important. If information on disparities among households is consistent with macroeconomic indicators, it enriches the understanding of economic developments and allows for a more complete assessment of the risks associated with for example, rising inequality of income, consumption, saving and wealth.

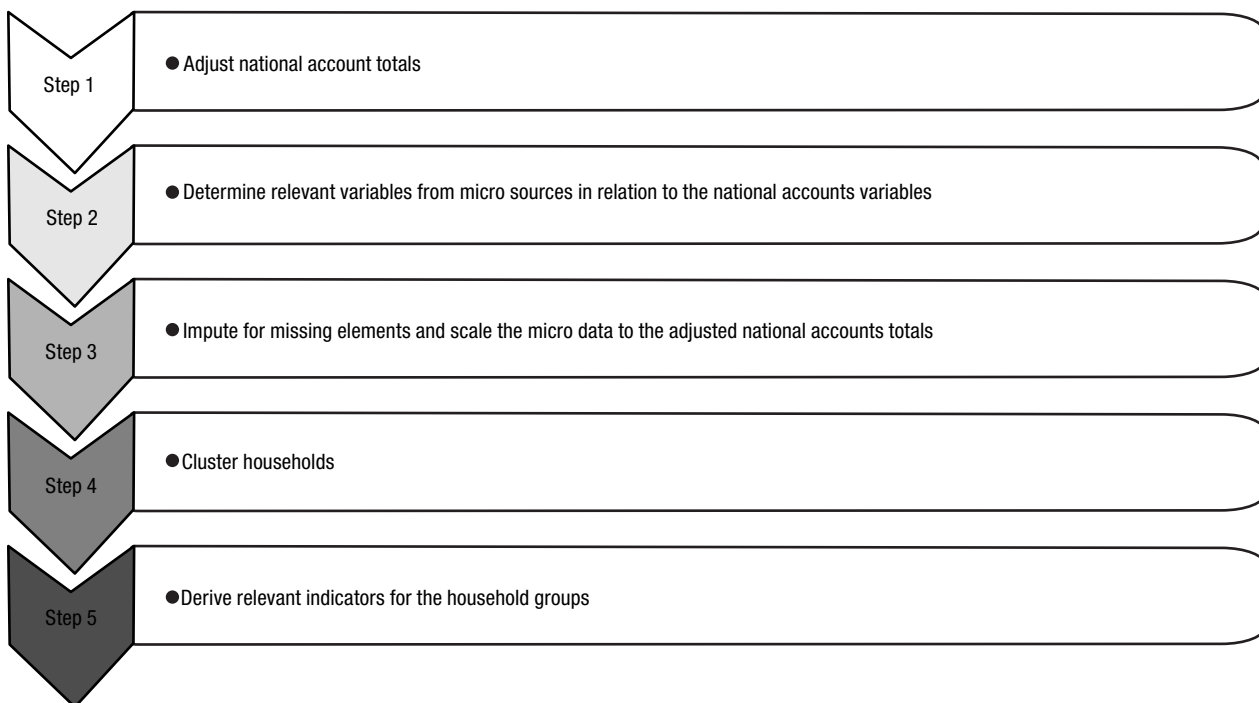
Recent comprehensive revisions to the Canadian System of Macroeconomic Accounts published in 2012 and 2015 better positioned the macroeconomic statistical program to undertake this work. Changes were introduced to align measures with new international standards, including the creation of a separate sector for non-profit institutions serving households, (previously included in the household sector) and the measurement of employer-sponsored pensions on an entitlement basis. More detail on the changes made during the revisions in 2012 and 2015 can be found in Revisions analysis - Canadian System of National Accounts 2012 (<http://www.statcan.gc.ca/pub/13-605-x/2012002/article/11718-eng.htm>) and Results from the 2015 Comprehensive Revision to the Canadian System of Macroeconomic Accounts (<http://www.statcan.gc.ca/pub/13-605-x/2015011/article/14298-eng.htm>).

This documentation outlines a first step towards a more complete program of annual distributional estimates for the household sector in the Canadian macroeconomic accounts. This documentation also presents the methodology used to develop, in the DHEA, distributions of wealth for the household sector of the National Balance Sheet Accounts (NBSA) for the reference years 2010 to 2017. It describes the technical details of the methodology and includes a report on the quality of the estimated distributions for the period 2010 to 2017. These estimates follow the releases of data in December 2017, March 2017 and December 2016, and have been further developed and refined. Distributions of income, consumption and saving are also produced and are part of the DHEA ongoing statistical program. More detail can be found in the Sources and methods guide related to income, consumption and savings distributions (<http://www.statcan.gc.ca/pub/13-607-x/2016001/937-eng.htm>).

### 3 International framework

In order to produce distributional information aligned with System of National Accounts (SNA) concepts, Statistics Canada follows the basic steps recommended by the OECD Expert Group on Disparities within the National Accounts (EG DNA). Statistics Canada's implementation of each step will be described in detail in the subsequent sections.

**Figure 1**  
**A step-by-step approach for the estimation of distributional information, provided by the EG DNA**



## 4 Adjusting the national accounts totals

### 4.1 National Balance Sheet Accounts

The National Balance Sheet Accounts (NBSA) are statements of the non-financial assets owned/used in the economy and of the financial claims outstanding among the economic units in the economy. They consist of the national balance sheet for the country as a whole, as well as the underlying sector balance sheets. At the core of the NBSA are assets and liabilities and the concepts of wealth and net worth.

The DHEA focusses specifically on the household sector of the national balance sheet. This covers the assets, liabilities, and net worth (including some sub-categories) of all households in Canada.

### 4.2 Adjustments

The OECD recommends isolating the household sector for distributional analysis; a process that may require adjusting the National Accounts sector total if it has been aggregated with the Non-Profit Institutions Serving Households (NPISH) sector.

Prior to the comprehensive revision in 2012, there were three main resident institutional sectors in the Canadian System of National Accounts (SNA): the persons and unincorporated business sector, the corporate sector and the government sector. The persons and unincorporated business sector included NPISH, credit unions, life insurance companies, fraternal organizations and collective investment schemes such as pension plans and mutual funds. Due to data limitations, this sector also encompassed activities of aboriginal governments.

With the 2012 comprehensive revision, the Canadian SNA adopted the basic SNA institutional sectoring detail throughout the sequence of integrated accounts. The former persons and unincorporated business sector was split between households and non-profit institutions serving households.

Given this work was already done to isolate the household sector, adjustments to the current NBSA data were not needed.

## 5 Identifying micro-data sources and variables

### 5.1 Survey of Financial Security

The micro-data source identified for the distribution of net worth and its components is the Survey of Financial Security (SFS). The purpose of the survey is to collect information from a sample of Canadian families on their assets, debts, employment, income and education. This helps in understanding how family finances change because of economic pressures. The SFS provides a comprehensive picture of the net worth of Canadians. Information is collected on the value of all major financial and non-financial assets and on the money owing on mortgages, vehicles, credit cards, student loans and other debts. A family's net worth is defined as the value of a family's assets minus their debt and can be thought of as the amount of money they would be left with if they sold all of their assets and paid off all of their debts.

The SFS is a sample survey with a cross-sectional design. It has been conducted on an occasional basis, in 1999, 2005, and 2012, and starting with 2016, it will be undertaken triennially. The SFS covers the population living in the ten provinces of Canada. Within the provinces, certain groups are excluded (for instance, persons living on reserves or other Aboriginal settlements and chronic care patients living in hospitals or nursing homes) which represent about 2% of the population.

Over the years, the SFS sample size and design has varied. The initial sample size was approximately 23,000 dwellings in 1999, 9,000 dwellings in 2005, 20,000 dwellings in 2012, and 21,000 dwellings in 2016. In 1999, 2012 and 2016, provincial estimates were targeted but, with the sample size reduced significantly for budgetary reasons in 2005, that iteration of the survey focused on producing reliable estimates at the regional level.

Data are generally collected directly from respondents, while in some cases additional information is extracted from administrative files and derived from other Statistics Canada surveys and other sources via record linkage. Examples include the use of personal tax data records and regulatory information on the terms and conditions of

employer-sponsored pension plans. Interviews are conducted via Computer-Assisted Personal Interviewing (CAPI) with an average interview length of approximately 45 minutes.

The survey is not mandatory and the response rates were 68.6% and 70.3% in 2012 and 2016 respectively.

More information can be found under Definitions, data source and methods for SFS (survey number 2620 (<http://www23.statcan.gc.ca:81/imdb/p2SV.pl?Function=getSurvey&lang=en&db=imdb&adm=8&dis=2&SDDS=2620>)) and CANSIM tables 205-0002 (<http://www5.statcan.gc.ca/cansim/a03?&lang=eng&pattern=2050002>), 205-0004 (<http://www5.statcan.gc.ca/cansim/a03?&lang=eng&pattern=2050004>) and 205-0005 (<http://www5.statcan.gc.ca/cansim/a03?&lang=eng&pattern=2050005>).

## 5.2 Mapping and concordance

The full National Balance Sheet Accounts (NBSA) are comprised of 102 categories and sub-categories that contain all types of assets, liabilities and net worth in the economy. The Distributions of Household Economic Accounts (DHEA) data contain 11 of these categories. The NBSA categories were simplified for multiple reasons. One reason is that some types of assets and liabilities are not applicable in the household sector. Another reason is related to the quality of distributions which will be discussed in more detail in subsequent sections of this paper.

According to the United Nations Economic Commission for Europe (UNECE); “conceptually, macro and micro statistics on household income have much in common. However, there are significant differences in the objectives and purposes of the two datasets, in their coverage and the data sources used to compile them, and because of practical data reporting or estimation issues for individual households” (UNECE 2011). The concordance process allows for the identification of areas of conceptual difference between micro- and macro-data and provides an indicator of the suitability of specific micro-data variables as distributors of macro components.

The categories from the NBSA chosen for the DHEA are laid out in Table 1 below. The coverage ratios are shown for the SFS in 2012 and 2016, the years used to produce the DHEA wealth distributions from 2010 to 2017. These categories contain sufficient detail for analysis of household financial well-being while also being at a high enough aggregate that the distributions may be modelled in years for which there is no complementary micro-data to the national accounts (non-survey years). These are the categories for which a suitable variable (or combination of variables) from the Survey of Financial Security has been identified. The concordances found in Table 1 are built by mapping variables from the SFS to a condensed version of the NBSA; the detail of which variables from each source were used to create this table are found in Table 2 below. Some details relating to the mapping in Table 2 are in sections 5.2.1 and 5.2.2.

**Table 1**  
**Concordance between the Survey of Financial Security (SFS) and the National Balance Sheet Accounts (NBSA), 2012 and 2016**

	SFS	NBSA	Coverage (SFS/NBSA)
	millions of dollars		percent
<b>2016</b>			
Total assets	11,979,666	12,424,511	96.4
Financial assets	5,837,711	6,475,543	90.2
Life insurance and pensions	2,317,797	2,446,147	94.8
Other financial assets	3,519,915	4,029,396	87.4
Non-financial assets	6,141,955	5,948,968	103.2
Real estate	5,537,216	5,254,099	105.4
Other non-financial assets	604,739	694,869	87.0
Total liabilities	1,755,045	2,056,943	85.3
Mortgage liabilities	1,416,565	1,331,264	106.4
Other liabilities	338,481	725,679	46.6
Net worth/wealth	10,224,620	10,367,568	98.6
<b>2012</b>			
Total assets	9,367,532	9,457,583	99.0
Financial assets	4,666,076	4,869,783	95.8
Life insurance and pensions	1,871,134	1,896,602	98.7
Other financial assets	2,794,942	2,973,181	94.0
Non-financial assets	4,701,456	4,587,800	102.5
Real estate	4,186,037	4,012,240	104.3
Other non-financial assets	515,418	575,560	89.6
Total liabilities	1,337,071	1,698,325	78.7
Mortgage liabilities	1,029,811	1,069,928	96.3
Other liabilities	307,261	628,397	48.9
Net worth/wealth	8,030,461	7,759,258	103.5

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.



**Table 2**  
**Wealth variables, Survey of Financial Security (SFS) to National Balance Sheet Accounts (NBSA) mapping**

Category	SFS variables	NBSA variables
Total assets	<ul style="list-style-type: none"> <li>Total assets, including employer pension plans, termination basis (<i>Less</i>)</li> <li>Value of collectibles including coins, stamps and art work</li> </ul>	<ul style="list-style-type: none"> <li>Total assets</li> </ul>
Financial assets	<ul style="list-style-type: none"> <li>Non-pension financial assets</li> <li>Private pension assets, termination basis</li> <li>Value of all businesses operated by the family unit</li> </ul>	<ul style="list-style-type: none"> <li>Total financial assets</li> </ul>
Life insurance and pensions	<ul style="list-style-type: none"> <li>Value of all employer pension plans, termination basis</li> </ul>	<ul style="list-style-type: none"> <li>Life insurance and pensions</li> </ul>
Other financial assets	<ul style="list-style-type: none"> <li>Value of all businesses operated by the family unit</li> <li>Asset value of money in banks, non-registered</li> <li>Asset value of all bonds, non-registered</li> <li>Mutual funds &amp; other investments, non-RRSP &amp; income trusts, non-registered</li> <li>Canadian and foreign publicly traded stock, non-registered</li> <li>Tax Free Saving Accounts (TFSA)</li> <li>Other investments or financial assets, non-registered</li> <li>Shares in not publicly traded stock, non-registered</li> <li>Registered retirement funds, including RRSPs, LIRAs, and RRIFs</li> <li>Asset value of other retirement funds</li> </ul>	<ul style="list-style-type: none"> <li>Total currency and deposits</li> <li>Canadian short-term paper</li> <li>Canadian bonds and debentures</li> <li>Foreign investments: paper</li> <li>Foreign investments: bonds</li> <li>Mortgages</li> <li>Equity and investment funds</li> <li>Other receivables</li> </ul>
Non-financial assets	<ul style="list-style-type: none"> <li>Non-financial assets (principal residence, other) (<i>Less</i>)</li> <li>Value of collectibles including coins, stamps and art work</li> </ul>	<ul style="list-style-type: none"> <li>Total non-financial assets</li> </ul>
Real estate	<ul style="list-style-type: none"> <li>Value of the principal residence</li> <li>Asset value of all real estate other than principle residence</li> </ul>	<ul style="list-style-type: none"> <li>Residential structures</li> <li>Non-residential structures</li> <li>Land</li> </ul>
Other non-financial Assets	<ul style="list-style-type: none"> <li>Value of personal use vehicles</li> <li>Value of other recreational vehicles</li> <li>Value of contents of principal residence</li> <li>Non-financial assets, other, not included elsewhere</li> </ul>	<ul style="list-style-type: none"> <li>Consumer durables</li> <li>Machinery and equipment</li> <li>Intellectual property products</li> <li>Stocks</li> </ul>
Total liabilities	<ul style="list-style-type: none"> <li>Total of all debts for the family</li> </ul>	<ul style="list-style-type: none"> <li>Total financial liabilities</li> </ul>
Mortgage liabilities	<ul style="list-style-type: none"> <li>Mortgage debt (on principal residence and other mortgages)</li> </ul>	<ul style="list-style-type: none"> <li>Mortgages</li> </ul>
Other liabilities	<ul style="list-style-type: none"> <li>Credit card and installment debt</li> <li>Vehicle loan debt</li> <li>Line-of-credit debt</li> <li>Debt value of student loans</li> <li>Other debt (other loans from financial institutions and other money owed)</li> </ul>	<ul style="list-style-type: none"> <li>Consumer credit</li> <li>Non-mortgage loans</li> <li>Other accounts payable</li> </ul>
Net worth	<ul style="list-style-type: none"> <li>Components of net worth enumerated above</li> </ul>	<ul style="list-style-type: none"> <li>Net worth</li> </ul>

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

### 5.2.1 Conceptual differences – valuables and collectibles

Valuables and collectibles are not an observed category in the NBSA and are not a part of the macro accounts asset boundary. Therefore, in order to align the micro source with the macro source, the value of valuables and collectibles has been removed from the SFS total for net worth and non-financial assets.

### 5.2.2 Conceptual differences – other liabilities

The category with the lowest coverage ratio is 'other liabilities'. The main reason for the under coverage of this category is due to the conceptual definition of credit card debt, which is mapped to this category. The SFS asks respondents to report the amount of credit card debt that carries over to another period, while the NBSA reports the total balance outstanding at a specific point in time. The difference reflects the fact that many households use credit cards for consumption, but pay off their balance at the end of each period.

## 5.3 T1 Family File

Since SFS data are not available on an annual basis, the methodology used to produce the wealth distributions includes a modelling component. The auxiliary information used for some of these models is the Annual Income Estimates for Census Families and Individuals, commonly called T1 Family File (T1FF), an annual administrative data file created by Statistics Canada primarily from income tax returns submitted to the Canada Revenue Agency (CRA). These micro-data cover all persons who completed a T1 tax return for the year of reference or who received CCTB (Canada Child Tax Benefits), along with their spouses and children. More information about the T1 Family File (survey number 4105 (<http://www23.statcan.gc.ca:81/imdb/p2SV.pl?Function=getSurvey&lang=en&db=imdb&adm=8&dis=2&SDDS=4105>)) can be found on the Statistics Canada website under Definitions, data source and methods.

## 6 Clustering households

### 6.1 Unit of analysis: the household

The unit of analysis chosen for the Distributions of Household Economic Accounts (DHEA) is the household, defined by the OECD as “either an individual person or a group of persons who live together under the same housing arrangement and who combine to provide themselves with food and possibly other essentials of living” (OECD 2013). The SFS data is available at the family unit level, which is comprised of unattached individuals and economic families defined as “a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law or adoption” (Statistics Canada 2017d). For the DHEA project, the economic family units have been aggregated to the household level by combining economic families that reside at the same address, which creates a unit definition that includes groups of people who share resources but are not necessarily related by blood, marriage, common-law or adoption. This brings the SFS data as close as possible to the OECD definition of household.

Related to this concept is the OECD recommendation to estimate distributions based on equivalized household values. This process takes into account differences in household size and the resulting economies of scale for income and consumption. Wealth data presented in the provisional estimates have not been equivalized. This will be investigated for future releases, when an integrated picture of income, consumption and wealth distributions is developed.

### 6.2 Distribution categories

Distributions of Household Economic Accounts (DHEA) estimates for assets, liabilities and net worth include four separate distribution variables. Households are grouped by province, equivalized household disposable income quintile, age group, and household type (multiple-person vs. one-person). With the exception of equivalized household disposable income, these groupings are based on definitions used in the SFS.

#### 6.2.1 Provinces

The province represents that of the principal residence of the household. Household members who are temporarily away from their principal residence, for instance for work or study, are included in the province of their principal residence.

#### 6.2.2 Age groups

Households are grouped into age groups according to the age of the major income earner as identified by the SFS. This differs from the OECD definition of a reference person for a household, which requires applying a number of characteristic criteria to each member of each household. This approach will be reviewed as the methodology is further developed.

The age group categories used are: under 35, 35 to 44, 45 to 54, 55 to 64, and 65 and over.

### 6.2.3 Household type

Grouping by household type is done according to a simplified definition of household composition, with only two categories: households composed of one person and households composed of more than one person. This simplified version is used in order to have similar definitions on both the SFS data and the auxiliary data source used for modelling distributions for non-survey years.

### 6.2.4 Household disposable income quintiles

The household disposable income concept is unique to the System of National Accounts (SNA) and is not measured directly in the SFS. While the estimates of wealth are not equivalized, the breakdown by income quintile will be based on an equivalized income concept to reflect differences in household size and composition. In order to assign SFS households to disposable income quintiles, equivalized household disposable income must first be estimated for each household on the 2012 and 2016 SFS as follows:

- The SNA household disposable income aggregate is broken down into components (for example compensation of employees, transfers to and from other sectors, etc.) for which corresponding variables or proxies can be found on the SFS.
- For each of these components, the SNA aggregate value is distributed over SFS households according to the value of the corresponding SFS variable or proxy. SFS survey weights are taken into account when calculating each household's share of the component.
- For each household, the distributed components are summed up to calculate the household's estimated disposable income.
- A final adjustment is done in order to "equivalize" the household disposable income. It consists of dividing the household disposable income by the number of consumption units for each household, which is based on the Oxford-modified equivalence scale.

The result is a new income variable for each SFS household, more closely aligned with the SNA concept of household disposable income than the available measure of after-tax income. Household equivalized disposable income is nevertheless highly correlated with equivalized after-tax income excluding capital gains, with a coefficient of correlation of 90.3% in 2012 and 88.7% in 2016. This is an important feature for modelling equivalized disposable income distributions in non-survey years.

Once every SFS household has been assigned an equivalized household disposable income, the households are grouped into equivalized household disposable income quintiles, which again are calculated taking into account the SFS weights.

## 7 Deriving indicators in survey years

The Survey of Financial Security (SFS) is the main source of distribution information for the DHEA for wealth. However, the SFS has been an occasional survey in the past and will be triennial beginning in 2016. This leaves gaps that need to be filled in order to produce an annual series of distributions. The proposed methodology for deriving these distributions is two-fold, with a simpler, more direct approach being used in survey years and a more complex model-based approach being required in non-survey years. Throughout this section and the next two, descriptions will be given to show how much each step of the process modifies the estimates.

This section describes the first part of the methodology used to populate the tables in survey years. It consists of two steps: reweighting SFS and obtaining distribution estimates from SFS which are scaled to NBSA totals. For this set of distributions, this methodology is used only for 2012 and 2016. Going forward, this process would be used for every survey year.

### 7.1 Weight adjustments

The SFS data currently used for the DHEA differs slightly from the version used to develop the DHEA estimates in the provisional releases and those used to publish estimates obtained directly from the survey.

The SFS 2012 and 2016 are reweighted to take into account population control totals more closely related to the analytical categories of the DHEA and to reduce the impact of certain outliers. This reweighting step is described more completely in section 8.1 since it is also used as a model for non-survey years.

## 7.2 Distribution estimates

Using these DHEA-specific weights, the SFS 2012 and 2016 micro-data variables for assets, liabilities and net worth are scaled to the adjusted national accounts totals according to the concordance table in section 5.2. For each of the four tables, the total values of net worth and of each of the asset and liability sub-categories for each distribution category are estimated from SFS using these scaled values.

Measures of sampling error in the form of coefficients of variation (CVs) for the SFS 2012 and 2016 are in the appendix in Tables 5 to 8. The CVs range from 1.6% to 12.4% for total net worth, from 1.5% to 10.9% for total assets, and from 1.9% to 10.0% for total liabilities among the age ranges, income quintiles, household types and provinces.

The next step, described in section 8, is to derive wealth measures for non-survey years using a modelling approach. After this is done, some estimates are adjusted in order to avoid introducing turning points in survey years when compared with the modelled estimates in adjacent non-survey years. This is described in section 9

## 8 Deriving indicators in non-survey years

Since the Survey of Financial Security (SFS) is not undertaken annually, a different methodology is required to derive wealth measures for the Distribution of Household Economic Accounts (DHEA) in years for which survey information is not available. Without a direct measure of net worth and its components, the non-survey years must be modelled based on auxiliary information.

Two modelling approaches are used, one based on calibration and another based on area-level models. For the provisional estimates released in December 2016 and March 2017, only net worth distributions were modelled using the area-level modelling approach while the distributions of assets and liabilities were carried over from the SFS 2012 to all other years. For this release, the same area-level model approach is used to estimate distributions of select additional asset and liabilities categories. As an alternative approach, the SFS is recalibrated which allows for the derivation of estimates of all lines. This alternative approach also produces DHEA-specific weights that are used throughout the DHEA. It is also used for those asset and liability categories for which satisfactory area-level models could not be found. Though the two approaches are different mathematically, both often yield similar distribution estimates for non-survey years.

Section 8.1 describes the calibration approach including an adjustment for influential values, section 8.2 describes the area-level modelling approach, and section 8.3 describes the selection of an approach for each line and distribution category.

### 8.1 Modelling using recalibration

This modelling approach is based on calibration. Calibration is a step of the usual SFS weight calculation process. It consists of adjusting the weights of the sampled units so that estimates from the survey coincide with known totals at the population level. Potential benefits of calibration are consistency between the survey estimates and the known population totals, reduction of non-sampling errors, such as non-response errors and coverage errors, and improvement in the accuracy of estimators.

As part of the DHEA methodology, the first step of the recalibration process is an adjustment to the weights of influential households that contribute significantly to net worth. Influential units can lead to unstable estimates and for this reason are often treated by adjusting their weights downward. Influential households, particularly in the lower income quintiles, are identified on both the SFS 2012 and SFS 2016 samples and their weights are adjusted downward.

Following the weight adjustment for influential households, the SFS 2012 and SFS 2016 samples are recalibrated to population totals for both survey and non-survey years. The calibration totals are estimates of the sampled population based on projections from Statistics Canada's Census of the Population, and are produced by Statistics Canada's Demography Division. The totals used include counts of individuals by sex and age group categories, counts of households by household size, and counts of economic families by family size for select family sizes within provinces. Recalibrating adjusts the weights of the sampled units so that estimates from the survey coincide with these population totals for non-survey years, in essence adjusting the survey weights to reflect demographic shifts. The calibration methods used are as described in Deville and Sarndal (1992) and these methods are implemented in Statistics Canada's G-EST software which is described in Statistics Canada (2017b).

Once the weights of the SFS samples are adjusted to reflect demographic shifts, estimates for net worth and its components can be obtained for non-survey years using the survey data and these adjusted weights. Two series of estimates are obtained for the time period between 2010 and 2017, one using the 2012 SFS and the other the 2016 SFS. The series based on SFS 2012 is used for estimates for 2010 to 2011. For 2012 to 2016, the series are combined by linearly interpolating between the series. For example, for 2013, the combined estimate is calculated as  $\frac{3}{4} \times$  estimate from SFS 2012 recalibrated to 2013 +  $\frac{1}{4} \times$  estimate from the SFS 2016 recalibrated to 2013. The SFS series based on SFS 2016 is used for estimates for 2017. To mitigate turning points created when combining the two series of estimates, a three-point centred weighted moving average is applied to the combined series in 2012 and 2016. This slightly modifies the estimates derived for survey years.

## 8.2 Modelling using area-level models

This approach is based on models that predict the net worth, assets or liabilities of groups for "areas" of households. It is motivated by the area-level models that are a standard small area estimation technique (Rao and Molina 2015). Area-level models are so-called because the units over which the model is fit is a set domains of interest that are often geographic areas. This modelling approach is implemented using Statistics Canada's Small Area Estimation System which is available as part of the G-EST software and is described in Statistics Canada (2017c).

This approach was used in the production of the provisional estimates in December 2016 and March 2017. At the time, this method was evaluated against two alternatives, a macro-level modelling approach and a unit-level modelling approach, with the area-level being identified as the most appropriate approach based on its ability to predict the distribution of net worth. A description of the alternative methods and a summary of the comparison is presented in Statistics Canada (2017a).

### 8.2.1 Impact of data sources and their availability

As previously mentioned, the Survey of Financial Security (SFS) has only been undertaken four times in the past, in 1999, 2005, 2012 and 2016. This provides two survey years from which to construct tables for 2010 to 2017.

Fortunately, wealth is linked to income, and there is much more data available on income. The T1 Family File (T1FF) is an evident choice for auxiliary micro-data since it is available annually and since the individual-level data can be readily grouped into families.

However, the T1FF becomes available approximately one year and a half after the end of the reference year. The 2015 T1FF is the latest version available for this production covering reference years 2010 to 2017. As the area-level modelling methodology can only be used for years in which the T1FF is available, area-level model estimates of net worth and of its components were not produced from SFS 2016. Additionally, two of the other available SFS years, 1999 and 2005, cannot be considered timely, especially with the 2008 financial crisis, which occurred in the interim, while the 2005 SFS has a substantially smaller sample and was designed to produce regional rather than provincial estimates. This leaves only the SFS 2012 on which to construct area-level model estimates for 2010 to 2015. As a result, model estimates were extrapolated for 2016 and 2017.

### 8.2.2 Modelling approach

The methodology for estimating distributions of net worth and its asset and liability components in non-survey years using area-level models is as follows:

- The country is divided into domains over which the variable of interest, total net worth or one of its components, is aggregated from the 2012 SFS data. Domains are defined by crossing geographic areas with the distribution categories of interest.
- A model is fit over these domains predicting the variable of interest based on auxiliary information that is available for those domains. The variables used as predictors are T1FF variables that have been aggregated over the domains. This is done using the 2012 reference year for both the SFS and the T1FF.
- This model is then applied to all years where the auxiliary data is available (2010 to 2015) giving an estimate of the variable for every domain in both survey and non-survey years.
- Finally, the modelled distributions for the wealth tables are obtained by summing the estimates of the variable over the relevant domains.

Experience from small area estimation suggests that an area-level approach may be especially helpful when coverage of the auxiliary data source is not complete or when there are conceptual differences between the survey and auxiliary data. This is the case for the T1FF; the T1FF's coverage of the Canadian population is quite good but not perfect as conceptual differences between data sources do exist. For example, the SFS is aggregated to the household level for the DHEA while the T1FF groups individuals into families. Similarly, the DHEA use the SNA household disposable income concept while the T1FF contains tax-based definitions of total income.

Though only information derived from the T1FF has been included in the models at this point, another advantage of area-level models is that they can incorporate auxiliary information that is only available at aggregate levels.

For this production, modelling was attempted for net worth and most components of assets and liabilities for age group and for household composition. Modelling was attempted for only net worth and selected components of liabilities for equivalized household disposable income quintile. Modelling was also not attempted for any quantities for the province dimension. Individual models were fit for each component for each distribution variable. Models were validated and selected using the standard small area diagnostics described in Rao and Molina (2015) and Statistics Canada (2017c) and by comparing the modelled distributions to the SFS distributions for 2016, 2012, 2005, and 1999 (see section 8.3).

### **8.2.3 Modelling period**

All models are built using 2012 data only. The 2016 SFS, not having corresponding auxiliary data, and the 2005 and 1999 SFS, deemed not timely enough to be used for the 2010 to 2017 period, were used only to evaluate the models fit on 2012 data.

### **8.2.4 Domain definition**

The domains are defined by crossing 49 geographic areas with the distribution categories of the wealth tables. The 49 geographic areas are based on economic regions, with some neighbouring economic regions being combined when necessary.

With the domains defined over two dimensions, geography and distribution category, the models could be fit on all domains together or over the 49 geographic areas for each of the distribution categories individually. The second option was implemented, as it gives better results. It allows for different relationships between the wealth variable of interest and income covariates in each distribution category. Taking net worth by age groups as an example, this amounts to saying that the relationship between income variables and net worth is different by age group, which is reasonable since net worth is accumulated over a person's lifetime.

### **8.2.5 Covariates and linking function**

All covariates for the models are derived from the T1FF for reference year 2012. The T1FF contains a variety of demographic, income and income-related variables, and many ways of aggregating them over the domains were considered. The variables retained for modelling total net worth and its asset and liability components within each domain are: total income, total of absolute value of investment income, total income of persons of age 75 and older, total pension adjustment, and total social assistance payments. Total income is the strongest variable and it is used in nearly all models. Though the variables used are based on income, demographic trends are also captured by the models since totals also reflect population size.

The implemented models make use of a logarithmic linking function, with the log applied to both the variable of interest, total net worth or one of its components, and the covariates. In the resulting model, the predicted log of total net worth or one of its components is a linear combination of usually the log of total income, potentially the log of additional covariates, and a constant term.

The use of a logarithmic linking function results in a biased estimator. No specific bias correction is introduced since benchmarking is used to align modelled distributions with the SFS distributions in survey years (see section 8.2.7).

### **8.2.6 Estimates for 2016 and 2017**

The lack of T1FF for these years means that the area-level model estimates of net worth and of its components cannot be produced for 2016 and 2017. Instead, estimates for 2016 and 2017 are obtained by taking the model output for the previous three years, 2013 to 2015, and extrapolating along a line that best fits these three points. Estimates in 2016 are required for benchmarking the modelled series to the SFS 2012 and 2016, described in section 8.2.7.

### **8.2.7 Benchmarking estimates from area-level models**

Benchmarking refers to techniques used to ensure coherence between time series data measured at different frequencies. In this case, the annual distribution series produced by the model are adjusted to be coherent with the SFS in survey years. It consists of imposing the level of the benchmarks while preserving the movement in the modelled series as much as possible. For this production, estimates from the area-level modelling approach were benchmarked to the 2012 and 2016 SFS distributions within one standard error. Estimates from the calibration approach do not require benchmarking. When the series is expanded to include other survey years, the model outputs will be benchmarked to every survey year.

The benchmarking methods used are derived from the Dagum and Cholette (2006) regression-based approach and are further described in Quenneville and Fortier (2012) and the references therein. The procedures are implemented in PROC BENCHMARKING, described in Latendresse, Djona and Fortier (2007), as part of Statistics Canada's G-SERIES software and can be obtained by contacting [statcan.g-series-g-series.statcan@canada.ca](mailto:statcan.g-series-g-series.statcan@canada.ca).

In certain situations, benchmarking can improve the accuracy of the output. In this situation, benchmarking is being used as a way to compensate for the bias resulting from the use of a log model.

Tables 21 to 23 in the appendix show the magnitude of the benchmarking adjustments to the distributions of net worth and its components.

## **8.3 Choice of modelling approach and comparison to the SFS distributions**

For some components of net worth, estimates are available from both modelling approaches; while for others, only estimates from the recalibration approach are available. In the cases where both types of estimates are available, the choice of approach to incorporate into the DHEA was largely based upon comparisons of the modelled distributions to the SFS distributions and in particular the distributions in the most recent year 2016. Other considerations such as volatility in the estimates contributed to these choices. The choice of which approach to incorporate into the DHEA was made individually for net worth and each asset and liability category, and for each distribution variable based on this comparison. Table 3 shows the chosen modelling approach.

**Table 3**  
**Chosen modelling approach: area model (AM) or calibration (C)**

	Age group	Household type	Equivalent household disposable income quintile	Province
Total assets	AM	AM	C	C
Financial assets	AM	C	C	C
Life insurance and pensions	C	C	C	C
Other financial assets	C	C	C	C
Non-financial assets	C	C	C	C
Real estate	C	C	C	C
Other non-financial assets	C	C	C	C
Total liabilities	AM	AM	C	C
Mortgage liabilities	AM	AM	C	C
Other liabilities	C	C	C	C
Net worth/wealth	AM	AM	AM	C

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

Tables 9 to 20 in the appendix show how the modelled distributions from the chosen approach compare to the SFS distributions in 2016, 2012, 2005, and 1999 for select components of net worth. The sum of the absolute differences by category between the SFS distribution and modelled distribution is shown as a measure of distance between the SFS distributions and those obtained by modelling. As can be seen in these tables, even in 2012, the year on which the area-level model is built, there is a difference between the SFS distribution and the area-level model output. This discrepancy, which is partly due to the use of a log linear model, is addressed through benchmarking.

## 9 Combination and internal coherence of final tables

### 9.1 Adjustments to survey years

Once wealth estimates are derived for non-survey years through modelling, adjustments are made to estimates in survey years in order to avoid introducing turning points at 2012 and 2016 when compared with the modelled estimates in adjacent non-survey years. In benchmarking, this is accomplished by allowing the SFS estimates serving as benchmarks to be adjusted by at most one standard error, and in the calibration approach, by replacing the 2012 and 2016 estimates in the combined series with a centred moving average.

### 9.2 Raking

After applying the above adjustments to the survey year data, the row and column sums of the resulting tables are not coherent. The sum of the distribution categories are not equal to the NBSA totals; in other words, the row sums are not coherent. As well, the relationships between assets, liabilities and net worth are not respected; in other words, the column sums are not coherent.

In non-survey years, complete tables of asset and liability components and net worth are constructed by putting together estimates from their individually chosen modelling approaches. The row and column sums of these tables are also not coherent, primarily because different modelling approaches are used for each line.

An adjustment process is required to ensure consistency within the tables in both survey years and non-survey years. This re-establishes the relationships between assets, liabilities, net worth, etc. within each distribution category (relationships down the columns of the tables); while ensuring that the sum of the distribution categories are kept equal to the NBSA total (relationships within the rows of the table); and leaves the NBSA totals untouched. This type of adjustment goes by many names: raking, balancing, and reconciliation. A key characteristic of raking is that it ensures that specified relationships are respected while minimizing the change to individual cells of the table.

The raking methods used are derived from the Dagum and Cholette (2006) regression-based approach and are further described in Quenneville and Fortier (2012), and the references therein. The procedures are implemented in PROC TSRAKING, described in Bérubé and Fortier (2009), as part of Statistics Canada's G-SERIES software and can be obtained by contacting [statcan.g-series-g-series.statcan@canada.ca](mailto:statcan.g-series-g-series.statcan@canada.ca).



The magnitude of the raking adjustments to the internal cells of the wealth tables are in Table 4. These factors are calculated as values after raking divided by values after the final scaling adjustment. These adjustments are generally close to 1, indicating that raking the tables does not result in major changes to the distributions.

**Table 4**  
**Raking adjustment factors, 2010 to 2017**

	Range of adjustments	Proportion of adjustments of 1% or less (in percent)
Age group	[0.96,1.04]	56
Household type	[0.98,1.01]	94
Province	[1.00,1.00]	100
Equalized household disposable income quintile	[0.98,1.02]	83

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

## 10 Sources of error

The Distributions of Household Economic Accounts (DHEA) are built by bringing together data from multiple sources. Each of these sources, as well as the way in which they are used and combined, are a potential source of gaps between the micro- and macro-level data. An overview of the sources of error for the DHEA wealth distributions is given below, categorized according to their source:

- National accounts totals
- Survey data
- Model

A similar classification is found in Zwijnenburg (2016).

### 10.1 Quality of national accounts data

#### 10.1.1 Quality of national accounts totals

The National Balance Sheet Accounts (NBSA) are estimated by using the most complete and high quality data sources available in order to establish benchmark annual estimates. This generally entails annual business surveys, administrative data files from the Canada Revenue Agency (CRA), annual household survey files, annual information from pension funds, financial institutions and government public accounts and establishing annual estimates. Data are analyzed for time series consistency, links to current economic events, issues arising from the source data, and finally with respect to coherence. It is not possible to produce an equivalent to national wealth or national net worth; nor is it possible to construct a balance sheet for the household sector, except periodically from household surveys. However, certain sub-sectors of the NBSA are largely comparable to estimates produced by source data divisions (e.g., pension funds, levels of government).

The NBSA are published quarterly, whereas DHEA refers to annual data. The NBSA data from the fourth quarter of each reference year has been selected as the data point to represent each reference year (i.e. 2012Q4 data is used as the 2012 total).

#### 10.1.2 Quality of the adjustments to the national accounts totals

As previously mentioned, the adjustment to isolate the household sector from the Non-Profit Institutions Serving Households (NPISH) sector was implemented in 2012. Work to build the NPISH sector began with the creation of a more broadly defined satellite account of non-profit institutions and volunteering, first released in 2004. The nonprofit institutions serving households portion of this broader non-profit sector was implemented in the core System of National Accounts (SNA) in 2012, with estimates built from a variety of sources including administrative files on registered charities and other non-profit institutions. A range of statistical improvements to better define the universe and account for measurement deficiencies were undertaken in addition to the sectoring changes. These included delineating the purchases of households from the NPISH sector. Revised industry and final demand estimates were correspondingly introduced in the supply-use framework.

## 10.2 Quality of survey data

### 10.2.1 Sampling error

Sampling error is inevitable in any sample survey and occurs because data is collected and inferences are made from a sample, rather than the entire population. The sampling error is measured by estimating the extent to which sample estimates would vary over all possible samples that could have been selected with the same design and sample size. The magnitude of the sampling error is affected by several factors: the inherent variability in the population of the characteristic being measured, the sample size, the sample design, and the response rate. With its smaller size, the 2005 SFS has a larger sampling error than do the other years of SFS.

The coefficient of variation (CV) is a common measure of sampling error and can be used as one indicator of the accuracy of the estimates. It is defined as the ratio of the estimated standard error of the estimate to the value of estimate itself. The CVs for estimates of totals of net worth and its components from the SFS 2012 and 2016 are in the appendix in Tables 5 to 8.

### 10.2.2 Coverage error

Coverage errors are omissions, erroneous additions, duplicates and errors of classification of units in the survey frame. They can create biased estimates and the impact can vary for different sub-groups of the population.

For the DHEA, the population targeted by the SFS and the NBSA totals differ. In particular, the territories are excluded from SFS, as are about 2% of persons in the provinces who are difficult to survey for a variety of reasons.

### 10.2.3 Non-response error

There are two kinds of non-response: total non-response, not answering the whole survey, and item non-response, not answering some questions. In the SFS, this type of error is addressed by using follow-up procedures to minimize non-response, by weighting that takes into account non-response, and by imputation.

### 10.2.4 Measurement and processing error

Measurement error, also called response error, is the difference between the recorded response to a question and the “true” value. Measurement error can be caused by misunderstanding on the part of the respondent or the interviewer. Processing is required to transform survey responses into a form suitable to tabulation and analysis and may be a source of error.

## 10.3 Quality of the models used for non-survey years

In non-SFS years, the DHEA wealth distributions depend heavily on models of net worth and its components. As such, their quality depends both on the quality of the auxiliary data on which the models are built and on the strength of the model itself. Model development work will continue for the DHEA wealth distributions and will include evaluating the use of additional sources of auxiliary data.

### 10.3.1 Quality of auxiliary data sources

The auxiliary data source used for the area-level models from which estimates are derived in non-survey years are based on the T1 Family File. Based on demographic estimates, T1FF’s coverage of persons is estimated at 95.6% nationally and is greater than 91% across all provinces and territories.

Since the T1FF and the SFS both draw their income information from the same source, their income variables are closely aligned conceptually, which is useful for modelling. On the other hand, the T1FF uses the census family concept to either group individuals in a census family (parent(s) and children living at the same address) or identify them as persons not in census families. This concept is not quite aligned with the definition of household on which the DHEA are built. However, area-level models are more robust to this type of discrepancy than other types of models.

The auxiliary data source used for the recalibration approach are demographic projections of person and household counts based on Statistics Canada's Census of the Population. These projections cover the same sampled population as the SFS and exclude the same segments of the population (see Section 10.2.2), and use the same household and family concepts as the SFS. They are of high quality and are used for the calibration of most social surveys at Statistics Canada.

### **10.3.2 Quality of the models**

The ability of the models to estimate net worth and its components in non-SFS years, is discussed at length above. The models are a fundamental component of the DHEA wealth distributions methodology and, as with any model, they can only reflect the trends for net worth distributions that are related to trends in the auxiliary data. In this case, that means trends in net worth and its components related to income and demographics using the area-level modelling approach, and related to demographics alone using the calibration approach.

At the core of the area-level modelling approach, the models assume that the relationship between T1FF data and net worth, or one of its components, that exists over geographic areas in the 2012 SFS data also holds over time and carries over into the 2010 to 2017 period. This is an assumption of fundamental importance. It was partially evaluated by using data from the 1999, 2005 and 2016 SFS. A more complete evaluation of this assumption will be possible in 2018 when both the 2016 SFS and 2016 T1FF will be available.

Similarly, the calibration approach also relies on having a relationship between demographics and net worth, or one of its components, which also holds over time.

## **10.4 Combining these sources**

The DHEA brings together data from many different sources and, so, it is not surprising that conceptual differences between micro- and macro-data sources are a major challenge. The use of modelling for non-SFS years adds an additional source of micro-data to be reconciled with the others.

The methodology put forth in this paper and used to produce the DHEA wealth distributions is comprised of multiple steps (reconciliation of micro and macro concepts, modelling, benchmarking, raking). Throughout these steps, the errors may accumulate or cancel out. One of the reasons to do benchmarking and raking is that it is hoped that these steps help limit the impact of the types of errors listed above.

## **11 Appendix**

### **11.1 Sample error coefficients of variation for the Survey of Financial Security, 2012 and 2016**

The following tables contain the sampling error coefficients of variation (CVs) from the SFS. These CVs are based on the SFS and do not include the steps of reweighting and scaling to the NBSA.

**Table 5**  
**Sampling error coefficients of variation for estimates of totals by province from the Survey of Financial Security (SFS), 2012 and 2016**

	Province									
	Newfoundland and Labrador	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia
	coefficient of variation									
<b>2016</b>										
Total assets	5.5	6.4	4.3	4.4	3.0	2.3	3.9	5.2	3.8	3.1
Financial assets	7.6	9.1	6.0	5.5	4.0	3.5	5.3	7.2	5.9	4.5
Life insurance and pensions	7.8	8.0	7.2	7.5	3.4	2.9	5.7	5.5	4.6	3.9
Other financial assets	11.4	15.1	8.9	8.7	6.5	5.5	8.7	11.0	8.2	6.6
Non-financial assets	5.6	6.3	5.4	5.5	2.9	2.2	4.4	4.4	3.0	3.5
Real estate	5.9	7.2	6.2	6.3	3.2	2.3	4.8	5.0	3.4	3.6
Other non-financial assets	8.7	8.5	4.9	5.2	2.9	3.4	4.4	5.2	3.6	4.0
Total liabilities	7.8	9.5	7.1	8.1	4.1	2.9	6.9	5.7	4.3	4.4
Mortgage liabilities	10.4	11.8	9.4	9.9	4.9	3.2	8.1	6.8	5.0	5.0
Other liabilities	7.4	9.7	8.1	8.7	3.8	4.6	7.1	9.3	4.7	6.1
Net worth/wealth	6.1	7.3	4.8	4.8	3.2	2.6	4.4	5.8	4.4	3.4
<b>2012</b>										
Total assets	4.6	10.9	5.5	4.2	3.9	2.9	4.8	4.7	3.7	3.1
Financial assets	7.4	14.4	7.3	6.2	5.3	3.9	6.2	6.2	5.9	4.4
Life insurance and pensions	9.8	17.4	8.2	8.0	3.9	4.7	7.1	8.1	6.2	5.0
Other financial assets	10.6	20.5	11.0	11.0	8.9	5.6	10.2	9.3	8.0	6.6
Non-financial assets	5.4	10.3	4.8	3.5	3.7	3.3	5.0	5.2	3.8	4.1
Real estate	5.6	10.6	5.3	4.1	4.2	3.5	5.5	5.6	4.1	4.5
Other non-financial assets	8.0	11.3	5.6	6.2	3.4	3.6	6.2	8.4	3.4	4.0
Total liabilities	9.8	10.0	6.6	5.4	6.0	4.6	6.1	7.4	5.0	4.5
Mortgage liabilities	12.2	16.1	8.3	7.6	7.6	5.4	7.3	9.3	7.1	5.2
Other liabilities	8.0	13.2	8.3	5.6	6.2	5.8	7.9	7.7	7.5	6.8
Net worth/wealth	5.7	12.4	6.1	4.9	4.1	3.1	5.3	5.3	4.3	3.4

Source: Statistics Canada, Survey of Financial Security.

**Table 6**  
**Sampling error coefficients of variation for estimates of totals by equivalized household disposable income quintile from the Survey of Financial Security (SFS), 2012 and 2016**

	Equivalized household disposable income quintile				
	Lowest quintile	Second quintile	Third quintile	Fourth quintile	Highest quintile
	coefficient of variation				
<b>2016</b>					
Total assets	6.0	3.6	3.5	2.9	2.7
Financial assets	7.5	4.9	4.3	3.3	3.5
Life insurance and pensions	9.1	5.9	4.9	3.5	3.0
Other financial assets	9.3	6.9	6.1	4.9	4.8
Non-financial assets	6.8	4.1	3.7	3.4	2.7
Real estate	7.3	4.4	3.9	3.6	2.8
Other non-financial assets	6.4	5.4	3.9	3.8	2.9
Total liabilities	7.6	4.9	4.4	4.3	3.6
Mortgage liabilities	8.5	5.6	5.0	4.8	4.0
Other liabilities	9.0	4.8	4.8	4.7	4.9
Net worth/wealth	6.4	3.9	3.7	3.0	2.8
<b>2012</b>					
Total assets	8.0	5.5	4.6	3.5	3.0
Financial assets	13.5	7.1	6.0	4.4	3.6
Life insurance and pensions	10.4	7.5	5.2	4.8	4.1
Other financial assets	18.5	10.3	10.2	6.6	4.8
Non-financial assets	7.8	5.9	4.9	3.6	3.4
Real estate	8.5	6.5	5.3	3.8	3.6
Other non-financial assets	4.8	4.8	4.4	4.5	3.5
Total liabilities	9.7	6.4	5.4	5.1	4.4
Mortgage liabilities	11.9	7.6	6.1	5.8	5.1
Other liabilities	7.2	7.6	6.9	6.5	6.1
Net worth/wealth	8.5	5.9	5.0	3.7	3.1

Source: Statistics Canada, Survey of Financial Security.

**Table 7**  
**Sampling error coefficients of variation for estimates of totals by age group from the Survey of Financial Security (SFS), 2012 and 2016**

	Age group				
	Under 35 years	35 to 44 years	45 to 54 years	55 to 64 years	65 years and over
	coefficient of variation				
<b>2016</b>					
Total assets	4.3	3.7	3.2	2.9	2.7
Financial assets	6.2	6.6	5.0	3.6	3.1
Life insurance and pensions	6.5	4.6	3.8	3.3	3.1
Other financial assets	8.1	10.1	8.1	5.8	4.1
Non-financial assets	4.8	3.3	3.1	3.2	3.0
Real estate	5.2	3.5	3.3	3.4	3.2
Other non-financial assets	4.9	3.4	3.4	3.8	3.3
Total liabilities	3.9	3.3	3.8	4.3	7.8
Mortgage liabilities	4.5	3.6	4.2	5.2	10.6
Other liabilities	4.5	4.4	5.8	4.4	6.0
Net worth/wealth	5.5	4.4	3.6	3.1	2.7
<b>2012</b>					
Total assets	6.7	4.5	3.9	3.8	2.8
Financial assets	12.1	5.8	5.1	4.6	3.6
Life insurance and pensions	11.7	6.5	4.9	4.7	3.9
Other financial assets	15.6	7.9	7.5	7.2	5.2
Non-financial assets	5.4	5.0	4.0	4.1	3.6
Real estate	5.9	5.4	4.3	4.4	3.8
Other non-financial assets	6.0	4.1	3.9	3.9	4.2
Total liabilities	5.6	5.0	4.5	6.4	8.6
Mortgage liabilities	6.4	5.7	5.2	8.3	11.2
Other liabilities	5.8	5.5	6.7	7.0	11.2
Net worth/wealth	8.5	5.2	4.2	3.8	2.8

Source: Statistics Canada, Survey of Financial Security.

**Table 8**  
**Sampling error coefficients of variation for estimates of totals by household type from the Survey of Financial Security (SFS), 2012 and 2016**

	Household type	
	One-person household	Multiple-person household
	coefficient of variation	
<b>2016</b>		
Total assets	2.6	1.5
Financial assets	3.4	2.1
Life insurance and pensions	4.0	1.8
Other financial assets	4.7	3.3
Non-financial assets	2.8	1.5
Real estate	3.0	1.6
Other non-financial assets	4.0	1.7
Total liabilities	4.5	1.9
Mortgage liabilities	5.2	2.2
Other liabilities	4.9	2.5
Net worth/wealth	2.7	1.6
<b>2012</b>		
Total assets	4.8	1.7
Financial assets	6.4	2.3
Life insurance and pensions	6.0	2.5
Other financial assets	9.1	3.6
Non-financial assets	5.5	1.9
Real estate	5.9	2.0
Other non-financial assets	4.1	1.9
Total liabilities	9.6	2.3
Mortgage liabilities	11.9	2.8
Other liabilities	7.5	3.3
Net worth/wealth	4.9	1.8

Source: Statistics Canada, Survey of Financial Security.

## 11.2 Comparisons of modelled distributions and the Survey of Financial Security (SFS) distributions

The following tables show how the modelled distributions compare to the SFS distributions in 2016, 2012, 2005, and 1999 for net worth, total assets and total liabilities. The estimates from the calibration approach in these tables are based on the recalibrated SFS 2012 file. Distributions therefore match the SFS distributions in 2012. The estimates based on the area-level approach for 2016 are extrapolated using a three-year trend. The sum of the absolute differences by category between the SFS distribution and modelled distribution is shown as a measure of distance between the SFS distributions and those obtained by modelling.

**Table 9**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of net worth by province**

	SFS				Calibration			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Province</b>								
Newfoundland and Labrador	1.0	1.0	0.8	0.8	1.0	1.0	1.1	1.1
Prince Edward Island	0.3	0.2	0.4	0.4	0.2	0.2	0.2	0.3
Nova Scotia	1.9	2.0	2.3	2.3	1.9	2.0	2.2	2.3
New Brunswick	1.3	1.5	1.3	1.8	1.5	1.5	1.6	1.7
Quebec	18.6	21.2	19.9	21.3	20.6	21.2	21.9	22.4
Ontario	41.1	39.2	40.8	41.0	39.5	39.2	38.9	38.3
Manitoba	3.0	3.0	2.8	3.1	2.9	3.0	3.1	3.3
Saskatchewan	3.1	3.6	2.6	3.2	3.5	3.6	3.7	4.1
Alberta	12.2	12.2	10.5	10.1	12.6	12.2	11.5	11.2
British Columbia	17.5	16.0	18.5	15.9	16.2	16.0	15.7	15.4
Sum of absolute difference between SFS and model	...	...	...	...	6.1	0.0	10.0	6.8

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 10**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of net worth by equivalized household disposable income quintile**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Equivalized household disposable income quintile</b>								
Lowest quintile	5.7	4.9	4.3	5.3	4.9	4.9	4.9	5.2
Second quintile	8.9	8.6	10.5	8.7	9.0	9.0	8.7	8.5
Third quintile	14.4	14.4	16.3	15.1	14.1	14.4	14.5	15.0
Fourth quintile	22.1	22.3	21.4	22.9	22.3	22.5	22.1	22.2
Highest quintile	48.8	49.9	47.6	48.0	49.7	49.2	49.8	49.2
Sum of absolute difference between SFS and model	...	...	...	...	2.3	1.4	7.1	2.3

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 11**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of net worth by age group of the major income earner**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Age group of major income earner</b>								
Under 35 years	5.6	5.7	4.4	7.0	5.5	5.7	6.1	7.0
35 to 44 years	12.1	12.3	17.3	18.8	11.6	12.2	14.5	17.8
45 to 54 years	21.6	26.5	26.6	25.8	22.3	25.2	27.8	28.1
55 to 64 years	30.9	27.3	26.8	22.7	29.0	28.2	25.7	23.0
65 years and over	29.8	28.2	25.0	25.6	31.6	28.7	25.9	24.1
Sum of absolute difference between SFS and model	...	...	...	...	5.0	2.7	7.7	5.2

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 12**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of net worth by household type**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Household type</b>								
One-person household	16.0	16.0	14.7	14.8	14.8	15.2	15.9	15.2
Multiple-person household	84.0	84.0	85.3	85.2	85.2	84.8	84.1	84.8
Sum of absolute difference between SFS and model	...	...	...	...	2.4	1.6	2.2	0.8

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 13**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of assets by province**

	SFS				Calibration			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Province</b>								
Newfoundland and Labrador	1.0	1.1	0.9	0.9	1.0	1.1	1.1	1.1
Prince Edward Island	0.3	0.2	0.4	0.4	0.2	0.2	0.3	0.3
Nova Scotia	1.9	2.0	2.4	2.3	2.0	2.0	2.2	2.3
New Brunswick	1.3	1.5	1.3	1.8	1.4	1.5	1.6	1.7
Quebec	18.4	20.8	19.3	20.9	20.3	20.8	21.5	22.1
Ontario	41.0	39.1	41.7	41.1	39.3	39.1	38.9	38.3
Manitoba	2.9	2.9	2.7	3.0	2.9	2.9	3.0	3.2
Saskatchewan	3.0	3.4	2.5	3.1	3.4	3.4	3.5	3.9
Alberta	12.8	12.8	10.6	10.2	13.2	12.8	11.9	11.4
British Columbia	17.3	16.2	18.2	16.2	16.4	16.2	16.0	15.7
Sum of absolute difference between SFS and model	...	...	...	...	5.5	0.0	10.5	7.0

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 14**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of assets by equivalized household disposable income quintile**

	SFS				Calibration			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Equivalized household disposable income quintile</b>								
Lowest quintile	6.8	6.4	5.4	6.4	6.1	6.4	6.4	6.7
Second quintile	9.9	9.7	11.1	9.9	10.1	9.7	9.9	9.5
Third quintile	15.3	15.3	17.0	16.0	15.4	15.3	15.1	14.5
Fourth quintile	22.2	22.3	21.9	22.9	21.8	22.3	22.8	22.2
Highest quintile	45.9	46.3	44.5	44.8	46.6	46.3	45.8	47.1
Sum of absolute difference between SFS and model	...	...	...	...	2.0	0.0	6.4	5.3

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 15**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of assets by age group of the major income earner**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Age group of major income earner</b>								
Under 35 years	8.0	8.6	7.4	9.9	7.9	8.3	8.6	9.4
35 to 44 years	14.4	15.6	20.1	21.0	14.3	15.5	19.5	22.1
45 to 54 years	22.4	26.3	26.6	25.8	24.0	26.8	29.1	26.5
55 to 64 years	29.0	25.1	24.5	20.8	27.0	24.7	20.2	20.4
65 years and over	26.2	24.3	21.5	22.5	26.8	24.8	22.5	21.5
Sum of absolute difference between SFS and model	...	...	...	...	4.3	1.9	9.7	3.6

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 16**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of assets by household type**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Household type</b>								
One-person household	15.3	15.4	14.2	14.2	14.7	14.7	14.1	14.9
Multiple-person household	84.7	84.6	85.8	85.8	85.3	85.3	85.9	85.1
Sum of absolute difference between SFS and model	...	...	...	...	1.2	1.4	0.2	1.5

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.



**Table 17**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of liabilities by province**

	SFS				Calibration			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Province</b>								
Newfoundland and Labrador	1.2	1.3	1.2	1.2	1.2	1.3	1.3	1.4
Prince Edward Island	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Nova Scotia	1.8	2.1	3.0	2.4	2.0	2.1	2.3	2.4
New Brunswick	1.4	1.5	1.4	1.7	1.4	1.5	1.7	1.7
Quebec	17.8	18.9	16.6	18.6	18.4	18.9	19.3	19.7
Ontario	40.1	38.3	45.9	41.8	38.2	38.3	39.0	38.3
Manitoba	2.8	2.5	2.3	2.4	2.5	2.5	2.5	2.6
Saskatchewan	2.7	2.7	2.1	2.6	2.8	2.7	2.6	2.8
Alberta	15.7	15.3	10.8	10.9	16.1	15.3	13.7	13.1
British Columbia	16.3	17.1	16.5	18.1	17.1	17.1	17.3	17.6
Sum of absolute difference between SFS and model	...	...	...	...	4.4	0.0	15.1	8.0

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 18**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of liabilities by equivalized household disposable income quintile**

	SFS				Calibration			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Equivalized household disposable income quintile</b>								
Lowest quintile	12.1	13.1	11.1	13.4	12.8	13.1	12.5	13.8
Second quintile	14.7	15.0	14.4	17.1	15.7	15.0	15.1	16.4
Third quintile	19.5	19.8	21.0	21.5	19.9	19.8	19.4	18.5
Fourth quintile	22.6	22.5	24.4	22.9	22.3	22.5	23.5	22.8
Highest quintile	31.2	29.7	29.2	25.1	29.2	29.7	29.6	28.5
Sum of absolute difference between SFS and model	...	...	...	...	4.4	0.0	4.9	7.6

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 19**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of liabilities by age group of the major income earner**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Age group of major income earner</b>								
Under 35 years	20.2	21.8	22.4	27.0	21.4	22.1	21.2	25.6
35 to 44 years	26.0	30.8	34.1	34.1	31.4	30.9	34.4	34.4
45 to 54 years	26.4	25.5	26.6	25.9	23.8	25.5	27.1	24.8
55 to 64 years	19.4	15.0	12.8	9.2	16.3	15.2	12.2	9.9
65 years and over	8.1	6.8	4.1	3.7	7.0	6.2	5.1	5.4
Sum of absolute difference between SFS and model	...	...	...	...	13.4	1.2	3.7	5.0

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 20**  
**Comparison of modelled and the Survey of Financial Security (SFS) distributions of liabilities by household type**

	SFS				Area-level model			
	2016	2012	2005	1999	2016	2012	2005	1999
	percent							
<b>Household type</b>								
One-person household	11.9	12.7	11.3	9.9	11.6	11.7	11.4	12.2
Multiple-person household	88.1	87.3	88.7	90.1	88.4	88.3	88.6	87.8
Sum of absolute difference between SFS and model	...	...	...	...	0.6	2.1	0.1	4.6

... not applicable

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

### 11.3 Benchmarking adjustment factors

The following tables show the range of the benchmarking adjustments to the distributions of net worth and its components that are estimated with the area-level modelling approach.

**Table 21**  
**Range of multiplicative adjustment factors resulting from benchmarking modelled estimates from 2010 to 2017 to the Survey of Financial Security (SFS) by equivalized household disposable income, 2012 and 2016**

	Equivalized household disposable income quintiles				
	Lowest quintile	Second quintile	Third quintile	Fourth quintile	Highest quintile
	range of adjustment factors				
Net worth/wealth	[1.01,1.17]	[0.96,0.99]	[1.01,1.01]	[0.99,0.99]	[0.98,1.01]

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 22**  
**Range of multiplicative adjustment factors resulting from benchmarking modelled estimates from 2010 to 2017 to the Survey of Financial Security (SFS) by age group, 2012 and 2016**

	Age range				
	Under 35	35 to 44	45 to 54	55 to 64	65 and over
	range of adjustment factors				
Total assets	[1.01,1.04]	[1.00,1.01]	[0.93,0.98]	[1.02,1.07]	[0.98,0.98]
Total financial assets	[1.03,1.07]	[0.96,0.99]	[0.91,1.04]	[1.01,1.07]	[0.96,0.99]
Total liabilities	[0.94,0.99]	[0.84,0.96]	[1.03,1.08]	[1.01,1.16]	[1.10,1.15]
Mortgage liabilities	[0.94,0.99]	[0.88,0.98]	[1.04,1.09]	[0.97,1.06]	[1.21,1.35]
Net worth/wealth	[1.00,1.02]	[1.01,1.04]	[0.97,1.05]	[0.99,1.04]	[0.95,0.97]

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

**Table 23**  
**Range of multiplicative adjustment factors resulting from benchmarking modelled estimates from 2010 to 2017 to the Survey of Financial Security (SFS) by household type, 2012 and 2016**

	Household type	
	One person household	Multiple person household
	range of adjustment factors	
Total assets	[1.04,1.05]	[0.99,0.99]
Total liabilities	[1.04,1.06]	[0.99,1.00]
Mortgage liabilities	[1.03,1.07]	[0.99,1.00]
Net worth/wealth	[1.05,1.08]	[0.99,0.99]

Source: Statistics Canada, Distributions of Household Economic Accounts, 2018.

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