

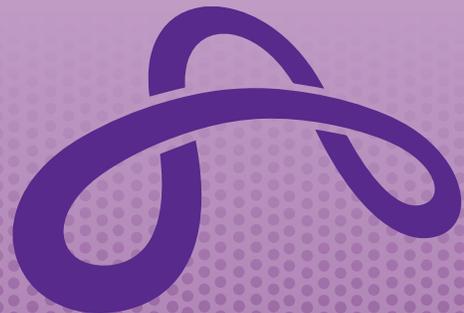


**United
Nations**

Department of Economic and Social Affairs

National Time Transfer Accounts Manual

Measuring and
Analysing the
Gendered Economy



Department of Economic and Social Affairs
Population Division

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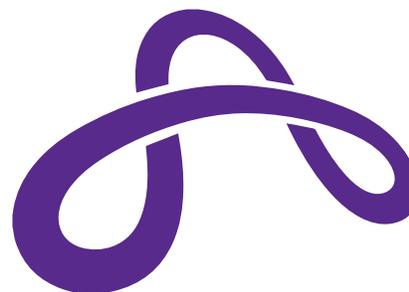
The Department of Economic and Social Affairs of the United Nations Secretariat is a vital interface between global policies in the economic, social and environmental spheres and national action. The Department works in three main interlinked areas: (i) it compiles, generates and analyses a wide range of economic, social and environmental data and information on which States Members of the United Nations draw to review common problems and take stock of policy options; (ii) it facilitates the negotiations of Member States in many intergovernmental bodies on joint courses of action to address ongoing or emerging global challenges; and (iii) it advises interested Governments on the ways and means of translating policy frameworks developed in United Nations conferences and summits into programmes at the country level and, through technical assistance, helps build national capacities.

The Population Division of the Department of Economic and Social Affairs provides the international community with timely and accessible population data and analysis of population trends and development outcomes for all countries and areas of the world. To this end, the Division undertakes regular studies of population size and characteristics and of all three components of population change (fertility, mortality and migration). Founded in 1946, the Population Division provides substantive support on population and development issues to the United Nations General Assembly, the Economic and Social Council and the Commission on Population and Development. It also leads or participates in various interagency coordination mechanisms of the United Nations system. The work of the Division also contributes to strengthening the capacity of Member States to monitor population trends and to address current and emerging population issues.

National Transfer Accounts

The goal of the National Transfer Accounts (NTA) project is to improve understanding of how population growth and changing population age structure influence economic growth, gender and generational equity, public finances, and other important features of the macroeconomy. Research teams in more than 100 countries are constructing accounts measuring how people at each age produce, consume, share resources, and save for the future. These accounts complement the UN System of National Accounts, population data, and other important economic and demographic indicators.

The NTA logo represents the general shape of consumption and production age profiles, highlighting the lifecycle deficits and surpluses that consequently help to understand intergenerational flows of resources and how changing population age structure influences economic growth, gender, and generational equity.



Suggested citation

United Nations Department of Economic and Social Affairs, Population Division (2024). *National Time Transfer Accounts Manual: Measuring and Analysing the Gendered Economy*. New York: United Nations.

This manual is available in electronic format on the Division's website at www.unpopulation.org. For further information about this report, please contact the Office of the Director, Population Division, Department of Economic and Social Affairs, United Nations, New York, 10017, USA, by Fax: 1 212 963 2147 or by email at population@un.org.

United Nations Publication

Sales No.: E.25.XIII.1

ISBN: 9789210033671

eISBN: 9789211069761

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Acknowledgements

We are grateful to Gretchen Donehower, who led the development of National Time Transfer Accounts and drafted the chapters of this manual. We also acknowledge the many individuals within the National Transfer Account network who have undertaken these estimates and have provided input at various stages, particularly: Gemma Abio, Tanja Istenic, Pamela Jimenez, Concepcio Patxot, Piedad Urdinola, and Lili Vargha. Thanks to Robert Gal for his assistance in reviewing the manual and revising the graphs. We gratefully acknowledge the comments from UN staff: Jorge Bravo, Mamadou Bobo Diallo, Francesca Grum, Maren Jimenez, Jemimah Njuki, Marta Roig, and John Wilmoth. We thank Nicole Mun Sim Lai and Tim Miller, who guided this project at UN DESA. Funding for this work was provided by the United Nations Regular Programme for Technical Cooperation.

The assistance of William Dunbar and Bintou Papoute Ouedraogo in editing and desktop publishing is acknowledged.

Explanatory notes

The following symbols have been used in the tables throughout this report:

A minus sign (-) before a figure indicates a decrease or negative number. A full stop (.) is used to indicate decimals.

Years given refer to 1 July.

Use of a dash (–) between years, for example, 1995–2000, signifies the full period involved, from 1 July of the first year to 1 July of the second year.

Numbers and percentages in this table do not necessarily add to totals because of rounding.

References to region, development group, country or area:

The designations employed in this publication and the material presented in it do not imply the expression of any opinions whatsoever on the part of the Secretariat of the United Nations concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. The term “country” as used in this report also refers, as appropriate, to territories or areas.

In this publication, data for countries and areas are often aggregated in six continental regions: Africa, Asia, Europe, Latin America and the Caribbean, Northern America, and Oceania. Further information on continental regions is available from: <https://unstats.un.org/unsd/methodology/m49/>. Countries and areas have also been grouped into geographic regions based on the classification being used to track progress towards the Sustainable Development Goals of the United Nations (see: <https://unstats.un.org/sdgs/indicators/regional-groups/>).

The designation of “more developed” and “less developed”, or “developed” and “developing”, is intended for statistical purposes and does not express a judgment about the stage in the development process reached by a particular country or area. More developed regions comprise all countries and areas of Europe and Northern America, plus Australia, New Zealand and Japan. Less developed regions comprise all countries and areas of Africa, Asia (excluding Japan), Latin America and the Caribbean, and Oceania (excluding Australia and New Zealand).

The group of least developed countries (LDCs) includes 45 countries, as of 8 May 2024, located in sub-Saharan Africa (32), Northern Africa and Western Asia (2), Central and Southern Asia (3), Eastern and South-Eastern Asia (4), Latin America and the Caribbean (1), and Oceania (3). Further information is available at: <https://www.un.org/ohrls/>.

The classification of countries and areas by income level is based on gross national income (GNI) per capita as reported by the World Bank (May 2024). These income groups are not available for all countries and areas. Further information is available at: <https://datahelpdesk.worldbank.org/knowledgebase/articles/906519>.

List of abbreviations

ATUS	American Time Use Survey
CAUTAL	Classification of Time Use Activities for Latin America and the Caribbean
CWW	Counting Women's Work
EAC	Equivalent adult consumer
GDP	Gross Domestic Product
HETUS	Harmonised European Time Use Survey
HRS	Health and Retirement Survey
ICATUS	International Classification of Activities for Time-use Surveys
ICLS	International Conference of Labour Statisticians
ILO	International Labour Organization
MHI	Minimum harmonized instrument
NSO	National statistical office
NTA	National Transfer Account
NTTA	National Time Transfer Account
SHARE	Survey of Health, Ageing and Retirement in Europe
SNA	System of National Accounts
UHSW	Unpaid household service work
UN DESA PD	United Nations Department of Economic and Social Affairs, Population Division
UN DESA SD	United Nations Department of Economic and Social Affairs, Statistics Division
UNECE	United Nations Economic Commission for Europe
UNFPA	United Nations Population Fund

Preface

This manual picks up where the previous manual in the series left off. The earlier manual, on the methodology of National Transfer Accounts (NTAs), shows how National Accounts data can be used to construct age profiles of economic production and consumption and to illustrate how resources flow from persons in age groups producing more than they consume to those in age groups producing less than they consume (United Nations, 2013).

The NTA project calls this system of age-based transfers the “generational economy”. Uncovering and elucidating the role of such transfers has been the project’s major contribution. NTA research has revealed how countries have evolved various means of meeting the needs of different age groups and how the nature of such systems impacts economic growth, human capital investment, intergenerational equity and sustainability as populations continue to change through growth or decline and through shifts in the age distribution towards younger or older ages.

Including a gender perspective in the National Transfer Accounts

The NTA methodology was originally conceived and developed by considering the population of men and women together in each age group. Subsequently, early attempts to elaborate such estimates separately for women and men and for girls and boys confirmed the gendered nature of the generational economy.

In every country where the generational economy has been measured separately by sex or gender, men earn more income than women on average, are more likely to be designated as head of the household and typically own a greater proportion of household assets. In such a system, unsurprisingly, men transfer more in resources to women and children than they receive. Of course, there are always exceptions to these generalizations. In any population, some women produce more than they consume, and some men are net receivers of transfers. Nevertheless, on average, men’s primacy as producers in the market economy has proven to be remarkably stable over space and time, even for populations that differ markedly in terms of size, income, location and other characteristics.

Notwithstanding these insights, important elements of non-market production are omitted from the analysis. For many years, researchers have recognized that measures based on National Accounts data, such as the Gross Domestic Product, do not assign value to the mostly unpaid, often uncounted and usually undervalued labour of caring for other people and maintaining households. This work includes caring for those who cannot care for themselves, due either to age or to infirmity, as well as cooking, cleaning, and managing and maintaining a household – work that makes it possible for household members to function as people and workers.

An existing methodology, known as “household production satellite accounting”, addresses this gap by harnessing time-use data to estimate the amount of time people spend on unpaid care work and by imputing a wage for that work to derive a monetary estimate of its market value (Abraham and Mackie, 2005). Household production satellite accounting offers a means of including what is traditionally understood as “women’s work” in our measures of economic output.

Researchers affiliated with the NTA project recognized that gender-specific estimates of age-based transfers would remain incomplete if unpaid household and care work were omitted. Therefore, in June 2010, the NTA Time Use and Gender Working Group was established and began work on combining the NTA methods for measuring age-based transfers with the methods of household production satellite accounting. The combination of these sets of two methods, with modifications, has resulted in the methodology of National Time Transfer Accounts (NTTAs) as described in this manual.

Measuring and analyzing the gendered generational economy

Initial work to develop methods for measuring the gendered generational economy was supported by the East-West Center at the University of Hawaii and the Center for the Economics and Demography of Aging at the University of California in Berkeley. The larger task of applying the new methods to data from countries with both existing time-use surveys and existing NTA country research teams was supported by grants from two sources.

The European Union supported the work on European countries through the AGENTA project, leading to a dedicated manual for NTTAs based on data sources typically available for European countries (Vargha and others, 2016). Meanwhile, the International Development Research Centre of Canada and the William and Flora Hewlett Foundation supported the Counting Women's Work project, focusing on the United States of America and a group of lower- and middle-income countries (National Transfer Accounts, 2017).

It took several years to finalize a methodology that was well adapted to existing data sources and provided opportunities for cross-country comparative analysis similar to that provided by NTA analysis. Over time, researchers have gained an improved understanding of the analyses and interpretations that the new data could and could not support. Today, estimates using the NTTA methodology have been generated for over 30 countries, including Bangladesh, Belgium, Bulgaria, Colombia, Costa Rica, Estonia, Finland, France, Germany, Ghana, Hungary, India, Iran, Italy, Japan, Kenya, Latvia, Lithuania, Mali, Mexico, Mongolia, Niger, Poland, Republic of Korea, Senegal, Slovenia, South Africa, Spain, Sweden, Thailand, Turkey, the United Kingdom, the United States of America, Viet Nam and Uruguay.

These applications of the NTTA methodology have illustrated its value-added. While NTA research shows how families and societies invest in the human capital of children and youth by purchasing healthcare and education, NTTA research shows that these market-based investments are only about half of what families invest in total throughout childhood if you include the value of unpaid care work (Vargha and Donehower, 2019).

Including non-monetary transfers in the analysis can fundamentally alter the picture of intergenerational equity, revealing that market-based transfers flowing from younger to older persons through taxpayer-funded pensions or family support may be more than balanced by time-based transfers flowing from older to younger persons, such as grandparents taking care of grandchildren (Gál et al., 2018). While NTAs are heavily influenced by the age pattern of entering and exiting the labor force, NTTAs show that retirement from the unpaid care workforce typically occurs much later in life than retirement from the market economy.

NTAs can be used to compare national systems for moving resources up the age scale to support the consumption of older persons through a combination of public transfers (including pensions), family-based transfers and personal savings. NTTAs add to this picture by showing how the unpaid care work of older persons is transferred up and down the age scale to their children, grandchildren, spouses and parents as well as the community (Vargha et al., 2023). Indeed, in contrast to the pressure that population ageing can put on the sustainability of pay-as-you-go pension systems and other age-based transfers within the market economy, analysis within the NTTA framework reveals the generative power of older persons in providing care to others and not just consuming it (Donehower, 2023).

Shining a spotlight on gendered economic institutions

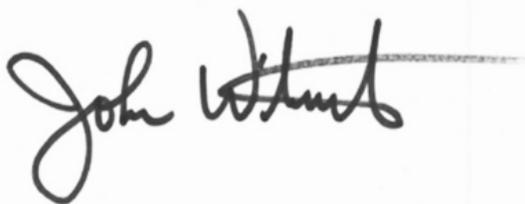
Beyond the issues of intergenerational transfers and age-related dependency that motivated the NTA project, measuring and analyzing the gendered nature of the generational economy offers an opportunity to re-evaluate the gender-based systems for deploying human capital that still hold sway in varying degrees across the globe. Channeling girls' human capital into unpaid care work and boys' into market-based production may have served a useful purpose in a demographic context of high fertility and high mortality, in which for most women the reproductive years were devoted mainly to the incredibly intensive labour of pregnancy, breastfeeding and child care.

That level of physical demand may necessitate some degree of gender-based specialization in productive capacity and in the cultural, legal and social institutions that support it. However, today's demographic context is radically different. Most countries have experienced significant declines in their levels of fertility and mortality. Today, the average woman is likely to spend far fewer years in intensive reproductive labour than did her mother or grandmother. Yet the cultural, legal and social institutions that direct women's productive capacities towards care work and men's towards market production are still dominant in many places.

Measuring and analyzing the gendered economy offers the opportunity to ask and assess whether such arrangements still serve us well. One issue is gender equity. Are women being afforded the same human rights as men when they have less access to income and income-based social protection schemes? Is it equitable for girls to have less access to higher education because it may be incompatible with their presumptive role as caregivers?

Another issue is efficiency. Is it an inefficient allocation of human resources if men who may be naturally inclined towards roles as caregivers are precluded from work in this area because of cultural expectations? Are public investments being optimized if cost-benefit analyses only consider costs and benefits in the market economy and not in the economy of unpaid care work? For example, is it possible that the benefits offered to potential parents by governments seeking to raise the fertility level are too small to motivate a change in behavior because they defray only the market-based costs of raising a child and not the uncompensated investments of parental time?

Finally, the NTTA methodology sheds light on phenomena that have been obscured because they were left out of the conceptual architecture of modern economics. Omitting traditional "women's work" from the definition of Gross Domestic Product has limited our understanding of the economy as a gendered institution. By contrast, assigning a monetary value to such labour makes visible the contributions of those who have specialized in work that is essential for the well-being of societies. The NTTA framework offers an opportunity to examine national economies with fresh eyes and to reformulate classic questions around what is important, how we spend our money and time, and how we can best provide for ourselves and one another.



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18 December 2024

Chapter I: Measuring the gendered economy

1.1 Introduction to National Transfer Accounts and gender

Age is one of the most important things to know about a person in order to understand and predict events in a person's life. Age – even more than other characteristics we often think of as paramount, such as where a person lives – is more predictive of living arrangements, income, risk of death, educational status, tax payments and many other phenomena. Imagine comparing three persons aged 2, 40 and 80. Is there any other characteristic that would tell more about those three persons' lives than their age? The ability of age to indicate so much about a person's social and economic life is one of the central factors behind economic demography and National Transfer Accounts (NTAs).

NTAs (United Nations, 2013) provide a framework for studying the age dimension of economic activity and answering one of the most fundamental questions about how our societies work: How do resources get to people who produce less than they consume because they are too young to produce enough, or because they are older and are achieving lowered productivity due to ageing or would like to retire? NTAs start with the established national accounting framework, which measures economic stocks and flows as national-level aggregates. The NTA methodology employs survey and administrative data, assumptions and models to disaggregate those national accounts aggregates by age. It can then infer how resources move from people in midlife, who earn more income than needed to sustain themselves, to those of younger and older ages who do not. These flows occur through transfers between persons, and also within one person's life over time due to the accumulation and disposition of assets and debts. The nature of these support systems in a country can have implications for economic growth, social protection programmes and economic and social stability over time.

NTAs have been estimated by national teams in over 80 countries using the same standard methodology as established in the United Nations' National Transfer Accounts Manual (2013). This work has revealed what the NTA framework refers to as the “generational economy” in many countries over many different periods, showing how people produce, consume, share and save resources by age (Lee & Mason, 2011). In addition, it has yielded important practical and theoretical insights into how population change impacts individuals, economies and economic policy. The work is supported by a network of government officials and researchers – the National Transfer Accounts network (www.ntaccounts.org) – in addition to training support provided throughout the United Nations system by the Population Division of the United Nations Department of Economic and Social Affairs (UN DESA PD), the United Nations Population Fund (UNFPA) and the regional economic commissions.

The NTA methodology is a work of economic demography linking population to economics. Age is fundamental to the field of demography, such that the two most essential characteristics in demographic models are always age and sex. The NTA methodology's objective is mapping and understanding the generational economy in different places and at different times, and so a natural extension is to also map the gender dimension of the economy. Just as the lives of people aged 2, 40 and 80 differ in predictable ways, so do the lives of a man versus a woman of age 40. At that age, the man is more likely to be in the labour force, and the woman is more likely to spend more of her productive time on unpaid household work, taking care of family members and running a household. Of course, men and women both engage in market labour and unpaid household production, and the extent of gender differences varies widely across countries, over time and by age. However, this overall specialization in the economic sphere is seen in almost every dataset that has been used to measure it.

Box 1.1

Sex and gender

It has become standard to refer to “sex” as a biological or physiological trait – albeit one that can have complex expressions – and “gender” as something that is socially constructed and learned through socialization, and that impacts opportunities, relationships and institutions in a context- and time-specific and changeable way.

In this manual, we describe a method for constructing gender data that uses information on sex-disaggregated, age-specific flows of market resources and unpaid household service work. The research interest is to understand the function of gender, not sex, in economies and societies. However, we use information on sex as defined in sample surveys and administrative data sources as a proxy for gender in these analyses.

One shortcoming of this approach is that the concept of gender is limited to a binary distinction, and thus the resulting analyses cannot shed light on non-binary aspects of gender, or gender categories referring to sexual orientation or gender identity.

From the United Nations’ “Integrating a Gender Perspective into Statistics” (UN DESA SD, 2016):

“The word “sex” refers to biological differences between women and men. Biological differences are fixed and unchangeable and do not vary across cultures or over time. “Gender”, meanwhile, refers to socially constructed differences in the attributes and opportunities associated with being female or male and to social interactions and relationships between women and men. Gender determines what is expected, allowed and valued in a woman or man in a given context. In most societies, there are differences and inequalities between women and men in terms of roles and responsibilities assigned, activities undertaken, access to and control over resources and decision-making opportunities. These differences and inequalities between the sexes are shaped by the history of social relations and change over time and across cultures.”

National Time Transfer Accounts (NTTAs) add the gender dimension to the age perspective of the NTA framework. The generational economy tells us important things about how economic life is organized, and so too does the “gendered economy.” Researchers have used this phrase to mean different things, but here we define it as the ways in which people’s interactions with all facets of an economy are affected by gender. This includes: participation in the formal and informal labour force where men and women are channelled into particular levels and types of participation, meaning men may be encouraged to go into certain professions and women into others, men may be more likely to work full time compared to women, and men and women may be paid different amounts for the same work due to gender discrimination; social dynamics related to how much males and females participate in the household economy, caring for persons, maintaining households and doing types of work that are often invisible to many economists yet are essential to the functioning of society; differences in consumption in contexts where resources are allocated differently to boys and girls or to men and women, and finally, it includes gender-based differences in interactions with the public sector based on a particular country’s social welfare policies, taxation strategies or other institutional or legal arrangements. It will inevitably vary from country to country, just as NTAs do for the generational economy. Indeed, one of the key contributions of research using NTAs has been documenting the degree of variation across countries in the organization of their generational economies. The gendered economy also differs significantly across countries, with each country having unique institutions that sustain patterns of difference as revealed by the data.

Adding gender to the NTA perspective does not just mean layering on another independent dimension about economic life in addition to age. Age, gender and economic life are linked because the phenomena that drive economic gender

differentiation are age-dependent lifecycle phenomena that shape the generational economy. Childbearing is the most obvious example. The processes of pregnancy and breastfeeding involve men and women in different ways, and these processes happen at particular ages in the life course. Although there can be a great deal of variation around when various events happen over individuals' life courses, the overall pattern at the population level is relatively stable and predictable. The way these processes shape economic life for men and women is thus age-dependent. To a lesser extent, ageing has similar gendered features, as it is an age-dependent process that men and women experience differently because disability and mortality differ by sex in most countries in predictable ways. This becomes meaningful for economic study by differentiating work lives, healthcare consumption and household arrangements by gender. Thus, understanding the generational economy requires understanding the gendered economy and vice versa.

This manual presents a method for understanding the generational and gendered economies together. It encompasses two distinct sets of quantitative estimates. One is the set of NTA age profiles, which cover the market-based part of the generational economy, separated by sex. The methodology of NTA estimates is covered extensively in a previous manual published by the United Nations (2013). Methods to disaggregate those NTA age profiles by sex are presented in Chapter 2. Chapter 3 covers the second set of quantitative estimates: National Time Transfer Accounts (NTTAs). NTTAs estimate the production, consumption and transfers of unpaid household service work (UHSW) in a manner that is similar to the NTA approach.

The NTTA methodology used in this manual is vital due to the prevalence of women's specialization in UHSW production, which is outside of national income accounting. Disaggregating NTA profiles by sex without adding the NTTA data on time use would give a misleading picture of productive activity and contributions to the household (Waring, 1999). Understanding the empirical reality of the generational and gendered economy worldwide requires two distinct efforts: (1) disaggregating NTAs by sex (which includes only market-based work), and (2) creating a set of NTTA satellite accounts (comparable to NTAs) that include UHSW.

Before proceeding to the methodology, however, the next section will discuss the theoretical background pertinent to studying the generational and gendered economy. The rest of this chapter will outline general sex-specific methods for both NTAs and NTTAs, describe the progress we have made in implementing these methods across countries and summarize what we have learned thus far.

1.2 Theoretical foundations of the generational and gendered economy

The NTA project considers age in economics at a time when age structures worldwide are changing rapidly due to the demographic transition towards longer lives and smaller families, driven by historic declines in mortality and fertility. This is important because of the economic lifecycle and the strong age pattern of economic dependency, a term applied to people who consume more than they produce. While anyone at any age can consume more than they produce, all babies and young children tend to be economic dependents because they cannot produce anything on their own. Some older persons reach their final years still producing more than they consume, but the majority do not. Also, as societies have become wealthier, it has become possible for more people to retire from the labour market and live on some combination of their accumulated savings, public-sector pension payments or other public-sector supports, and family contributions or other private contributions. The age pattern of economic dependency links age with vulnerability because any person who is not self-supporting is potentially at greater risk from disruptions in support systems, meaning the institutions and policies that societies develop to provide for vulnerable persons.

For young children, those support systems include families, schools, and public social protection programs that target children. For older persons, families and the public sector also provide resources, as do financial instruments that older persons have funded by saving throughout their working lives. Those financial instruments allow older

persons to save later in life, either through income generated by their assets or by selling assets when resources are needed. The functioning of these types of institutions and policies to provide the goods and services needed by economic dependents has been documented well by the NTA project over many years.

What has yet to be explored in NTAs is how support is provided to persons in forms other than the provision of market goods and services, due to the structure of NTAs being linked to national accounting. National accounts employ a “production boundary” to define what is inside and outside the economy. Table 1.1, from a report on care work by the International Labour Organization (2018a), shows current definitions of human-produced goods and services, classified by what type of work they are and whether that work is included in standard definitions of the economy.

The top-line classification is about who will consume, or whether a good or service is produced for one’s own final use (consumption) or for consumption by others. The next tier delineates types of work primarily based on whether it is paid or unpaid, as determined in the most recent statement by the International Conference of Labour Statisticians (ICLS). Paid work involves employment, while unpaid work is further classified by whether it produces goods or services or is part of traineeship or volunteering. Below that is a classification of activities for the different sorts of production used to classify activities in time-use research from the 2016 International Classification of Activities for Time-use surveys (ICATUS). Finally, the bottom row of the table shows which of these activities is included in the “traditional” definition of the economy by the range titled “Activities within the SNA production boundary.” The System of National Accounts (SNA) is a United Nations-led effort to codify national accounting, and most countries around the world organise their national accounting concepts and practices following the most recent set of SNA guidelines (United Nations, 2009). The activities within the SNA production boundaries are the productive activities included in national accounting concepts like Gross Domestic Product (GDP). They include all employment and employment-related activities, work to produce goods for own use, and volunteering for either non-household entities or producing goods.

The SNA does not include UHSW and volunteering within a household to provide services (not goods). This includes care of persons and provision of domestic services for one’s household or other households and, because of gender and social norms, has been traditionally understood as “women’s work.” In high-fertility contexts where women have generally spent most of their lives during the reproductive years gestating, breastfeeding and caring for young children, such specialization may have been an optimal strategy. Still, cultural ideals of women as natural caregivers with a greater aptitude and obligation to provide unpaid care than men have persisted despite enormous reductions in fertility throughout the world, and continue to persist in the face of more evidence that skills as a caregiver come from the practice of giving care, not from genetic predisposition (Abraham et al., 2014).

Measures like GDP have become the cornerstone of modern macroeconomics and are used in the international financial system by institutions like the World Bank and the International Monetary Fund. However, these do not include UHSW and other activities that produce humans and human capital, maintain society, and enable persons to carry out market-based work activities. Such activities are invisible to economic thought and policy since they are measured in a different way than other forms of work.

Social scientists have long understood the problems around the invisibility of UHSW and have developed tools to address this oversight. Indeed, when national accounting was developed during the Great Depression, Simon Kuznets and his collaborators decided to exclude “housewives’ services” (Carson, 1975). Household production satellite accounting was developed to include the aggregate value of unpaid household provision of services. NTTAs are an extension of NTAs that include household production satellite accounts in its generational framework. The result is tools to describe how economic life varies by age and by gender. Gender differences are as rooted in the lifecycle as age differences, so we would expect an accurate look at the gendered economy to include the age dimension.

The rest of this chapter will give a broad overview of the methods used to estimate the gendered and generational economy and then discuss what has been learned so far in this effort by applying NTAs and NTTAs by sex across a diverse group of countries that are part of the NTA research network.

Table 1.1
Care work and its relation to work classifications

Table 1.1. Care work and its relation to Resolution I of the 19th ICLS, the ICATUS 2016 and the SNA 2008

Intended destination of production	For own final use		For use by others					
	Own-use production work		Unpaid trainee work	Other work activities	Volunteer work			
Forms of work in the 19th ICLS Resolution I	Of services	Of goods			in market and non-market units	in households producing	Goods	Services
ICATUS 2016	4. Unpaid caregiving services for household and family members	3. Unpaid domestic services for household and family members	2. Production of goods for own final use	53. Unpaid trainee work and related activities	59. Other unpaid work activities ²⁵	51. Unpaid direct volunteering for other households	52. Unpaid community- and organization-based volunteering	
			1. Employment and related activities	5. Unpaid volunteer, trainee and other unpaid work				
			11. Employment in corporations, government and non-profit institutions	12. Employment in household enterprises to produce goods	13. Employment in household and household enterprises to provide services			
Type of work	Unpaid work		Work for pay or profit				Unpaid work	
Type of care work	Unpaid care work <i>(as a subset of Unpaid work, comprising care of persons and household work)</i>		"Care employment" to provide care services in care occupations and/or care sectors <i>(as a subset of Employment)</i>				Unpaid care work <i>(as a subset of Volunteer work)</i>	
							Unpaid community- and organization-based volunteering to provide care services in care occupations or care sectors	
							Unpaid direct volunteering for other households to provide care services akin to unpaid care work	
Relation to SNA 2008			Activities within the SNA production boundary				Activities within the SNA general production boundary	

Note: In orange, forms of care work and their relation to the 19th ICLS Resolution I, the International Classification of Time Use Activities (ICATUS) 2016 and the System of National Accounts (SNA) 2008. In yellow, their relation to the general types of work: "Unpaid work" and "Work for pay or profit". "Unpaid care work" matches the ICLS form of work "Own-use production work of services". "Care employment", "Unpaid trainee care work" and "Volunteer care work" are, respectively, subcategories of "Employment", "Unpaid trainee work" and "Volunteer work".

1.3 Overview of methods

1.3.1 NTAs by sex

The method for disaggregating NTA age profiles by sex differs depending on the method for calculating the sexes-combined NTA age profiles. Different methods are needed depending on the data sources and types of profiles. These can be grouped into three broad categories: (1) individual-level indicators that are generally available from surveys or administrative data; (2) household-level indicators that are available from surveys; and (3) profiles that are imputed based on NTA assumptions.

Estimating most NTA age profiles involves using survey or administrative data that gives relative amounts of different economic flows by age to disaggregate national accounts aggregates of those flows. Given the importance of gender as a social category, in general any survey data source that has age as a characteristic of survey respondents will also have sex as a characteristic, following the nomenclature practice of referring to gender as a social construct and sex as a characteristic that one might be asked about in most surveys. Thus, if it is possible to estimate relative amounts of different economic flows by age, the same goes for flows by age and sex. An excellent example of this is labour earnings. Survey data may be available on the labour earnings of each individual in a household from an income survey that very likely also has the sex of each household member recorded in the survey. The same applies to administrative data such as government reports, where, if specifics on age are given, then often sex is as well.

Sometimes, a data source does not have sufficient age-by-sex detail, for example, if it only includes sex differences in broad age categories. In this case, an assumption can be made that sex differences are the same for all age groups within that age category or a smoothed age schedule can be fitted that is consistent with the broad age categories.

Where the available data are given only at the household level in a survey, such as for private consumption, there is usually no way to determine precisely who in the household consumed what. For the single-sex NTA age profiles, we assume consumer weights to allocate consumption to individuals, or we use numeric methods to estimate different consumption patterns based on between-household variation in household composition and consumption. To disaggregate the sexes-combined profiles by age, we use similar assumptions, applying the consumer weights in precisely the same way for males and females or adding sex as an element to the numeric methods based on household composition. More details are given on precisely what this means in Chapter 2. However, in general, it should be noted that these methodological choices both impose strong assumptions which may underestimate gender differences between persons of similar age within households. For this reason, gender differences estimated for profiles based on household-level source data should be understood as a lower bound of difference. Some methods exist to get closer to within-household allocation differences for estimates of consumption, but these generally involve exploiting very detailed classifications of types of expenditure that can be distinguished as being more likely male or female. Given the goal of cross-country comparison in the NTA project, it is not possible to get this level of detail on a similar basis across NTA countries.

Where the NTA age profile is the product of an assumption, such as for the consumption of public goods or private transfers, the same assumption is made for both sexes. We also assume that the adjustment made to any age indicator necessary to make the NTA age profile consistent with an aggregate-level macro control from national accounts data is the same for both sexes. Any “error” in the age indicator data is assumed to have no gender dimension, which may be a strong assumption in some cases.

Finally, there are some age profiles for which there may be multiple ways to distinguish between sexes depending on a particular research or policy question. An excellent example of such a case is with flows that arise from the ownership of assets, such as the flow of services of an owned house or the dividends and interest that arise from owning financial assets. There may be differences in a legal definition of who owns and thus accrues the income

versus a more contingent definition of who makes decisions around using that income, and these two definitions may have important gender implications. In cases such as this, it ultimately depends upon the research in question or the potential policy interventions that are being considered to address gender gaps or other social issues.

1.3.2 UHWS and NTTAs

As discussed previously, the NTA framework for measuring the generational economy has one severe limitation in extending its approach to the measurement of the gendered economy. NTAs are based on disaggregating national accounts by age and, as a result, NTAs add estimates of some transfer flows not measured in national accounts. However, they only include transfers of resources within the production boundary of national accounts. If we think of the usual definition of economics and economic activity as concerning the production, distribution and consumption of goods and services, the production boundary of national accounts does not include every type of economic activity. As shown in Table 1.1, national accounts include flows arising from the production and consumption of goods and services traded in a market for money, usually referred to as “market goods and services.” They also include some flows that are not traded in markets for money – the value produced by the owner-occupied housing market and the value of some types of financial transactions and services are imputed in national accounts (U.S. Bureau of Economic Analysis, 2008), as is the production and consumption of goods produced by households for their own use, primarily the value of food grown by a household for its own consumption. In some countries with a large subsistence agriculture sector, this last piece can be a substantial imputation. The policies around the measurement of own-use production are changing, and national statistical agencies’ ability to measure this production and consumption varies widely. Conceptually, the national accounting boundary is supposed to include the value of the production and consumption of these home-produced goods. However, the value of home-produced services such as UHWS is not included in the national accounts production boundary.

UHWS includes time spent on both care work such as taking care of children, older persons, sick persons or persons with disabilities and the community through volunteer service activities, and also the domestic work of managing and maintaining a household, including cooking, cleaning, household management and maintenance (for a more complete list of activities covered by NTTAs, see Section 3.3.2 below).

As shown in the bottom line of Table 1.1, the SNA addresses the invisibility of UHWS by defining it as inside a “general production boundary” that encompasses the traditional production boundary but also includes UHWS. In addition, it defines UHWS as the unpaid own-use “provision of services provided to household or family members, including:

- i. household accounting and management, purchasing or transporting goods
- ii. preparing and serving meals, household waste disposal and recycling
- iii. cleaning, decorating and maintaining one’s dwelling or premises, durables and other goods, and gardening
- iv. childcare and instruction, transporting and caring for elderly, dependent or other household members, domestic animals or pets, etc. (International Labour Organization, 2018b)

While researchers and advocates have noted for years that UHWS is a valuable economic activity, in recent years, statistical agencies and international measurement and monitoring bodies such as the ILO and the UN explicitly include it in their work plans, goals, and reporting. (United Nations, 2016)

Box 1.2**UHSW and unpaid family work**

The nomenclature around UHSW can be confusing. Time inputs not accounted for in national income should not be confused with unpaid family work in household-owned farms or other enterprises often referred to as “unpaid family work.” The ICLS refers to this kind of work as work done by “contributing family workers.” This is in contrast to UHSW, which is the unpaid care and domestic work not included in national income. Unpaid family work does not generate earnings for the unpaid family labourer but does produce goods and services traded in the market, thus generating income for the household that is already part of national income, or it produces goods consumed by the household which are not traded in a marketplace but are imputed as part of national income. UHSW time inputs are those for which the value of the time is never paid to anyone and is not included in national accounts measures such as GDP or Gross National Income. While the term “household production” has become common in the literature for referring to productive activities not resulting in market goods or services, note that some included activities are performed outside of the household for non-household members, for example providing care for persons outside of the household and volunteer services.

We are still years away from having the kind of consistent, comparable data across countries on UHSW that we have for measures like GDP and marked labour force participation, but it is likely that such data will be available in the future. In the meantime, this manual follows the long-standing methodology that researchers have used to estimate the production of UHSW, and then applies the NTA framework to highlight the age pattern of UHSW production and consumption in the same way that it has been applied to the market economy.

1.4 Why measure the gendered economy?

Integrating unpaid household service work and market production into our understanding of economic lives opens up possibilities for new research questions and policy interventions. Some of these questions are historical and philosophical: How did gender specialisation come about? How is it changing? Is it fair? Is the specialisation maintained by coercion and discrimination or is it the product of preferences and free choice? This is not just a matter of women’s opportunities, as enforced gender niches restrict the opportunities available to both genders. Beyond ethics, there are questions of efficacy and efficiency: Is it the most efficient use of resources to restrict how each person contributes to the economy based on gender? When societies invest in the human capital of their members, are some of those investments wasted if we do not allow each person to deploy his or her human capital in areas where he or she has particular abilities that confer a comparative advantage? Is productivity helped or hindered by gender specialisation?

Accounting for time spent caring for others is essential for many other reasons relevant to NTA research concerns in addition to issues of gender. If we wish to understand the age pattern of consumption and production, we should include time inputs along with market inputs. For example, the production of a family dinner includes not only the inputs of food growers but of home cooks as well. The family consumes not just the food items but also the time of the home cook. A child at the dinner table receives a transfer equal to the purchase price of the food, along with the value of the time spent cooking it. Time use is also essential for accurately valuing human capital investment and the cost of youth and old-age dependency. Results from the Counting Women’s Work (CWW) project show that the cost of an infant in terms of parents’ time can be as much, if not more than, the cost of market goods and services purchased for that infant (National Transfer Accounts, 2017). Measuring these time inputs gives us the total cost of children, which is relevant for understanding fertility decisions and human capital investment dynamics. This measurement also allows us to examine trade-offs between money and time: Are intra-household transfers

received by co-resident older persons offset by their time spent in childcare, cooking or other home production that is transferred to others in the household? Or are co-resident older persons even costlier when we include time spent caring for them by younger household members? Are bequests to adult children by parents at older ages related to the time transfers that older persons receive from them?

Measurement is the first step in answering these research questions. The following section will show examples from particular countries, followed by comparative results and what they demonstrate.

Box 1.3

Counting Women's Work (CWW)

The CWW initiative, a component of the National Transfer Accounts (NTA) project, improves understanding of women's economic roles by measuring their full economic contribution, both in the marketplace and at home. CWW analysis involves two major initiatives: separating the contributions of women and men within standard measures of economic activity; and adding the production, consumption, and transfer of unpaid household service work that is primarily performed by women. CWW data are currently available for 14 countries, in Latin America (Colombia, Uruguay, Mexico), Africa (Côte d'Ivoire, Ghana, Mali, Mauritius, Niger, Senegal, South Africa, Togo), Asia (India, Viet Nam), and the United States at the <https://www.countingwomenswork.org/data> site.

1.5 What have we learned so far?

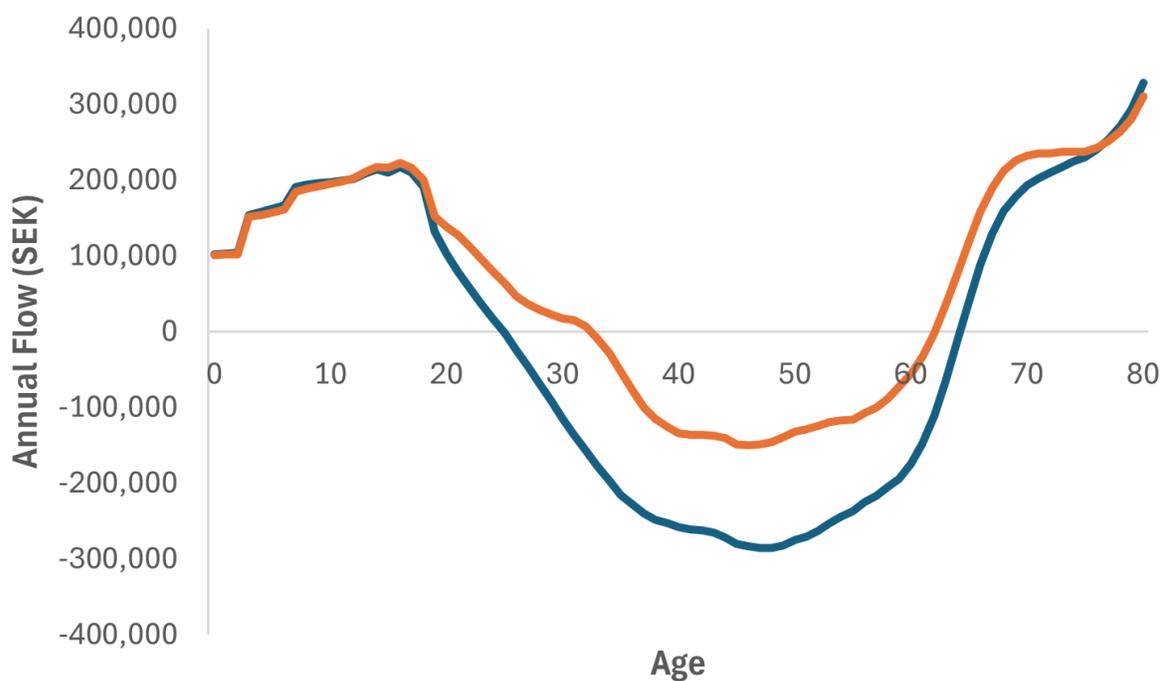
1.5.1 Country examples

To begin, we can examine the generational and gendered economy in market terms by showing NTA estimates separated by sex. For example, the estimates for Sweden in Figure 1.1 give an example of the lifecycle deficit – consumption minus labour income – based on national accounts for Sweden in 2010, separately for men and women. These are age- and sex-specific average amounts, smoothed over age.

We see women producing smaller surpluses during their working years on average and incurring somewhat higher deficits when older compared to men. We see much higher deficits for women than men in their early 20s. This is partly due to women delaying entry into the labour market while spending heavily on education. The higher female deficits at older ages are due to older women's lower labour income compared to men. It is important to remember that this picture is a cross-section of different age groups instead of a cohort chart showing one age group's experience moving through the life course. This picture may look quite different in 2040 when the heavy investments in human capital made by younger female cohorts in 2010 help them command higher salaries when they are older.

The results from Sweden show gender in the market economy, but as discussed, UHSW, an entire realm of economic life, is left out of this picture. Figure 1.2 shows both market work and UHSW for economic life in Mexico in 2014. The left side of the figure shows time spent on market work, including work for pay and unpaid work for household enterprises that create market goods or goods produced and consumed by the household. On the right side is time spent in UHSW, the unpaid time spent producing services consumed by household or community members. When valued by a replacement wage that approximates what this labour would cost to purchase in the market, this labour is included in the NTA production age profiles. Figure 1.2 shows that men and women are active in both spheres of the economy, but on average there is a great deal of specialisation with men working in market work and women in unpaid household service work.

Figure 1.1
NTA average lifecycle deficit by age and sex, Sweden, 2010 (SEK per year)



Source: Istenič et al. (2016).

Note: Data are provided by the Agenta project, a research project of European countries within the NTA network. The methodology used to implement these estimates is consistent with the concepts and procedures described here, adapted to the particular nature of data available across European countries (www.agenta-project.eu).

Figure 1.2
Average weekly time spent by type of labour, age and sex, Mexico, 2014 (hours per week)



Source: Courtesy of Estela Rivero, calculated from Mexico's Encuesta Nacional sobre uso del tiempo - ENUT (National Time Use Survey) (2014).

Note: Time spent in market labour includes related activities like job searching and commuting time.

Figure 1.2 shows a picture of market and household economies in terms of time. Another example from the United States of America demonstrates what can be learned by combining market and household economies in monetary terms. Figure 1.3 shows estimates from 2009, all of which are age profiles representing average amounts for an age group for a particular type of flow. Consumption flows are shown in red, production in blue, and the difference between them in green. This difference is the lifecycle deficit, a measure of how much an age/sex group needs to get either in transfers or through assets from other age/sex groups in order to support its consumption. Estimates are separated by sex, with men charted as solid lines and women as dotted lines. The top row of graphs in Figure 1.3 shows the production and consumption of UHSW time measured in NTTAs. For the production estimates, age profiles of average time spent in UHSW activities from the American Time Use Survey are weighted by an imputed wage for each type of household activity. Consumption of this time is imputed to household members, and the average imputed amounts by age and sex form the age profile. Time spent caring for children or adults is imputed to the children or adults in the household in the target age group. At the same time, the consumption of general activities like cooking, cleaning and maintenance is divided equally across all household members. Details on the wage imputations and consumption estimates are given in Chapter 3. The next row of graphs shows the age profiles for national accounts-based NTA flows of production (labour income, for the market economy) and consumption and the difference between them, or the lifecycle deficit. Finally, the bottom row of graphs shows the combined accounts adding NTTAs and NTAs to accurately represent the total economy by age and sex.

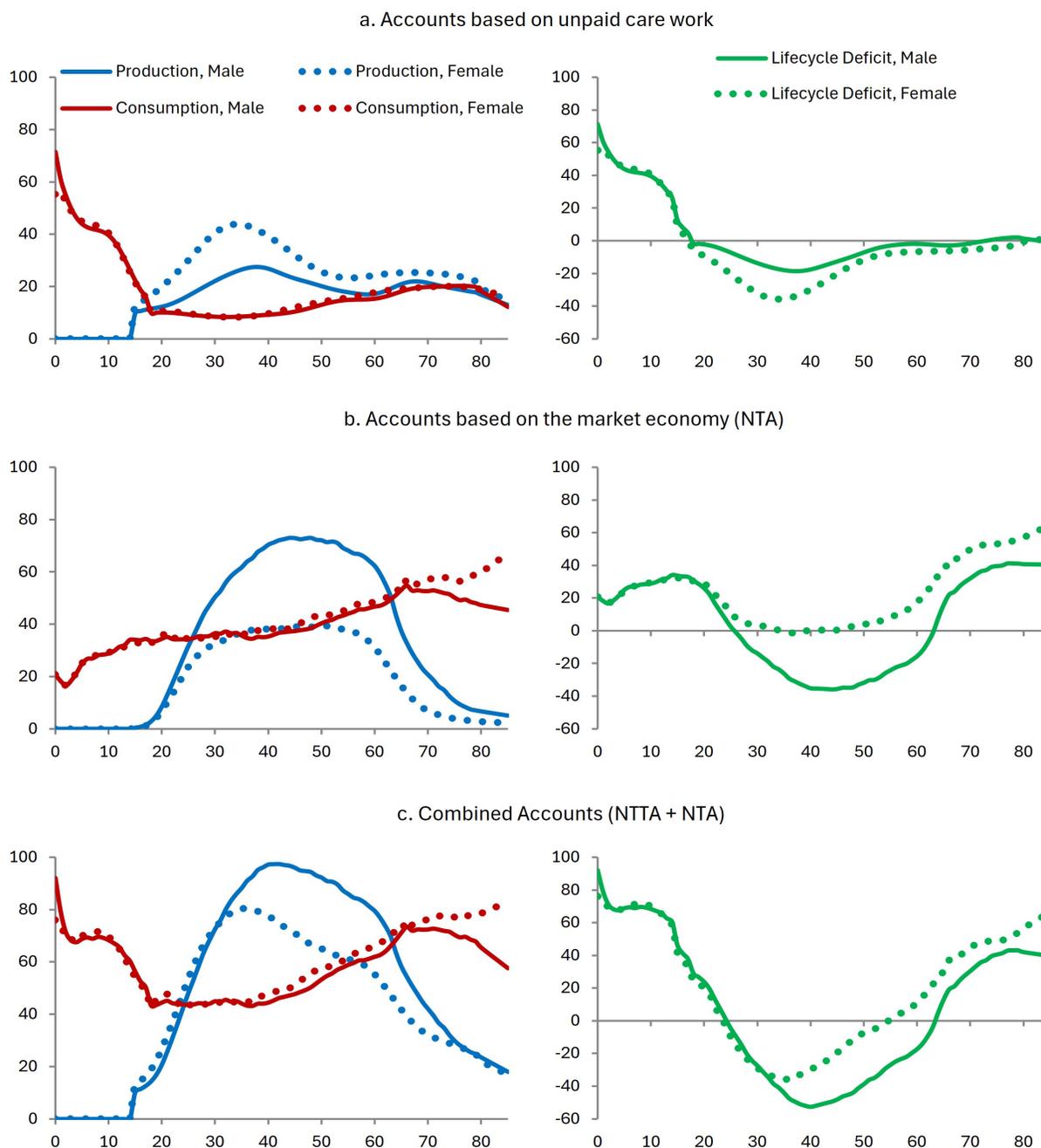
We see in Figure 1.3 that for the United States of America, in terms of money – as in the Mexico example in terms of time – women do more unpaid household service work, and men do more market work. While the production curve for men is much higher for NTA production compared to NTTA production, for women, the difference across the economic sphere is less extreme. Consumption looks roughly equal for males and females across age groups. The one exception to this is market consumption at the oldest ages. This is greater for women than men mainly because men are more likely to be disabled or live in nursing homes, both of which include much consumption of expensive health care.

The scale of unpaid household service work production, when measured in dollars, is significantly lower than for market production. Average NTA market labour income for men reaches a peak in the mid-40s age group at about \$73,000 per year, while the peak of the NTTA unpaid household service work production curve is for women in the mid-30s age group and is only about \$44,000 per year. Although the time estimates are not shown, the time spent by these groups is, in fact, roughly the same. The low market replacement wages for care and household services are responsible for the lower value of unpaid household service work when expressed in monetary terms. There are many reasons these market wages are low, including competition between market and household providers, historical devaluing of women's occupations and lack of a developed market for certain services, among many others. While NTTA estimates seek to redress the long-standing error of unpaid household service work's invisibility, they cannot "correct" a history of gender-based economic discrimination, which took for granted that this type of work would always be primarily provided by women mainly for "free."

Given these limitations, it is essential to note the benefits of adding NTTAs. First, considering the lifecycle deficit in NTA market terms only, in this example women produced no surplus at all, having average consumption equal to or greater than their production. The deficit in NTTAs, however, is substantial for women. Thus, when the accounts are combined, the sexes look much more similar in the size of their deficits and their ability to produce surplus than if we observed either NTAs or NTTAs independently.

An accurate representation of men's and women's productive activities is only possible with the inclusion of unpaid household service work. Furthermore, failing to consider the vast amounts of unpaid care consumed by the very young and very old would considerably underestimate the value of inputs provided to them and the transfers they require to maintain their consumption.

Figure 1.3
 Production, consumption and lifecycle deficit for NTAs, NTTAs and combined per capita age profiles, United States, 2009 (USD per year, in thousands)



Source: Counting Women's Work (<https://www.countingwomenswork.org/>).

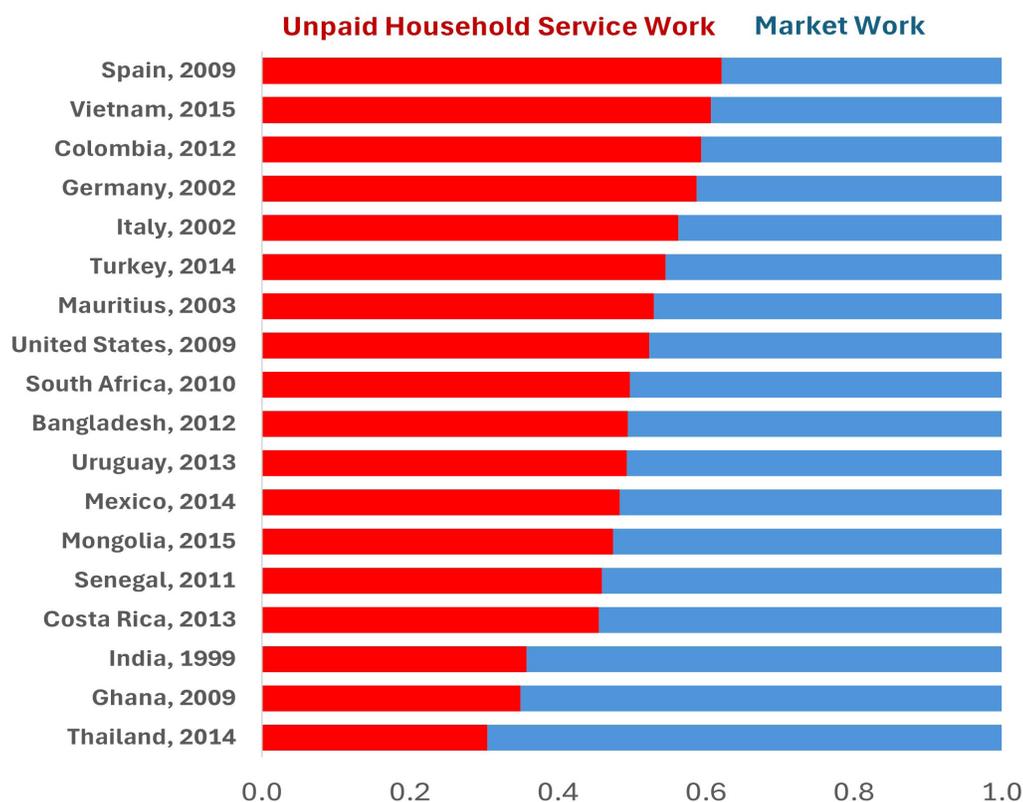
Notes: The "production" line plotted for row b is labour income (wages, benefits, self-employment income). Results do not include impacts of multitasking (indication of more than one activity taking place during the same time unit).

One additional point that is very important for NTA research objectives is to observe the changes in the relative “dependency” of the very young versus the very old depending on which row of charts is considered. In the top row of NTA charts, the youngest persons have the highest lifecycle deficits, while the very old hardly receive any net transfers of UHSW time. By contrast, in the NTA charts, the oldest age groups have the highest lifecycle deficits. In the bottom row of charts, where the two are combined, the youngest come out as having the highest lifecycle deficits, although the difference between oldest and youngest is smaller than in either NTAs or NTTAs in isolation. Leaving out UHSW radically misestimates the relative dependency of young and old and thus radically misunderstands the economic implications of changing age structures (Gál et al. 2018).

1.5.2 Cross-country comparison

Next, we will embark upon a tour of comparative cross-country results from research teams undertaking NTA and NTA estimates by sex. The group of countries represented is diverse across world regions, income levels and religious and cultural backgrounds. The results indicate that the unpaid care economy is significant, valuable and performed mainly by women, has distinct age and gender dimensions, is hugely important to human capital development, and forces us to rethink assumptions about what population ageing means for supporting dependents and labour productivity.

Figure 1.4
Proportion of aggregate total work hours in UHSW versus market work by country

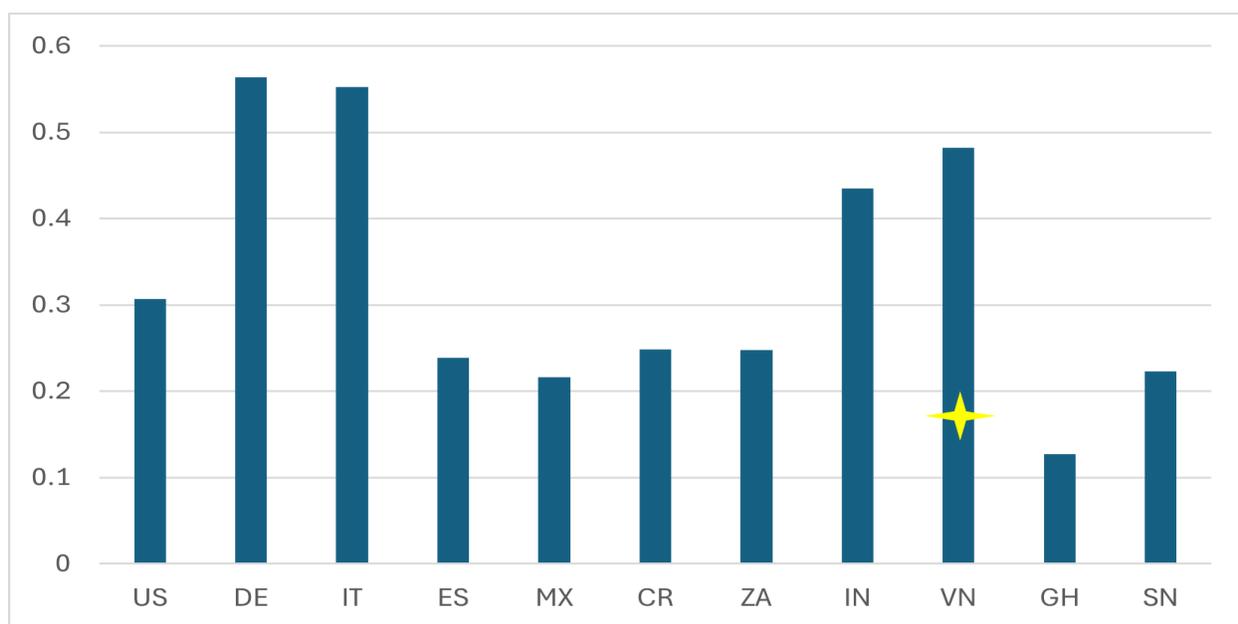


Source: Counting Women's Work (<https://www.countingwomenswork.org/>) and Vargha et al. (2016).

Figure 1.4 indicates the size of the UHSW economy that most measures of labour markets miss. For the diverse set of 18 countries represented, the total number of hours worked in either market or UHSW was calculated as observed from time-use surveys. The proportion of total work hours spent in UHSW ranges from about 60 per cent in Spain to 30 per cent in Thailand. Indeed, some of the cross-national differences may stem from methodological aspects of

time-use data collections (such as full diary versus simplified, stylized questions, or whether simultaneous activities and/or supervisory care are included) as well as from different ideas about what work versus leisure or social time consists of, making a simple interpretation difficult. What we can say, however, is that even in the country with the least observed proportion of time spent in UHSW, it still represents a significant portion of all work hours.

Figure 1.5
Value of aggregate UHSW relative to GDP



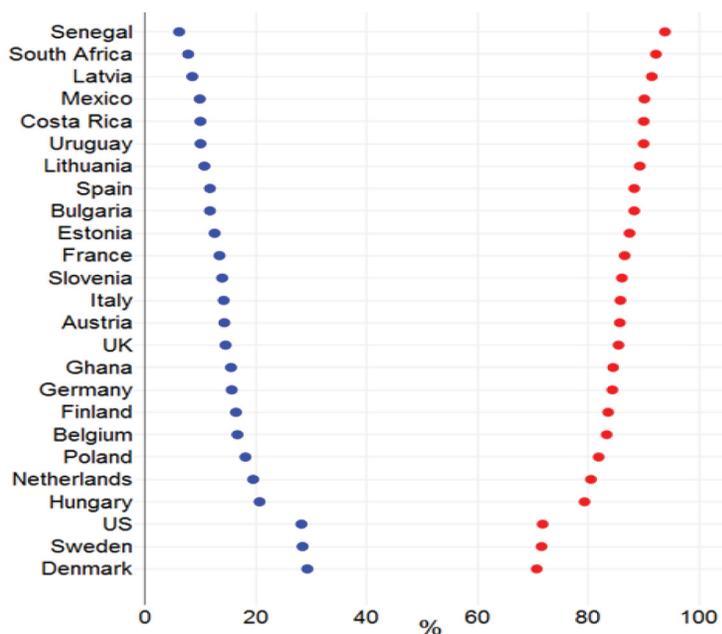
Source: Counting Women's Work (<https://www.countingwomenswork.org/>) and Vargha et al. (2016).

Note: Time spent in UHSW is valued at the market wage received by a specialist performing a similar task. Country codes: US: United States of America; DE: Germany; IT: Italy; ES: Spain; MX: Mexico; CR: Costa Rica; ZA: South Africa; IN: India; VN: Viet Nam; GH: Ghana; SN: Senegal. For Viet Nam, the chart offers two estimates for UHSW based on the legal minimum wage (height of bar) or on prevailing service-specific wages (yellow star).

Figure 1.4 shows results in time units, while Figure 1.5 shows unpaid household service work time valued at a specialist replacement wage – each hour of unpaid household service work activity is valued at an imputed wage based on what a person doing that type of activity for market wages would be paid. Again, the amount is shown relative to total GDP. The two highest values are for Italy and Germany. Likely, this is due to the high minimum wages in these two countries and high coverage of regulated labour markets as opposed to informal labour work in these two countries. Contrast this with the case of Viet Nam, where the height of the bar indicates what the valuation would be using the legal minimum wage, but the yellow star shows what the valuation would be using prevailing wages paid for the services in question, most of which are not covered by legal minimum wages, or if covered then little enforced. Still, even with the low wages for many care activities in the market, we see a range of valuations attesting to the size and importance of unpaid household service work in the context of the economy.

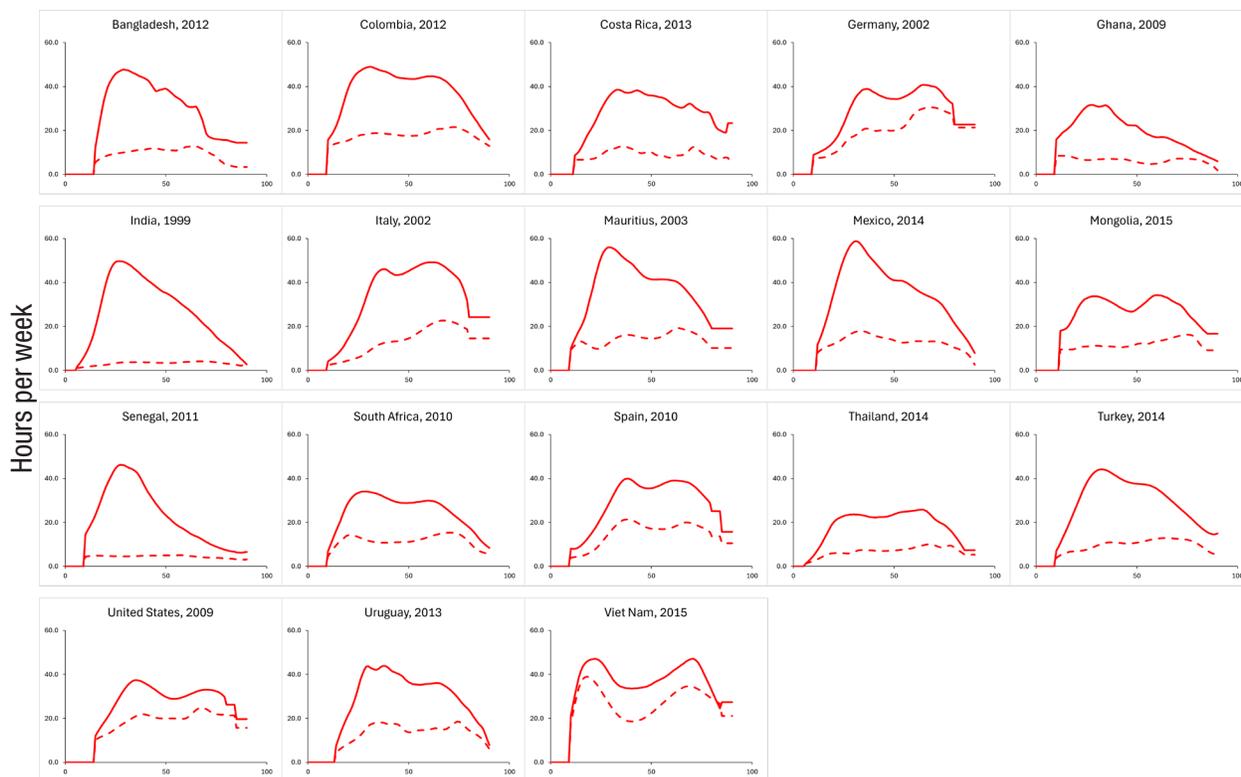
While Figures 1.4 and 1.5 are based on the unpaid care economy, Figure 1.6 shows the overall gender differences in UHSW. While the total populations of the countries represented are mainly close to 51% female, every country shows a significant majority of the UHSW being done by women. However, they vary widely from the highest proportion done by women in Senegal at about 95 per cent to the lowest in Denmark at about 70 per cent. This indicates that different societies have very differently gendered economies, but also that there is nothing inherently biological in this aspect of the gendered economy.

Figure 1.6
The proportion of all UHSW hours done by women (in red) and men (in blue)



Source: Counting Women's Work (<https://www.countingwomenswork.org/>) and Vargha et al. (2016).

Figure 1.7
Age profiles of hours worked per week in UHSW for women (solid lines) and men (dashed lines)

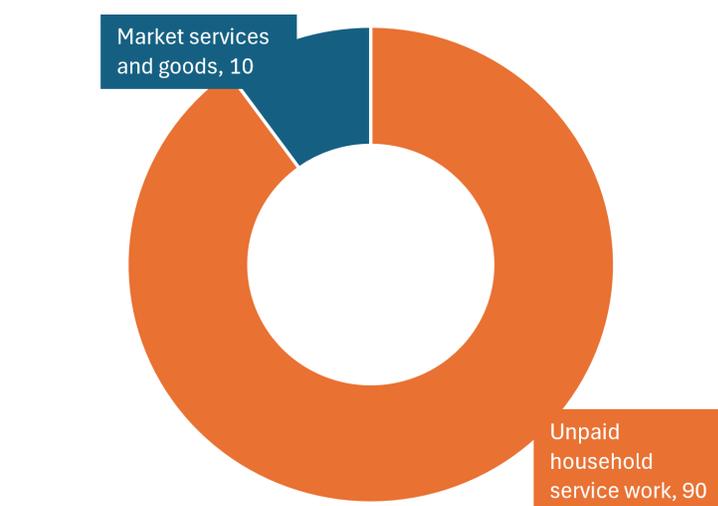


Source: Counting Women's Work (<https://www.countingwomenswork.org/>) and Vargha et al. (2016).

Figure 1.7 shows the gendered division of UHSW time, but this time by age. Each line represents hours per week in UHSW. As in Figure 1.6, there is remarkable homogeneity in terms of women performing more unpaid household service work than men in all countries, at all ages, with a few small exceptions at the oldest age groups. There is also tremendous diversity in the degree of difference. Some countries, such as India and Senegal, show almost no participation in UHSW by men. In contrast, others like Germany, the United States of America and Viet Nam show much more sharing of unpaid household service work across men and women. In focusing on age patterns of unpaid household service work, several countries, including Colombia, Germany, Italy, Mongolia, South Africa, Spain, Thailand, the United States of America and Viet Nam, show a distinct M-shaped or “double-humped” pattern in female UHSW or for some of these countries in both male and female UHSW. The early maximum is likely during the peak childcare years when mothers have young children, but the last hump is more mysterious. It is unclear whether this is increased UHSW done when retirement frees older adults up to do more housework and childcare potentially for grandchildren, or care for a frail older spouse, or other work. A combination of factors probably come into play and differ across care economy systems.

Figure 1.8

Expenditures on children in the first year of life: goods and services purchased in market versus services from UHSW (average across 22 countries)



Source: Counting Women's Work (<https://www.countingwomenswork.org/>), Istenič et al. (2016) and Vargha et al. (2016).

Shifting from who produces UHSW to who consumes it, Figure 1.8 shows the proportion, averaged across a sample of 22 countries, of all expenditures on children during the first year. The estimate of market goods and services comes from NTA consumption estimates. The estimate of UHSW comes from the imputed consumption of unpaid care time consumed by infants, valued at a specialist replacement wage for the various unpaid care activities. It is striking that 90 per cent of the investment put into a child during his or her first year would be outside of typical estimates of the “costs of children”. If policymakers were seeking to raise fertility by compensating parents for only the market costs of raising children, they would be orders of magnitude away from the actual investments parents make. This may have some bearing on why child allowances have shown so little impact in changing the likelihood that a couple will have a first, second or subsequent child.

These comparative descriptive results briefly summarize the generational and gendered economies to date. For further comparative NTA results see Donehower (2019), Vargha, Gal and Crosby-Nagy (2017), Urdinola and Tovar (2019) and Vargha, Binder-Hammer and Donehower (2023). Through the continuing efforts of country teams around the world at work on estimating NTAs and NTTAs, a more complete understanding of the generational and gendered economy between countries and over time is emerging.

Chapter 2: National Transfer Accounts: age profiles by sex

2.1 Introduction

The material in this chapter assumes that the reader is familiar with the methods for computing standard NTA age profiles, which do not distinguish by sex, as described in the National Transfer Accounts Manual (United Nations, 2013). Ideally, a complete set of NTA accounts has been estimated by any research team using this manual. However, the chapter starts with a brief review of NTA and its notation so that later sections about disaggregating by sex are clear and follow consistent language and notation.

Once a set of NTA age profiles for both sexes combined (i.e., single-sex) has been computed, the two subsequent steps to separate profiles by sex are: first, find gender-specific indicators of NTA age profiles to create separate age profiles by sex; and second, adjust those two sex-specific age profiles so that they are consistent with the original sexes-combined NTA age profiles. The first step will vary depending on the nature of the NTA age profile data, whether it comes from survey data at the individual level or the household level, and whether it comes from some published source or is the product of a set of assumptions or model-based estimates. However, the second step is generally the same for all types of NTA profiles.

At the end of the chapter, a brief discussion recommends several checks, sensitivity tests and variants. The checks are intended as part of the quality control process that should be integrated into all NTA and NTA work. The sensitivity tests involve changing some parts of the methodology and then calculating the estimates under the resulting different assumptions to see how much results change when specific changes are made in how the estimates are calculated. Ideally, changing certain parts of the methodology will not make a significant difference to the lessons drawn from those outcomes. If however, there is a large difference, it is important to know this and then consider carefully which method aligns with the desired concepts and research questions.

2.2 NTA review and notation

Following the SNA, NTA flows currently cover those included in the SNA's "current account", which describes the accrual and disposition of income within a calendar year. There are additional accounts that include wealth, capital and assets, as well as modules that account for how changes in asset prices affect balance sheets. The NTA project is working on expanding its scope beyond the current account. Still, as of this writing, NTA methodology is sufficiently refined for extensive international comparison only for the current account. NTA is organized into different flows that cover consumption, labour income, transfers, asset income and saving/dissaving.

All flows except for labour income include flows channelled through the private and public sectors (labour income is all private sector). Consumption, therefore, consists of both private consumption paid for by households and public consumption of publicly provided health, education and other general and administrative services. Transfers include private transfers within and between households and public transfers included in government tax and benefit programs. Asset income and saving/dissaving include flows generated from both public and private ownership of assets and flows arising from borrowing or paying interest on debt. All public sector assets and debts and the flows that arise from them are assumed to be "owned" by taxpayers. The methodology discussed here to separate all these flows by sex applies generally. Still, it has been most commonly used on only consumption and labour income in countries within the NTA research network. There are undoubtedly many important research questions related to gendered flows in assets and transfers (see, e.g., Deere et al. 2015). We hope that research will continue and empirical work extend further into these areas.

In general, creating each NTA age profile consists of two steps. First, a cross-sectional set of age-specific averages of the economic activity, referred to as the “age schedule”, is estimated, giving the relative per capita amount of that economic activity by age. Often, the necessary data is provided in nationally representative household surveys of income and expenditure. Such a survey will give the data to calculate age schedules of income earned, benefits received, taxes paid and many other flows for each individual. For many flows, however, amounts at the individual level are not available, although a household amount is. For example, in a consumption survey, an amount of expenditure on food is available for the household, but there is no direct measure of how much each individual consumed. Therefore, for general private consumption, we use equivalent adult consumer weights to apportion this household consumption to each individual. The weights used begin at 0.4 for infants, rise linearly to 1.0 at age 20, and are 1.0 for all ages 20 and older. Different weights are not used by sex, as there is no empirical basis on which to create these weights in a consistent way across all countries in the NTA research project, given the very different source data each country research team has to draw upon.

In the second step, aggregate measures of the particular economic flow from national accounts are used to serve as an aggregate control. Because some of the concepts NTA research focuses on are not specified in high-level SNA aggregates, there are usually some differences between NTA aggregate controls and similar measures in SNA, but these differences are small in most cases. A multiplicative adjustment factor is then determined that shifts the entire age schedule up or down so that the aggregate NTA amount matches the control, given the population age distribution.

To introduce the notation that will be followed throughout, here is the adjustment to the sexes combined NTA macro control in equation form:

a :	age a , ranges from 0 to ω (usually 85+ or 90+)
$N(a)$:	population count, age a
X :	aggregate control
$x(a)$:	per capita age schedule at age a
$\theta = X / \sum_{a=0}^{\omega} x(a)N(a)$:	adjustment factor
$\tilde{x}(a) = \theta x(a)$:	per capita NTA age profile, age a
$\tilde{X}(a) = N(a)\tilde{x}(a)$:	aggregate NTA age profile, age a

Separate treatment of males and females to measure the gendered economy in these accounts means age schedules and age profiles are estimated by sex. Sex-specific items will be indicated with an additional index s as follows:

$N(a, s)$:	population count, age a , sex s
$x(a, s)$:	per capita age schedule, age a , sex s

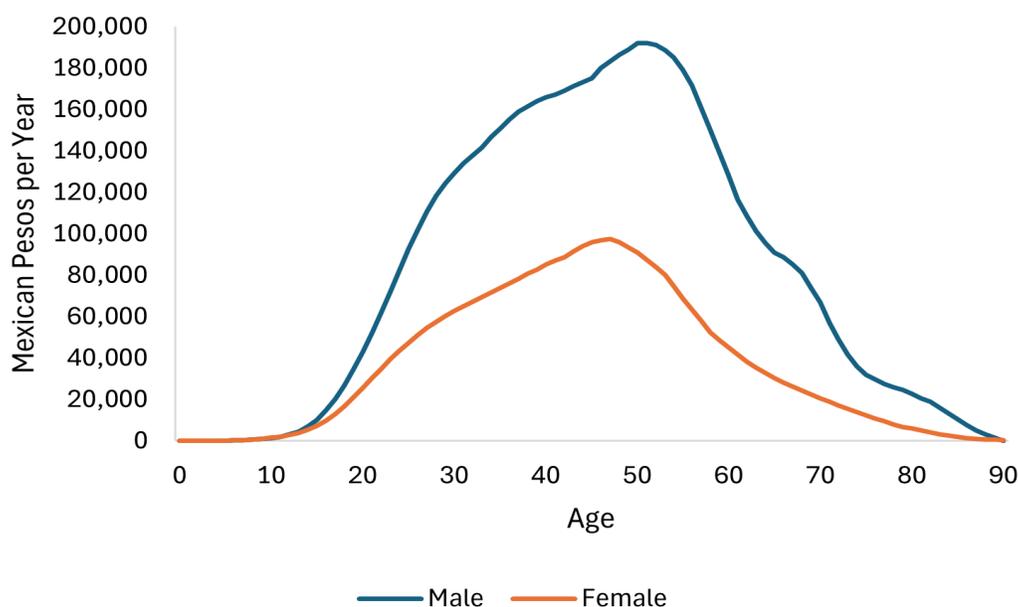
To create sex-specific age profiles, find $x(a, s)$ for both sexes and adjust both age schedules to be consistent with the macro-adjusted sexes combined age profile $\tilde{x}(a)$. This means that the adjustment differs at different ages but is the same for both sexes at each age group. More details on this process are given below.

2.3 Sex-specific age schedules

2.3.1 Age schedules when data are available for individuals

Data to estimate age schedules by sex are readily available in national income and expenditure surveys for many types of economic behaviour. When the standard sexes combined NTA age schedules are calculated from individual-level survey data, the survey typically includes sex as a variable in the data along with age. In this case, the same variables can be used to calculate a sexes combined NTA age profile using age- and sex-specific means rather than only age-specific means. For example, labour earnings are a component of labour income and are typically available in income surveys for each household member, for all persons in the survey older than some minimum age. In this case, the same data can be used to get average earnings by age for women, for men and for both sexes combined. Figure 2.1 shows an example for average labour earnings by age and sex in Mexico in 2014, in which men had higher labour earnings than women throughout life.

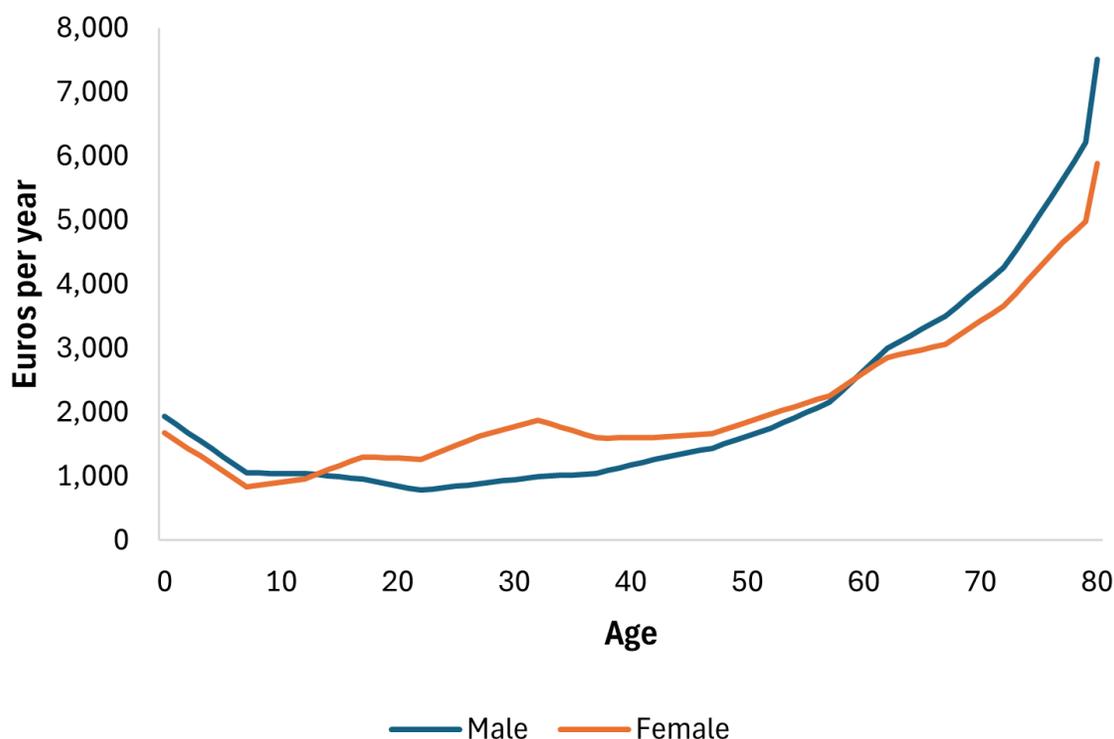
Figure 2.1
Average labour earnings by age and sex, Mexico, 2014



Source: Counting Women's Work (<https://www.countingwomenswork.org/>)

Some flows provided by government sources are not measured in household surveys precisely because the government provides them. Therefore, household members lack an accurate idea of how much they receive or consume. For these programs, administrative records are sometimes available that give age- and sex-specific schedules of public benefits. Figure 2.2 shows an example using the average consumption of public health by age and sex in Finland in 2010. On average, men's consumption of public healthcare resources exceeded that of women for youth below age 15 and older persons above age 60.

Figure 2.2
Average consumption of public health by age and sex, Finland, 2010



Source: Istenič et al. (2016).

If a specific tabulation of administrative data by sex is not available publicly, requests for special tabulations of such information can be made to statistical agencies. For example, Generational Accounts, which require many of the same data as NTA public sector accounts, are always estimated by sex as a preliminary data step, so where it is possible to calculate inputs to Generational Accounts, those same inputs could be used to produce NTA age schedules by sex (Auerbach et al., 1999).

2.3.2 Age schedules when data are available for households

As mentioned previously, when the age profile is based on household-level data, the NTA methodology uses two main methods to allocate household-level data to individuals by age: data-driven methods like regression; or assumed relative age shares (equivalent adult consumer weights).

When regression is used to estimate age shares, we regress the household amount of a flow on the age structure of the household and any available indicator for which a household member was involved in the household level flow. For example, private education spending at the household level is regressed on the age structure of those in the household and an indicator of school enrollment. Similarly, household out-of-pocket spending on hospital or doctor bills is regressed on household age structure and whether each household member was shown to have been to a hospital or clinic during that period. These regressions generate coefficients for each age group that are used as weights to apportion a household expenditure amount. This process gives the age estimates for the basic NTA sexes combined age profiles. For the sex-specific estimates, the sex of household members is included in the regression equation to generate coefficients that can differ for males and females of the same age. The examples below show models with separate age factors for men and women, but other formulations that include sex have been explored,

such as including a single additive term after the age terms. Based on the goodness of fit tests, researchers decide which model is the most appropriate.

For example, a regression equation used for estimating the NTA age schedule of education consumption when an enrollment indicator is available is as follows:

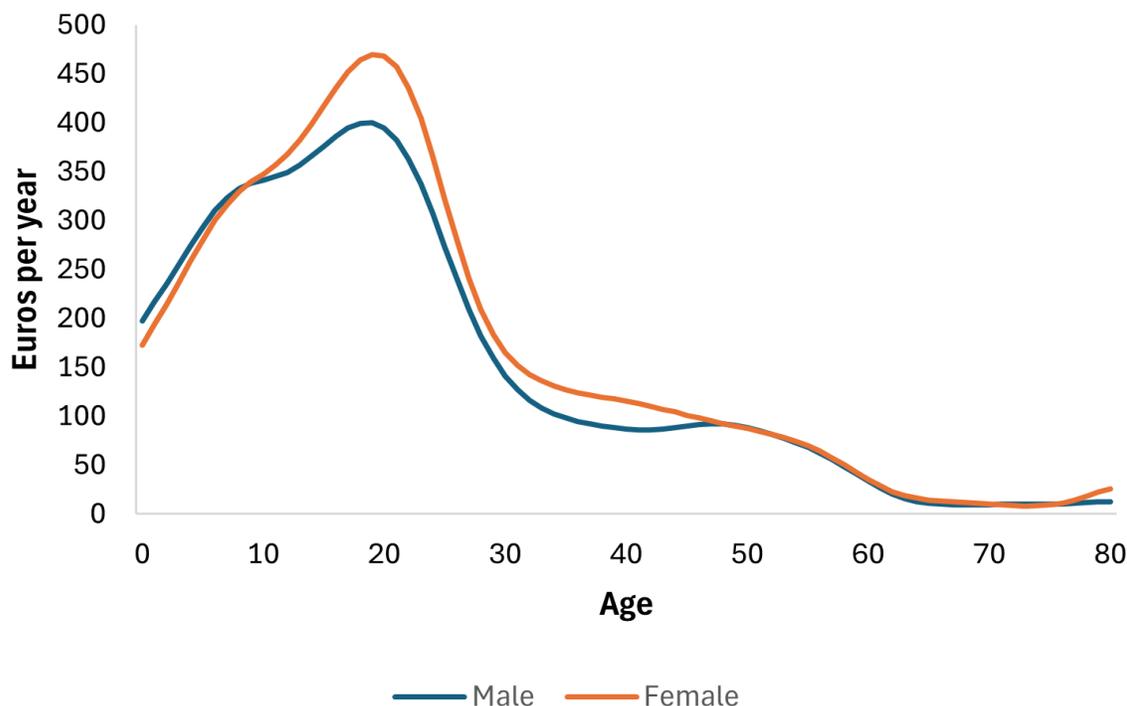
$$X_j = \sum_a \alpha(a)E_j(a) + \sum_a \beta(a)NE_j(a) + \varepsilon_j$$

where $E(a)$ is the number of enrolled household members of age a and $NE(a)$ is the number of unenrolled household members of age a . Note that, where appropriate for the variable X , age a is reported in 2-year or 5-year age groups to reduce noise. After estimating this regression equation, the positive coefficients are assigned to the relevant age groups and used as weights to distribute the household amount spent on education, while negative coefficients are set to a small number just above zero. To add sex into this equation, we can double the number of coefficients by estimating for age a and each sex s :

$$X_j = \sum_a \sum_s \alpha(a, s)E_j(a, s) + \sum_a \sum_s \beta(a, s)NE_j(a, s) + \varepsilon_j$$

Figure 2.3 shows the results of this estimation method for private education consumption by age and sex in Germany in 2010. Women consumed more private education than men, especially between the ages of 18 and 23, most likely reflecting higher college enrollment rates among women.

Figure 2.3
Average consumption of private education by age and sex, Germany, 2010



Source: Istenič et al. (2016).

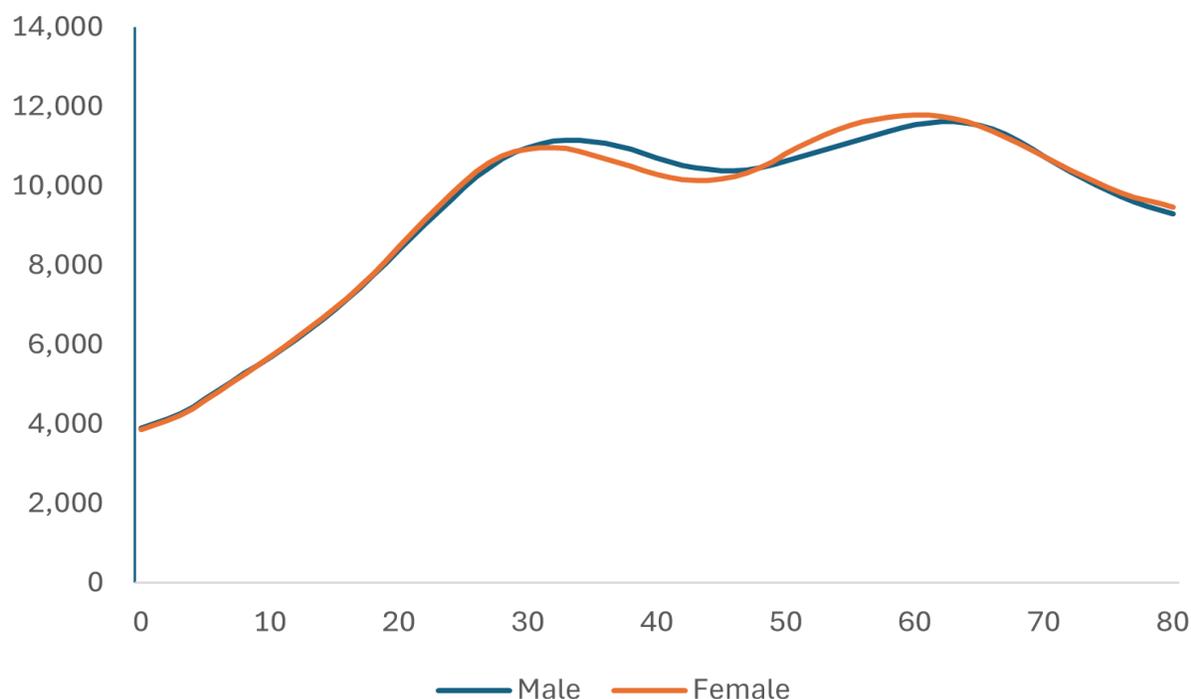
Several other models described in the NTA manual (United Nations, 2013) section on consumption might be used. These methods can be expanded to include sex following the same principle described above, such that where an NTA regression equation has one term for a particular age group, it is expanded to two terms for each age and sex group.

For other types of profiles, mainly private consumption, NTA uses assumed relative age shares, also called equivalent adult consumer (EAC) weights. For sex-specific profiles, the same EAC weights are used for men and women of the same age, meaning we assume there are no differences in consumption between women and men of the same age within a given household. Some gender differences will be evident in the final age schedules because different amounts of consumption will be observed depending on the difference in household composition.

In the past, some NTA researchers have examined data-driven methods to estimate an equivalent consumer scale by sex, but the differences found have been relatively small (Lindh et al., 2010). In contrast, researchers outside the NTA group argue that a unitary sharing model within the household is inaccurate (Browning and Chiappori, 1998) and find that both spousal market income and gender roles contribute to different consumption by gender within the household (Phipps and Burton, 1998). Given these previous studies, we would expect women to receive a lower share compared to men in the household, which would lower their consumption and lifecycle deficits. Examining alternatives to the equal gender weights assumption will be an important priority for future methodology revisions. For the current methodology, researchers should be clear on the potential for bias in estimates of women's versus men's private consumption and note that sometimes it is more appropriate to show the sexes combined version of consumption estimates instead of separate sex ones. This is most relevant in contexts where the chances of intra-household gender discrimination are high based on other existing studies or local practices.

Figure 2.4 shows the results of using the same equivalent adult consumer weights by age for men and women across 25 member states of the European Union (EU). As noted, due to the assumption of identical weights by sex, there is virtually no difference between male and female consumption patterns. That is, by assumption, there is no gender bias in the distribution of private consumption within households. The minor differences that emerge in later life in Figure 2.4 arise solely from inter-household differences such as the tendency for men in their 40s to live in higher consumption households than women while the reverse is true for women in their 50s.

Figure 2.4
Average private consumption, excluding education and health, by age and sex, EU, 2010



Source: Istenič et al. (2016).

2.3.3 Age schedules from imputation

Some age profiles that are not observed directly are imputed based on NTA methodology. Specifically, age profiles for intra-household transfers are imputed based on the results of other NTA age profiles and an assumed sharing model. In contrast, the private saving profile is computed as a balancing residual of all other profiles. The separate sex versions of these profiles are computed in much the same way as the sexes combined profiles.

For intra-household transfers, the procedure is the same as for a sexes combined profile, meaning the sharing algorithm is computed using aggregate adjusted microdata. The profile values for the “ingredients” of the intra-household sharing model for each individual (not the age group averages) are adjusted as described in the section below with the age-specific factor that makes the sex-specific profiles consistent with the aggregate-adjusted sexes combined profiles, and then the same algorithm as for the sexes combined version can be run. The results should be collapsed by age- and sex-specific means for other types of profiles.

For private savings, the age profile is the final balancing residual for all the other profiles: labour income plus net transfers plus asset income minus consumption. The only modification for the separate sex versions is that the calculation is done separately by sex, using only “ingredient” age profiles for that sex.

2.4 Finalizing age profiles

2.4.1 Smoothing

In NTAs, age schedules are smoothed to reduce noise and produce more informative visual representations in the resulting age profile. Schedules by sex may need more careful statistical smoothing than those for sexes combined NTAs due to the smaller sample sizes, but the implementation is the same. Researchers examine and adjust the smoother by the same methods as when estimating sexes combined NTAs to preserve real discontinuities which might be brought about by public program incentives or age-defined cultural practices, but do so to eliminate as much as possible statistical noise introduced by sampling or other types of random variation.¹

2.4.2 Adjustment for consistency with sexes combined NTA

Once the age schedules have been calculated and smoothed, researchers must adjust the sex-specific age profiles consistent with the aggregate controls from national accounts and the sexes combined NTA estimates. Note that we do not have sex-specific national accounts, so instead of adjusting the sex-specific NTA profiles to macro controls, we implement an adjustment so that the sex-specific profiles are consistent with the macro-adjusted sexes combined profiles.

Specifically, we must adjust both the male and female profiles at each age to be consistent with the sexes combined profile that has been adjusted to the aggregate control. The adjustment factor for a profile at age a is the ratio of the sexes combined macro-adjusted profile value at that age to the weighted average of the unadjusted sex-specific age schedules:

$$\theta(a) = \frac{\tilde{x}(a)}{x(a,mal)N(a,mal)/N(a) + x(a,fem)N(a,fem)/N(a)} : \text{ adjustment factor, age } a$$

$$\tilde{x}(a, s) = \theta(a)x(a, s): \text{ per capita NTA age profile, age } a, \text{ sex } s$$

$$\tilde{X}(a, s) = N(a, s)\tilde{x}(a, s): \text{ aggregate NTA age profile, age } a, \text{ sex } s$$

¹ NTA research groups use a cross-validation smoother called Friedman’s Super Smoother. See Friedman (1984) for details; also <https://stat.ethz.ch/R-manual/R-devel/library/stats/html/supsmu.html> for implementation in the R statistical computing program, and <https://ideas.repec.org/c/boc/bocode/s458030.html> for implementation in the Stata statistical computing program.

This produces an age schedule of adjustment factors applied to each age of the male and female age schedules. The factors differ by age, but within age, the factor is the same for men and women. After this adjustment, the male and female age profiles will be consistent with the sexes combined age profile and will have a combined aggregate total equal to the aggregate control.

Adjusting the sex-specific profiles to be consistent with the sexes combined profile accomplishes the goal of making sex-specific age profiles consistent with sexes combined profiles, but it is also statistically expedient. The sexes combined profiles will have the most observations at each age and thus will produce the most accurate estimate of the age dimension of a particular flow. In addition, any sex-specific profile will be less well estimated in the data due to smaller sample size, so consistency with the sexes combined profile enhances the reliability of the sex-specific estimates.

2.5 Recommended checks and sensitivity tests

There is more than one way to estimate any particular NTA age profile by sex. Sensitivity tests are an essential part of understanding how our estimates work, examining different implementations to see if they create a different picture of results by gender. NTA researchers generally examine two alternative implementations of the methodologies described above. The first involves experimenting with different techniques to estimate within-household allocations for quantities we only observe directly at the household level. The second involves changing assumptions about household headship.

2.5.1 Altering within-household allocation rules

As mentioned above, there may be reasons that the assumption of equal equivalent adult consumer weights for males and females may be misleading. These weights are used to allocate private consumption within the household. Researchers should examine the private consumption results using an alternate data-driven method, such as iteration or regression, to get a different allocation to compare. For example, by applying the same regression method used for health or education without any utilization measures, using the coefficients to allocate the household amount, and comparing the resulting profiles with those obtained under the equal gender weights assumption.

2.5.2 Changing household headship assumptions

NTA methodology may produce different patterns by sex as a result of the role of household headship. This has no impact on consumption or production but is potentially important in determining the observed age and sex dimensions of asset-based flows and some kinds of transfers. NTA methodology generally follows whatever headship definition is used in a survey data source. The concept of headship in NTAs is essential for some allocation assumptions. In NTAs, the head is the only household member who can own assets, go into debt, give or receive inter-household transfers, and give or receive intra-household transfers based on owned housing. When we calculate a sexes combined asset income profile, the headship assumption will not matter for the case of two spouses of similar age. One is assumed to have all the assets, the other none, but they are averaged together in the age profile. When these age profiles are separated by sex, however, in many contexts different assumptions about who is the household head will create very different gender-differentiated age profiles. Researchers are encouraged to try different headship definitions to determine the sensitivity of results by gender to the headship definition.

Some possible definitions of headship are:

- i. Survey-defined (this is the NTA default)
- ii. Highest wage earner in the household

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- iii. Owner or renter of housing unit (if available in the survey)
- iv. Equal headship (assign headship-related roles equally to all adults in the household)
- v. Proportional headship (assign all assets and other headship roles to adults in the household based on their wages or some other indicator)

As headship in NTAs mainly impacts estimates through the ownership of assets, the ideal would be to identify the head as the legal owner of the assets in question. For example, for allocations related to housing, the head is the legal owner or renter, divided among multiple owners. For allocations related to asset income, the head is the legal owner of the assets. As most surveys will not include this level of information, researchers should examine the default definition of headship and then identify at least one plausible alternative definition to establish and report a range of possible estimates. Understanding the role of headship is another priority for future refinements in this methodology, and different definitions may be appropriate for different research questions.

Chapter 3: National Time Transfer Accounts: age profiles by sex

3.1 Introduction

This chapter provides step-by-step instructions on how to estimate NTTAs in a manner that is comparable to the estimation of NTAs. The starting point for all NTTA estimates is survey data on individuals' time use. The degree of comparability of NTTA estimates from country to country ultimately depends on the comparability of the time-use data from each country, which can be questionable. However, the same can be said for many other international data comparison projects that do not rely on totally comparable data from country to country, but nonetheless provide great value in understanding change over time and, in broad strokes, across different places.

To produce NTTA estimates, we begin by following the long-standing research tradition behind household production satellite accounting (Terkoğlu, 2017; Pan American Health Organization, 2010), which produces a national aggregate estimate of unpaid household service work. Then, we join this aggregate flow to the NTA methodology for disaggregating national flows by age and imputing consumption and transfers of flows.

The market-based NTA estimates start mostly from national accounting and a country's income and expenditure survey. Most nations have these surveys, and many produce them regularly, although the same is unfortunately not true for time-use surveys. With increasing interest in understanding time use and UHSW, however, many countries are instituting new surveys or repeating surveys carried out in the past. Time-use data is the main factor in producing NTTA estimates, and without it there is no other way to estimate NTTA accounts. That said, many different types of time-use data can be used for this purpose. Wage data by occupation is also needed if the research project includes monetary and time-valued estimates, since an imputed wage can be used to value UHSW time in monetary units.

Our process consists of five steps:

1. **Data:** Gather and evaluate available time-use data from either a time diary survey or another type of survey that contains a comprehensive set of questions on time spent across different work activities, including UHSW activities.
2. **Production measured in time units:** Identify time spent on UHSW activities by age and sex in the time-use survey and estimate the age profile of production for each type of activity. Repeat for relevant comparative activities, including paid work and education.
3. **Consumption measured in time units:** Combining data on household composition from the time-use survey with assumed imputation rules, impute the consumption of UHSW time produced for household members in each household to the individuals residing in the household. Distribute any time produced for non-household members based on the type of UHSW.
4. **Transfers measured in time units:** Use existing NTA methods to impute UHSW transfers based on production and consumption estimates.
5. **Monetary-based estimates:** To create a set of monetary-based estimates, weight each time unit using specialist replacement wages for each type of UHSW activity.

These steps are examined in more detail in the subsequent sections. Where possible, methods are also discussed for situations where some data is lacking and alternative methods can be used. These are generally experimental

and may not yield estimates comparable with other countries with complete data. Still, they can be valuable in creating estimates for a country, which can be compared either with sub-groups within that country or estimates for that country over time if the time-use collection instrument is repeated. A few additional steps are discussed in this chapter, including smoothing the final age profiles and evaluating the final product for internal and external consistency.

Note that these five steps account only for the labour component of UHSW. The final part of this section discusses the role of the capital component of UHSW and how total NTTA monetary-based estimates will differ from household production satellite accounts.

3.2 Data

3.2.1 Overview

Ideally, NTTA age profiles are calculated using a time-use survey with characteristics similar to the income and expenditure household surveys that generate NTA estimates. They give an accurate picture of the nation, include information on household members, are weighted appropriately in the manner of a scientific sample, and provide enough diverse time-use data to calculate the target flows.

Unfortunately, there are fewer time-use surveys than household consumption or income surveys, so researchers may need to compromise on some of the desired characteristics. If a time-use survey is available for a particular sub-region of the country, for example, or does not list all household members or time-use activities in sufficient detail to allow for the calculation of the complete NTTA system of production, consumption and transfers, even the limited results that such data can produce could be informative. If only time production for some portion of the population can be calculated, it could still be helpful to compare to NTA results. This could also be a valuable exercise to demonstrate the value of the analysis in a small way and create support from policymakers or funders for a complete survey to allow for the full set of results.

3.2.2 Types of time-use surveys

Two main types of time-use data widely available are time diary surveys and activity-based questions. In time diary surveys, a respondent is asked to account for all of their activities during a period of time. Typically, the accounting would start when the respondent is expected to be asleep – 4 a.m. is a typical start time – and then asked to describe their activities from that time for the next 24 or sometimes 48 hours usually in 15-minute increments, although longer or shorter increments can be used. Survey administrators give a numeric code to the respondent's answers for each activity using a comprehensive classification scheme, thus turning verbal responses into information that can be analysed quantitatively. More information is provided about classification systems in later sections on identifying particular activities included in NTTA estimates. There is another type of diary survey, called a "light" diary, in which respondents classify their activities by filling out a grid that accounts for a limited but exhaustive list of activities in short intervals.

The other main type of time-use data comes from activity-based questions. These are typically included in more extensive surveys as a module on time use, in contrast to diary surveys, which are often stand-alone surveys owing to the more significant time it often takes to answer them and the need for specially trained activity coders with skills related to a very particular type of data. In an activity-based time module, respondents will be asked how much time they spent on a specific activity over a certain period. Sometimes the request is for accounting for a "typical" amount of time spent, or it can be for a particular recent reference period such as the previous week. For example, a question might be, "How much time do you spend in a typical week doing laundry?" or, "How much time did you spend last week doing laundry?" Activity-based questions can also be asked in a sequential manner that makes it

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easier for respondents to give accurate data. For example, a series of questions might proceed as: 1. “Do you ever wash clothes?”; 2. “How many days a week do you typically wash clothes?”; and, 3. “On days when you wash clothes, how long does it take?”

Both types of data can be used to estimate how much time a respondent spent on a particular activity. For time diary surveys, we look for codes for each type of activity included in NTTA estimates and add the amount of time each respondent spent on those codes. For activity-based surveys, we find the questions with the relevant activities and add the time based on the respondent’s answer and any unfolding question format. As in the three-item clothes-washing example in the previous paragraph, this would mean giving zeros to anyone who did not report doing that activity in a week and, for those who did report, adjusting the daily hours by the days per week to get an estimate that reflects an accurate overall average time spent washing clothes over some reference period (see Box 3.1, Calculating Averages for Unfolding Activity Questions).

The two main types of surveys both have their strengths and weaknesses. The main drawback of the diary survey is that it is typically more costly than a set of activity-based questions. However, it allows for a much richer dataset because respondents can be asked contextual questions about each activity they report, such as who else was with them, where they were, a subjective rating of happiness at the time of the activity, whether there were any other simultaneous activities taking place, and many others. Time diary surveys also benefit from the structure of the 24-hour day, which keeps respondents from wildly under- or overestimating how much time they spend on tasks. However, activity-based modules are likely to become more common given the cost of complete diary surveys, especially in lower-income countries. Either type of data can be used to estimate NTTAs, as long as the classification scheme used for a diary is sufficiently detailed or the list of activities asked about in an activity-based module covers the desired activities to be included in NTTAs.

Box 3.1

Calculating Averages for Unfolding Activity Questions

In some activity-based surveys, questions will be asked in a sequential manner over different periods in order to get the best recall for people possible. Daily activities are asked about relative to a reference day. Activities that one might only do once a week, month or year will be asked about using that period (week, month or year) as a reference for the number of times the person engaged in the activity. Then, a follow-up question will be asked about the amount of time spent on the days when one engaged in the activity.

The Senegal 2011 time-use survey is one such example. Below is a paraphrase of the questions about laundry from that survey:

Item e30_4. Did you clean laundry at all during the last seven days?

Item e31_4. (If e30_4=YES, continue) How many days did you do laundry during the last seven days?

Item e32_4. (If e30_4=YES, continue) On the days you did laundry, how long did you spend?

To calculate an average time spent per day, give each time-use respondent a 0 value if they report in Item e30_4 that they did not do the activity at all. If they report in Item e30_4 that they did the activity, take the number of days per week (Item e31_4) times the duration per incident (Item e32_4) and divide by 7 to get a daily estimate.

3.2.3 Necessary aspects of time-use surveys for NTTA

Either a time diary or an activity-based module can provide the data necessary to calculate NTTA estimates. Key characteristics of the survey required for NTTA estimates include that:

- It is nationally representative; each household member's age and sex are listed (i.e., a full household roster which lists age and sex).
- It covers roughly the same period as comparable NTA estimates to facilitate comparison between NTA and NTTA.
- It is able to represent an annual amount of time spent (i.e. time-use information includes the impact of weekends, holidays or any other exceptional times, with appropriate weights given so that such observations are correctly weighted relative to an annualized period).
- It covers complete time-use data for at least one person in each household (whether in diary format or activity-based questions).
- The hours in a day in the survey add up to 24 or close to it, or omitted hours are considered non-productive.

As mentioned earlier, it may be possible to compromise on some of these aspects. For example, some countries have a time-use survey that is only conducted in metro areas and is not nationally representative. NTTA could still be calculated on this time-use sample, but it would be understood that the results would only reflect metro areas. To get an equivalent comparison with market-based NTA estimates, a researcher would have to estimate a set of comparative NTA profiles only for metro areas, and, as metro-only national accounts are probably unavailable, the researcher would have to assume that the macro-control adjustments for the metro-only set of age profiles would be the same as the adjustments for the total population age profiles. This assumes that the error represented by the macro control adjustment is the same in metro and non-metro areas, which may be very questionable, especially if the metro areas account for a small share of the entire economy.

If the time-use survey does not come with a complete household roster, the time-use results for time-use respondents can be imputed onto a survey with a complete household roster. Techniques for this are discussed in Appendix C of the NTA manual (United Nations, 2013). In addition, some NTA researchers have made use of a single survey question on housework to estimate something similar to NTTA estimates by using neighbouring countries that did have a complete set of NTTA age profiles to give relative levels of activities, calibrated by the amounts reported in a single survey item (Jesus, Wajnman and Turra, 2021). While certainly not an ideal data set, this is one way to get results from a minimal data source, which can show the value of the approach and encourage policymakers to want to invest resources in more time-use data collection.

If the time-use survey is from a different year than the comparable NTA estimates, they can still be compared as long as the overall economic and labour force situation is expected to be roughly similar. A major fiscal crisis or natural disaster in one of those years would prevent meaningful comparisons, but barring such significant events, we can make the assumption that overall time-use patterns were the same in the NTA year as the NTTA year and then use imputed wages from the NTA year to create monetary NTTA estimates. If imputed wages are only available for the NTTA year, the monetary estimates of the NTTA year can be inflated or deflated by the growth factor of per capita GDP. We measure the growth in per capita GDP rather than prices because we want to reflect overall economic growth, not just the effects of price inflation. Inflating by per capita GDP creates an approximate set of NTTA estimates in which we assume that time-use patterns have stayed roughly similar between the two time periods, but wages have changed.

3.2.4 Data quality issues

In orienting to any new source of survey data, researchers typically have an exploratory stage in which they get a clear understanding of how the survey was conducted, how the data was gathered from the field and made into the data files accessed by researchers, and if there was any data cleaning and post-processing between the stages of collecting responses and making data available to researchers. Most of this information will be included in survey documentation, but at this stage it is advisable to check for data quality and make necessary adjustments. This section discusses basic quality checks around general survey representativeness and the quality of time-use data gathered. Some suggestions are included for what researchers can do to address shortcomings. Further recommendations are suggested by the documents of the United Nations Statistical Commission on defining quality for data and statistics on time use² and on quality considerations for time-use surveys.³

A crucial part of post-processing is usually the production of survey weights included in published files. The survey weights in a typical household survey will address issues of differential participation by some groups in the survey and the representativeness of the survey for sub-groups in the population if there was over-sampling of any sub-group. The sub-groups are most often defined by age and sex but can also include any geographic, racial, or ethnic groups of particular interest in that country. Researchers should always estimate population distributions by age and sex implied by these survey weights and compare them to external sources of age and sex distributions (such as from the country's national statistical office (NSO) or an international set of estimates such as the United Nations World Population Prospects database). If there are significant disparities between distributions, researchers should first revisit the documentation for the survey and whatever statistical package they are using to calculate estimates and ensure they are using the weights correctly. They can also contact the statistical office that produced the data files and discuss any issues with them to get clarification that either the weights themselves are faulty or that the researchers are using them incorrectly. If this still does not yield a satisfactory set of weights, a different set of weights can be estimated to generate more representative overall statistics.

Finally, there may be some problems in population distributions that cannot be solved, such as the need for more data for very young children in the survey. Of course, very young children will likely not have time-use data, but they are needed in the survey to understand the dynamics of childcare in households with infants. Some surveys find relatively few infants and young children in the surveyed households for various reasons, such as child naming or fostering practices that make respondents or survey takers miss infants. Reweighting, in this case, may not be possible without causing other representativeness problems, so researchers should state clearly in any results that this issue exists with the survey data and notify the agencies in charge of collecting the data so that they can address the issue in future surveys.

The primary data quality issue of concern in estimating NTA is the time-use data itself. For time diary surveys, the first check is that 24 hours of activity is given for each time-use respondent if the diary covers one day, 48 hours for two days, etc. The nature of the diary usually imposes this control on data quality, but it is still a good idea to verify this fact to ensure the data is being used correctly. In cases where 24 hours per day per person is not maintained, if the error is small, at less than an hour or so per day, researchers can make a proportional adjustment of that respondent's time accounting to force the total to 24 hours. For example, if a respondent's total time accounted for in a 24-hour survey is 23.5 hours, the researcher could multiply all of that respondent's activities by a correction factor of $24/23.5$ or about 1.02. If the error is quite large, perhaps at more than 5 hours, a researcher may drop that respondent if there are only a few of these cases of significant time disparities. If many respondents have large time deviations from 24 hours per day, the researcher may have made a mistake in estimating the total time observed, or the survey may have such poor data quality that it is unusable for this purpose.

² https://unstats.un.org/unsd/statcom/51st-session/documents/BG-Item3m-Defining_Quality-E.pdf

³ https://unstats.un.org/unsd/statcom/53rd-session/documents/BG-3h-Quality_UN_EG_TUS2021_FINAL_SENT_rev-E.pdf

Due to the nature of the data collection, the control of 24 hours per day per respondent is not available for activity-based surveys. If there are enough types of activities accounted for that almost every activity is included, researchers can make a crude total time calculation and compare it to 24 hours. Still, there is likely no reasonable way to make adjustments based on this calculation. Instead, researchers can examine the distribution of responses to each activity question to see if they look reasonable. If some respondents are reporting sleeping for zero or 24 hours, or spending no or all of their time on one particular activity, or give consistently very high or very low time allocations, those respondents can be flagged for possibly providing faulty data. If there are a few of these cases in the survey, they can be discarded. If there are many, the data may not be usable.

All data evaluation checks should be documented in background technical papers on the country's NTTA estimates or, for published work, in appendices or footnotes.

3.3 Production measured in units of time

3.3.1 Conceptual basis for identifying NTTA activities

As a general principle, we want NTTAs to include activities that would be included in national income if they were done for wages instead of being non-market labour done for no pay. Researchers have developed different ways to determine if an activity meets this standard. One is the “third-party criterion”, which asks if the respondent could pay someone else to do the activity but still receive the benefit from it (Reid, 1934). Activities like sleeping, eating, sports and leisure activities would not be included, because paying someone to do these things would not give the benefit to the respondent. For example, a person could pay someone to sleep, but the benefit of the sleep would not accrue to them. Any home management or care activities would qualify by the third-party criterion.

The other primary criterion for activities to include in NTTAs is that they are not already included in national income measures such as GDP. This means that any work done for pay is excluded. Work done to make goods for one's own use, such as subsistence farming and gardening to feed one's own household, is also not included. This work is not included in NTTAs because, conceptually, it is already included in GDP. Following national income accounting practices means that national accountants must take their best guess at the value of all subsistence agriculture in the country and impute that value as a part of GDP. An important particular case is gathering wood and water. These activities make goods available for the household to use, and so conceptually are the same as subsistence agriculture and should also already have been imputed and included in GDP. In practice, however, many national accountants do not do these imputations, so the value of this type of production is not included in GDP. In many countries, gathering wood and water is considered a specifically female chore, so leaving it out of GDP means the gender implications of this type of production will be missed. Therefore, for any of these types of production of goods for one's own use, researchers should carefully review their NSO's imputation practices and add this production only if it is not already imputed and included in national accounts.

A final issue in considering which activities should be included in NTTA is that some aspects of care work could be viewed as both productive work and leisure. For example, taking a child to the theatre could be leisure for the parents or care for the child and may therefore be conceptually ambiguous. In most instances, the time-use survey respondent or classification scheme will make this decision, or the survey respondent faced with an activity-based question about time spent in childcare will decide for themselves if they consider such time leisure or care work. As a general principle, NTTAs would recognize this as childcare instead of leisure by the third-party criterion, meaning that one could pay someone else to take their child to the theatre. In this case, they would miss out on the leisure of going to the theatre but would still benefit from someone else looking after their child. Also, if that child was young enough and the parent did not spend that time with the child, they would have to get someone else to provide that care and supervision, even if the care was just sitting next to the child in the theatre. Pet care is another potentially ambiguous task that NTTAs would still classify as work. While someone may walk their dog or play with him as a

leisure activity, they could pay someone else to do it and still get the benefit of a well-exercised pet even if they did not get the enjoyment of the walk for themselves. There is a helpful comparison here to paid employment in that there may be many pleasurable aspects to a paid job, but the market does not deduct wages if someone enjoys their work. NTTAs should not do this either. Productive activity is no less valuable to consumers if the producer also gains satisfaction doing it.

3.3.2 Identifying time spent in NTTA production

Activity coding schemes

There are different ways to classify activities, and whatever classification was used in the surveys available in a particular country is the one that must be used. The following are two examples of classifications and where to look for UHSW activities in those schemes. First, Table 3.1 shows the International Classification of Activities for Time Use Statistics (ICATUS) maintained by the UN. Adopted as an international standard to promote harmonization of time-use statistics, ICATUS was developed to be aligned with SNA and the resolution of the nineteenth ICLS. It also classifies activities based on the third-party criterion, making this classification useful for a wide range of uses of time-use data. Table 3.1 shows this classification scheme's most recent update, ICATUS 2016.⁴

Major activity groups and the first level of sub-groups are shown. Each sub-group is further divided into 3-digit categories. Groups 1 and 2 are activities whose value is included in GDP. Group 1 includes market-based activities, and Group 2 consists of non-market activities that involve producing goods that are not sold for money although the value of that production is supposed to be imputed and included in GDP. It is only the production of non-market services that is excluded from GDP. In practice, some countries do a better job than others in imputing the value produced by Group 2 activities. Groups 3–5 are activities that are not included in GDP but would be if they were paid for in the market, and Groups 6–9 represent activities that generally could not be performed by one person and benefit another. For example, you could not pay someone to learn, socialize, consume leisure, or take care of themselves and still get the benefit yourself, so they do not meet the third-party criterion.

Table 3.1
Major and sub-groups in the International Classification of Activities for Time-use Statistics (ICATUS) 2016.

Note: Major groups of productive care activities not in GDP to be included in NTTA are marked with an asterisk ().*

1	Employment and related activities
11	Employment in corporations, government and non-profit institutions
12	Employment in household enterprises to produce goods
13	Employment in households and household enterprises to provide services
14	Ancillary activities and breaks related to employment
15	Training and studies in relation to employment
16	Seeking employment
17	Setting up a business
18	Traveling and commuting for employment
2	Production of goods for own final use
21	Agriculture, forestry, fishing and mining for own final use
22	Making and processing goods for own final use
23	Construction activities for own final use

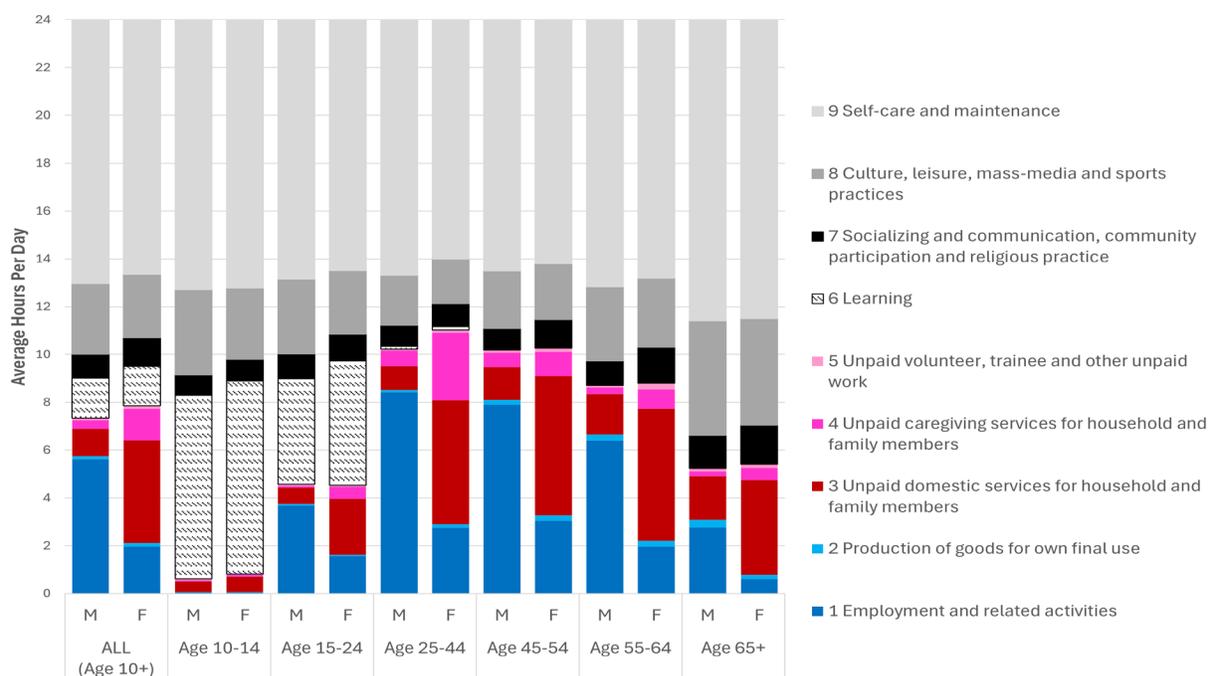
⁴ <https://unstats.un.org/unsd/demographic-social/time-use/icatus-2016/>

- 24 Supplying water and fuel for own household or own final use *[Note: see discussion in section 3.3.1 for details on including this code in NTTA estimates]*
- 25 Traveling, moving, transporting or accompanying goods or persons related to own-use production of goods
- 3 Unpaid domestic services for household and family members ***
 - 31 Food and meals management and preparation
 - 32 Cleaning and maintaining of own dwelling and surroundings
 - 33 Do-it-yourself decoration, maintenance and repair
 - 34 Care and maintenance of textiles and footwear
 - 35 Household management for own final use
 - 36 Pet care
 - 37 Shopping for own household and family members
 - 38 Traveling, moving, transporting or accompanying goods or persons related to unpaid domestic services for household and family members
 - 39 Other unpaid domestic services for household and family members
- 4 Unpaid caregiving services for household and family members ***
 - 41 Childcare and instruction
 - 42 Care for dependent adults
 - 43 Help to non-dependent adult household and family members
 - 44 Traveling and accompanying goods or persons related to unpaid caregiving services for household and family members
 - 49 Other activities related to unpaid caregiving services for household and family members
- 5 Unpaid volunteer, trainee and other unpaid work ***
 - 51 Unpaid direct volunteering for other households
 - 52 Unpaid community- and organization-based volunteering
 - 53 Unpaid trainee work and related activities
 - 54 Traveling time related to unpaid volunteer, trainee and other unpaid work
 - 59 Other unpaid work activities
- 6 Learning**
 - 61 Formal education
 - 62 Homework, being tutored, course review, research and activities related to formal education
 - 63 Additional study, non-formal education and courses
 - 64 Traveling time related to learning
 - 69 Other activities related to learning
- 7 Socializing and communication, community participation and religious practice**
 - 71 Socializing and communication
 - 72 Participating in community cultural/social events
 - 73 Involvement in civic and related responsibilities
 - 74 Religious practices
 - 75 Travelling time related to socialising and communication, community participation and religious practice
 - 79 Other activities related to socialising and communication, community participation and religious practice

- 8 Culture, leisure, mass media and sports practices**
 - 81 Attending/visiting cultural, entertainment and sports events/venues
 - 82 Cultural participation, hobbies, games and other pastime activities
 - 83 Sports participation and exercise and related activities
 - 84 Mass media use
 - 85 Activities associated with reflecting, resting, relaxing
 - 86 Traveling time related to culture, leisure, mass-media and sports practices
 - 89 Other activities related to culture, leisure, mass media and sports practices
- 9 Self-care and maintenance**
 - 91 Sleep and related activities
 - 92 Eating and drinking
 - 93 Personal hygiene and care
 - 94 Receiving personal and health/medical care from others
 - 95 Traveling time related to self-care and maintenance activities
 - 99 Other self-care and maintenance activities

Figure 3.1 shows an example of the distribution of time spent across the nine major activity groups in the Sri Lankan population from the time-use survey conducted in that country in 2017. The first pair of bars shows activity distribution for the entire population aged 10+, and subsequent bars show the same information for particular age groups. Note that total work – combining paid work and work producing goods in shades of blue with unpaid household service work combining housework and care in shades of red – are far more equal across sex than either the blue or red bars in isolation. This highlights the necessity of considering unpaid household service work to assess total population productivity.

Figure 3.1.
Average time spent across the population age 10+, Sri Lanka, 2017, by sex and age



Source: Calculations based on data provided in Sri Lanka Time Use Survey Final Report - 2017 (http://www.statistics.gov.lk/PressReleases/TUS_FinalReport_2017).

Before moving on to different activity classification schemes, note code 24 in Table 3.1: “Supplying water and fuel for own household or own final use.” This code is in major group 2, “Production of goods for own final use,” which is conceptually included in market-based economic accounting because it produces a good instead of a service (recall that traditional economic accounting consists of the production and consumption of goods and services that are traded for money plus those goods, but not the services produced by household members or household-owned assets for household use). For wealthier countries with infrastructure that provides fuel and water to households, these activities will represent a very small allocation of time. For many lower-income countries, however, these activities supply a critical component of household consumption and occupy a great deal of time. Researchers should verify whether national accountants in their countries actually include this source of income in market-based estimates. If not, then they should indeed be included in NTTA estimates. However, there may be particular research questions that could be addressed by including these activities as part of NTTA estimates. One example is accounting for the benefits of potential infrastructure investments. If that accounting only consists of the impacts on commercial farms and businesses but not households, then those benefits will be underestimated. Researchers could use NTTA-style estimates of time spent gathering water and fuel to argue that infrastructure investment would also increase the overall productivity of the time households spend on non-market work. Another reason researchers may want to focus on these activities is if, in their context, these activities are heavily gender segregated. In any case, researchers should document the inclusion of these activities so that it is clear they are being treated as a special case of unpaid work.

If a particular time-use survey does not follow the classification in Table 3.1 but instead uses an older version of the ICATUS, see the UN documentation for more details on that vintage coding scheme to find the relevant activity codes. Correspondence tables between ICATUS and regional classifications have been prepared, such as those applied by the American Time Use Survey (ATUS), the Harmonised European Time Use Survey (HETUS) and the Classification of Time Use Activities for Latin America and the Caribbean (CAUTAL). Many countries have also created their own correspondence tables.

NTTA Activity groups

For comparability in NTTA estimates across countries, the same general list of activities should be included. With varying modes of time-use data collection and varying classification schemes, this is a challenge. However, in our experience, small deviations or coding issues often make little difference to the age profiles as long as the same groups of activities are included. Table 3.2 shows the list of thirteen activities that NTTA estimates should include, data permitting.

The categories in Table 3.2 closely correspond with categories 3–12 of the minimum list of activities (minimum harmonized instrument or MHI) created and endorsed by the UN Statistical Commission to promote international comparability in time-use measurements. Table 3.2 includes three extra categories and splits the two caring categories by whether the beneficiary is living in the respondents’ household or elsewhere. The categories are intended as high-level groupings that most countries are likely to be able to identify in their time-use data. There are exceptions, though, particularly with activity-based surveys. An activity-based survey may ask a general question about time spent on “housework” but not have any further detail in the survey data. Researchers should consult survey documentation to see what instructions are included for respondents as they answer the questions. For example, if a general housework question is asked, it raises the question of whether survey takers should be instructed to describe housework as including specific sub-tasks listed in Table 3.2. Particular attention is due to activities that NTTAs classify as general housework but that might not be included in a more common definition, for example household management tasks such as managing finances or scheduling family activities. Researchers should be very familiar with their time-use survey data and documentation to have insights on such issues.

Table 3.2
Household production activity groups in NTTAs

1.	Cleaning (mainly inside but includes household exteriors, and also includes cleaning up after cooking/eating)
2.	Laundry (includes sewing and clothing repair)
3.	Cooking (food and drink preparation)
4.	Household maintenance and repair
5.	Lawn and garden care (does not include farming for produce to be sold or gardening if the garden produces a significant portion of household food consumption)
6.	Household management (includes finances, scheduling, coordinating and related telephone calls)
7.	Pet care (not veterinary care)
8.	Purchasing goods and services (as long as they are not part of paid employment)
9.	Travel (related to any of the other NTTA activity groups)
10.	Childcare <ul style="list-style-type: none">• Care for household children• Care for non-household children
11.	Care for adults and older persons (if sufficient data are available to allow for the separation of care for adults versus older persons, this is preferred) <ul style="list-style-type: none">• Care for household adults and older persons• Care for non-household adults and older persons
12.	Volunteering or other forms of care for unspecified community members
13.	Fetching wood or carrying water (as discussed above, this category may be unnecessary or already accounted for in a country's national accounts and so may not be strictly understood as NTTA activities but are included for specific research purposes)

Care work for children, adults and older persons (groups 10 and 11 in Table 3.2) can be separated into different accounts, as noted, if the survey data are sufficiently detailed. Some activities, such as pet care, may be hard to measure but are suspected to represent a very small amount of time overall. In this case, if the time-use data for this category is unavailable, researchers can leave it out but be sure to document the absence of the activity group.

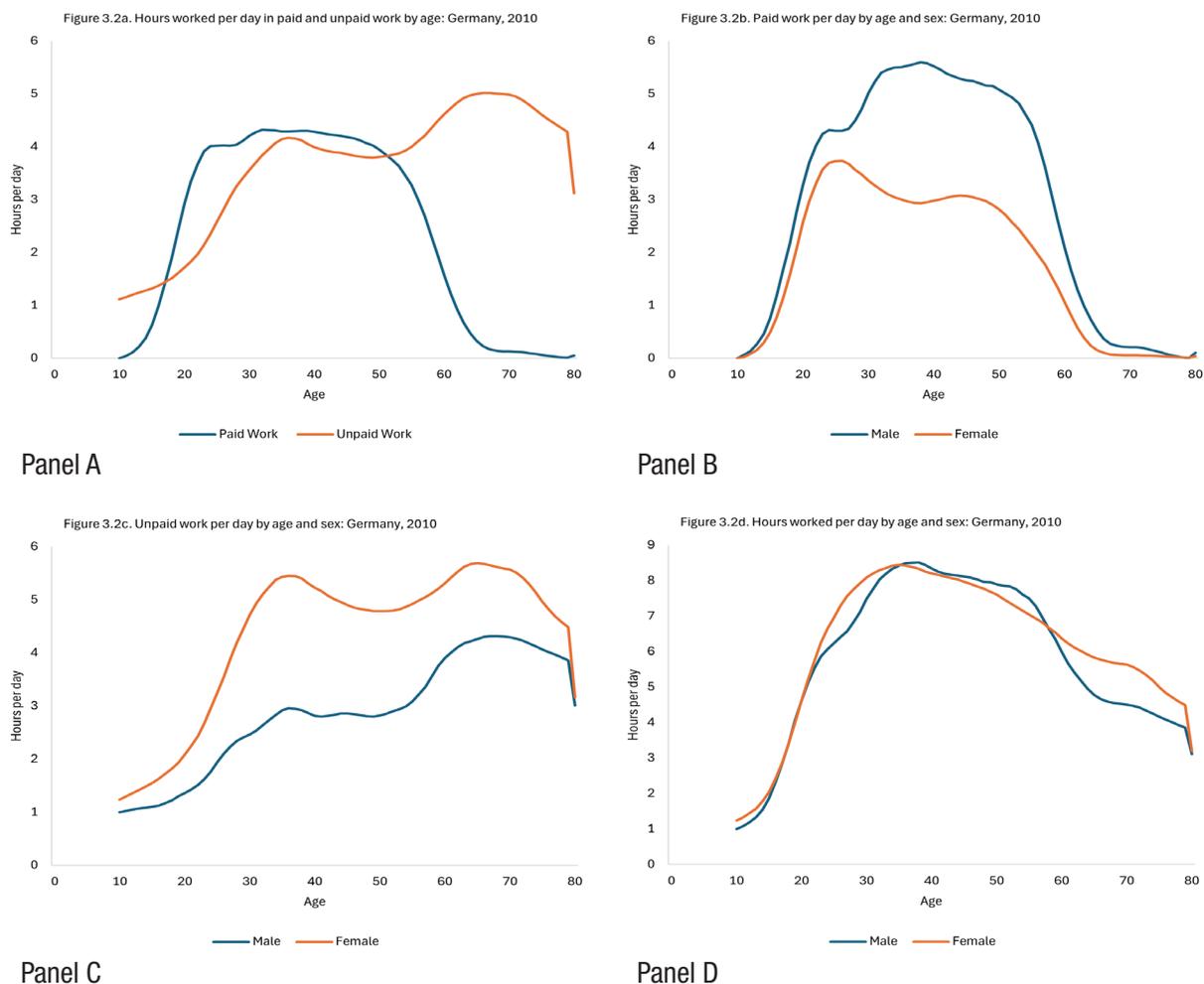
Non-NTTA activities for comparison – market work, education, other

Many activities in Table 3.1 relate to issues relevant to NTTA research questions but are not themselves NTTA activities. Research teams may wish to create age profiles of these activities, and it is beneficial for comparative research if country teams include these.

Creating an age profile of the time spent on paid work is especially important here. Paid work should include actual time at a paid job and work-related activities such as job search time, socializing and commuting. In some contexts, commuting times can be very long and make a significant difference to estimates of time spent in paid work. Researchers should clearly document if their paid work estimates include commuting time and, when possible, report commuting as a distinct age profile so that it can be added or removed from the paid work age profile. Comparing paid work time with NTTAs time across time, geography, gender or other sub-groups touches on many vital issues and also allows for comparisons of total work, as represented by paid work plus unpaid household service work.

As an example, Figure 3.2 shows daily hours of paid and unpaid work in Germany in 2010. Panel A shows that hours of unpaid work are a significant part of working life, especially at older ages. Panel B shows that men spend more time in paid work than women, while Panel C shows that women spend more time in unpaid work. Finally, Panel D shows that women work more than men at most ages in terms of total work (the sum of paid and unpaid work). This is particularly true later in life, when women's withdrawal from work proceeds much more slowly than men's.

Figure 3.2
Hours spent per day in paid and unpaid work, Germany, 2010



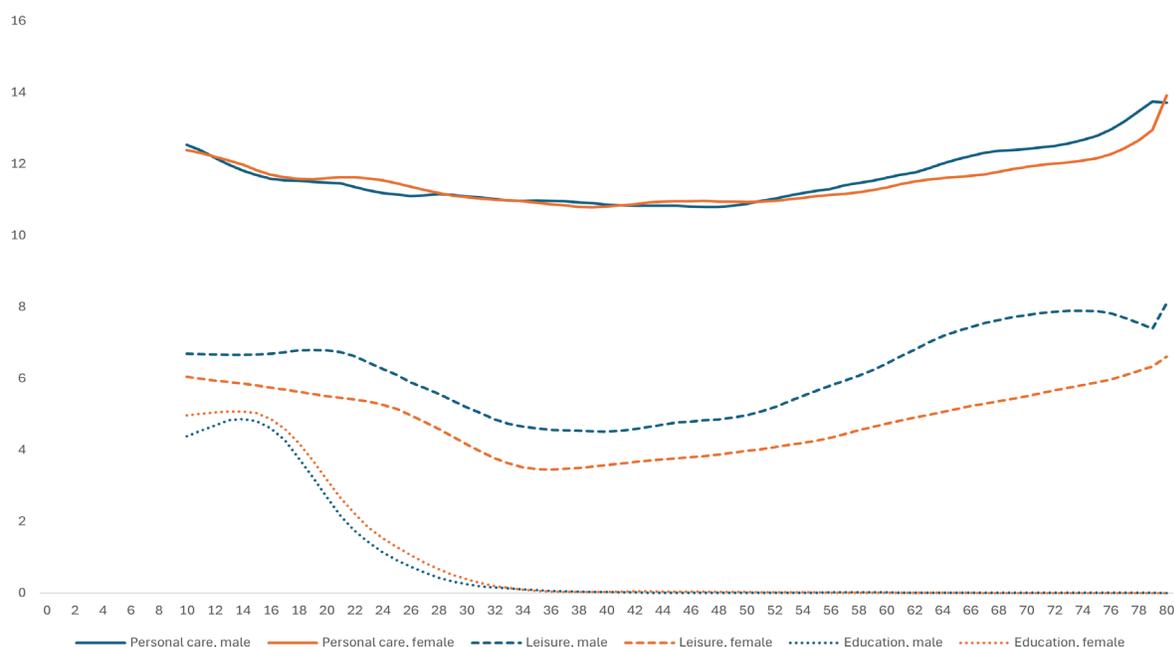
Source: Vargha et al. (2016).

Education is another important use of time that can be included in NTTAs as a distinct age profile. Time spent on education is not work but rather represents human capital investments that people make in themselves, where time is as much an investment as the cost of schooling. Age profiles of time spent in education should include both time occupied in formal schooling and time spent at home for homework or study.

After accounting for unpaid household service work, paid work and paid-work related time (such as commuting) and education, there remains time spent in leisure and self-care. For some research purposes, teams may want to track sub-groups of this remainder category, such as separating leisure from self-care activities or having an age profile for sleep, which is a large category of time use.

Figure 3.3 shows these estimates for Italy in 2010. Personal care (which includes sleep) is the largest of the three activities – declining from a peak of more than 12 hours a day at age 10 before increasing after age 50 to eventually surpass 12 hours for men in their early 70s and women in their late 70s. Leisure follows a similar U-shaped pattern, reaching its lowest point around age 35. Especially noteworthy is the sex difference in leisure. Women have about an hour less leisure per day than men throughout the life course. Time spent in educational activities is concentrated early in life, peaking at around age 18.

Figure 3.3
Personal care, leisure and education per day by age and sex, Italy, 2010



Source: Vargha et al. (2016).

Other issues

Measuring care by and for older persons accurately

For several reasons, one issue that remains a concern for NTA estimates is the accurate measurement of eldercare. First, the difference between caring for an older person versus spending leisure time with an older person may be less evident than the same distinction for children. There is no doubt for young children that even if you were not engaged in social interactions with that child, you would be supervising them and in charge of their welfare. Spending time with an older parent, however, may involve necessary supervision if the parent's health or cognition is severely compromised, but it may simply be socializing if the parent is capable of meeting all of his or her own needs. And time spent socializing with an older relative or friend may also include monitoring activities that seem like care work. Usually, the survey instrument and how the respondent interpreted it, or how the coder decided to code the activity, will make the decision for you. Still, researchers should be aware that eldercare may be underestimated relative to childcare.

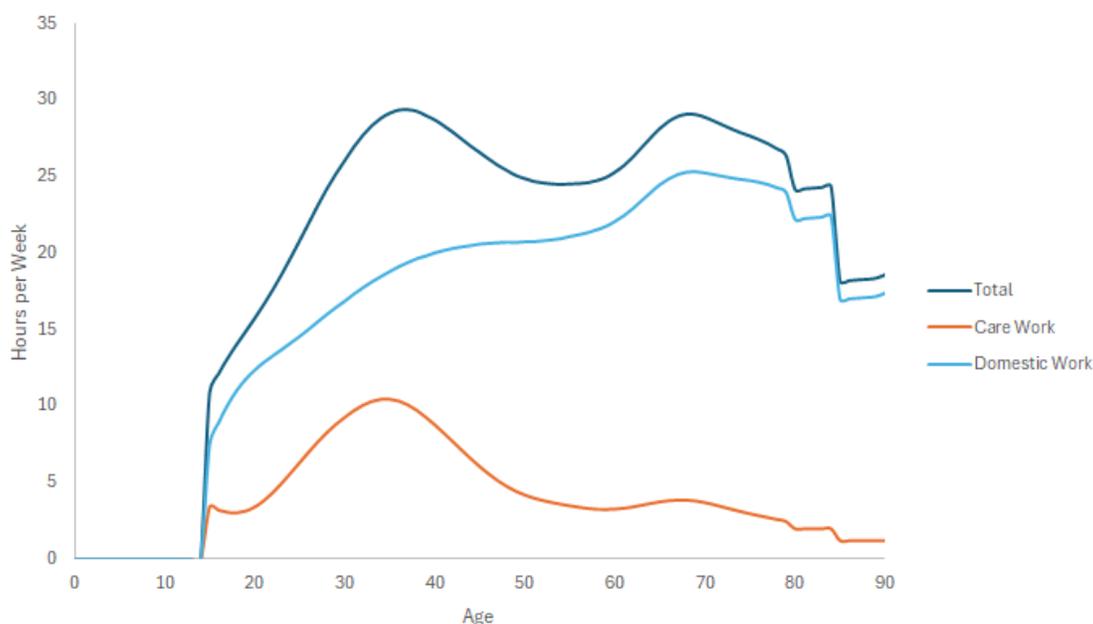
Another reason that eldercare may be underestimated is that some of the most intensive periods of eldercare that adults are called upon to provide will be during health crises – times when care providers are also least likely to participate in any survey. Also, these instances will be intense but relatively rare, meaning that the variability of any time estimate will be higher than that of more frequently performed activities. In this instance, there is not much that can be done other than to be mindful of the problem and take advantage of any data provided in a survey that might

make an alternative care measure possible. For example, some surveys code who was present with the respondent during any activity they record. Researchers can estimate how much time a potential care provider spent with older persons and create an alternative “upper bound” estimate by assuming that any time spent with an older person constitutes care. Some countries will have surveys of older persons that, while not time-use surveys per se, have specially designed questions to get at issues of care needs of older persons. For example, there is the Health and Retirement Survey (HRS) in the US and the Survey of Health, Ageing and Retirement in Europe (SHARE), and many countries now have similar surveys. These surveys can be large and complex, but they are designed to have large sample sizes at older ages, whereas national surveys sometimes have very few observations. These other surveys can allow researchers to create some checks on the data they get from time-use surveys.

Time spent by older persons providing care may also be impacted if that care is not provided daily. The estimates of events which may only happen once a month or once a year will have higher variance than events that happen every day. For example, if grandparents are caring for young grandchildren for two weeks, but only once a year, a survey would be less likely to cover that time than if the grandparents took care of the grandchild for an hour a day, even though the total annual time commitment is similar for the two scenarios. As mentioned, if a survey of older persons is available in a particular country, such as the HRS or an HRS-like survey, researchers can consult those surveys for data on caregiving and care receiving for older persons.

Figure 3.4 shows the average hours of work by age devoted to unpaid household service work in the United States of America in 2009. Domestic work (housework) is the main form of unpaid household service work, much larger than care work. Care work peaks in people’s late 30s, a reflection of the significant investment in childcare during these years, primarily by women. There is a much smaller secondary peak later in life in people’s late 60s, most likely a reflection of increased investment in caring for parents or an older spouse. The overall amount of care given shows two peaks of nearly 58 hours of care per week, the first around age 37 and the second around age 68. Despite some common patterns across countries, the shapes of these types of curves depend on the demographic characteristics of the population and available care systems.

Figure 3.4
Unpaid household service work per week, by age (hours), United States of America, 2009



Source: Counting Women's Work (<https://www.countingwomenswork.org/>).

Multitasking, simultaneous activities and supervisory care

One final issue in defining and measuring NTTA activities is multitasking, closely related to the issue of supervisory care. In some surveys, more than one activity can be reported for a unit of time. For example, in the American Time Use Survey, respondents report a primary activity. Still, they are also asked if any time spent on that activity was concurrent with secondary childcare or with eating and drinking. Other surveys ask respondents what they were doing at a particular time, and then after an initial answer, the respondent is prompted to indicate if they were doing anything else at the same time. With activity-based surveys, there is no control over how much time respondents report, and it is likely that they are making guesses about how much time they spent on a particular activity when they may have been doing that activity but also doing something else as well. Unfortunately, this diversity across survey instruments in how questions about secondary or overlapping activities are framed poses an important problem for cross-country comparison. For this reason, NTTA estimates intended for cross-country comparison use primary activities only and do not include any information on multitasking, overlapping activities or secondary activities.

However, countries with surveys that include this type of data often estimate a separate set of age profiles which include multitasking, as this may suggest the potential downward bias of estimates that exclude it. Where surveys report activities and allow respondents to indicate more than one activity at a time, time units should be divided equally across all indicated activities for a particular period. Once divided up in this way, researchers can identify time spent on NTTA activities in the newly separated time data. This method maintains the time constraint of 24 hours per day and recognizes the body of literature in psychology and productivity that discounts the existence of a “multitasking miracle”. Although it is an oversimplification, this research can be summarized to say that what appears to be simultaneous activities is just rapid switching among them, which comes with cognitive costs. Multitasking people end up doing more poorly on each task than if they had focused on one activity at a time (Madore and Wagner, 2019).

Multitasking is related to the notion of supervisory care in that someone may be responsible for someone else's well-being – for example, supervising a young child, a sick person or a person with disabilities – while also reporting any number of non-care related tasks. Such responsibilities can have legal meaning in some locations where governments have laws regarding how long or in what conditions a child or another vulnerable person can be left alone. In addition, supervisory care also follows third-party criteria, as paid supervision can be purchased from the market. Supervisory responsibility may not be reported in a time-use survey, but does impose costs and restrictions on families. For example, most of us would report sleep as our main activity overnight. However, parents of young children also have supervisory responsibilities that constrain their whereabouts overnight, or require them to arrange for another caregiver if they are away from home. While most time-use surveys do not include enough detail to calculate the exact amount of supervisory time someone is responsible for, researchers have used assumptions to infer that amount of time, such as 24 hours a day for infants or 24 hours less the length of a school day for older children.

Estimates of care time created in this way will find much more care production than what we have discussed as the definition of NTTA care time, and our current estimates do not include supervisory care. However, the research that does include supervisory care finds extensive real-world impacts on caregivers' access to paid employment, time for self-care or leisure, and economic constraints (Suh & Folbre, 2016). For these reasons, research groups may want to include supervisory care estimates in their research plans.

What is missing from NTTAs? NTA age profiles with no NTTA analogue

In market-based national accounting, national income comes from labour income and capital income. In household production satellite accounting, there is also a component from labour income and one from capital income (UNECE, 2017). The labour income portion is what we have so far counted as NTTAs. The asset income portion is the income derived from consumer durables –machines such as dishwashers, ovens, vacuum cleaners and other devices that

make people more productive at UHSW, the portion of income derived from the role of capital in the production process. A small part of asset income is related to public capital, as roads and bridges make households more productive, not just businesses.

We do not include this capital income portion in NTTAs, primarily due to limitations in data to make accurate estimates. Some countries will have data estimated on the flow of services generated by consumer durables, but most will not. In countries with estimates of the flow of services of consumer durables, it will be interesting to compare these amounts to the total labour inputs we estimate and evaluate the shares we find. Without this asset income piece for household production, the NTTA production account will be comparable to NTA labour income, not NTA labour income plus NTA asset income.

NTTAs also do not include saving or dissaving of household production because saving and dissaving allow consumption and production to happen at different times. NTTA methodology assumes that all care is consumed at the time and place of production, so there can be no saving or dissaving. While this simultaneity assumption seems reasonable for most care work that happens face-to-face, it is less likely for some domestic work activities. For example, if someone in a household does the laundry, the clean clothes may not be worn for some time, although this lag would most likely not be very long.

There is also no public sector in NTTAs. There are instances where one could imagine public time-based production – serving on a jury, community service as a penalty for law-breaking or other compelled unpaid service time to the government – but this would be very small compared to private amounts in most contexts, so we do not attempt to include them.

3.3.3 Estimating production age profile in time units

After identifying time spent in NTTA activities and the comparative activities of education, paid work and whichever others the researcher might be interested in, the steps to estimate age profiles are:

- For time spent in each activity group, for both sexes combined and then for each sex separately, calculate means by single year of age and smooth.
- Adjust the male and female smoothed age means so that they are consistent with the single-sex smoothed age profile.
- Sum lower-level activity groups to make any summary age profiles.

Each of these steps is discussed in more detail below. The time can be estimated for any reference period as long as it is clearly documented. For time-based age profiles, weekly or daily averages are often most easily related to lived experience. Comparisons to forty-hour work weeks, or eight hours of sleep per night, are more intuitive than an annual measure of time spent on an activity.

Calculate single-sex and sex-specific age means

Three sets of age means must be calculated: both sexes combined; male; and female. Zeros should be used for the average calculation for people who spent no time on a particular activity group, because if there are missing data codes instead of zeros for people who did not engage in a particular activity, the average will be time spent for those who engaged in the activity rather than the average for the population. Also, survey weights provided should be used to calculate population-representative means.

Most time-use surveys do not interview younger children, and thus there is a minimum age at which UHSW production can be estimated. In the absence of data, children too young to be interviewed are assumed not to engage in productive activities, or, if they do, it is not productive enough to be worth valuing in terms of a wage. These age

groups should have zero values for their age profiles. For the comparative education profile, if accurate estimates for persons too young to be included in time-use data collection are needed, average amount of time spent on education by young age groups can be inferred based on the number of school days per year in the country, an average length of a school day, and enrollment rates at different levels of education.

Smoothing

The age means for each activity group are smoothed using Friedman's SuperSmoother, the "supsmu" function in the R statistical programming language (Friedman, 1984). This is a weighted cross-validation smoother that can take the number of observations at each age group as weights in the smoothing procedure, favouring age group means based on more observations over those based on fewer observations. Age groups valued at zero (because they are too young to provide data or are not surveyed about the activity by the survey instrument) are left out of the smoothing procedure. For example, if time-use data is only recorded for ages 15 and up, only the means for those ages are smoothed, with zeros entered for ages 0–14 after running the smoothing procedure. This avoids over-smoothing in the age groups around the age eligibility transition.

Smoothing should be evaluated by visual inspection of each smoothed profile to check for over- or under-smoothing. Implementing Friedman's SuperSmoother in different statistical packages allows users to adjust the smoothing parameters to get a good fit. Some general issues about smoothing NTA age profiles can be found in the NTA manual (UN, 2013). NTA profiles may need more smoothing than NTA profiles because of the generally smaller sample sizes for time-use surveys compared to the income and expenditure surveys on which NTA estimates are based. Researchers may also need to group ages for NTA age profiles instead of estimating profiles by single years of age to dampen some of the statistical noise caused by smaller sample sizes. A detailed discussion of smoothing appears in Appendix B of the NTA manual (United Nations, 2013).

Adjust sex-specific smoothed age profiles for consistency with single-sex smoothed age profile

Smoothed single-sex age profiles are calculated first because having larger sample sizes for each age group than those for separate-sex profiles means the estimates will be more accurate. In some cases of extreme gender segregation, however, skipping single-sex estimates may lead to more accurate sex-specific age profiles.

The method to adjust the sex-specific smoothed age profiles at each age, so they are consistent with the single-sex smoothed profile, was discussed for the sex-specific NTA estimates in Chapter 2, but is reviewed briefly here. First, the smoothed male and female age profiles are adjusted by the same multiplicative factor at each age so that the average of the sex-specific age profiles at each age is consistent with the smoothed single-sex age profile at each age.

In mathematical notation, let a index age, s index sex, and mal and fem denote the sex groups, $x(a)$ is the smoothed, single-sex age profile for an activity group, $x(a,mal)$ and $x(a,fem)$ are smoothed age profiles for male or female persons for that activity group, and $N(a)$, $N(a,mal)$, and $N(a,fem)$ are population counts at age a for both sexes combined, male or female persons respectively. Then the schedule of adjustment factors at each age is calculated and applied as follows:

$$\theta(a) = \frac{\tilde{x}(a)}{x(a,mal)N(a,mal)/N(a) + x(a,fem)N(a,fem)/N(a)} : \text{ adjustment factor, age } a$$
$$\tilde{x}(a, s) = \theta(a)x(a, s) : \text{ per capita NTA age profile, age } a, \text{ sex } s$$

Adjusting to aggregate controls

In NTAs, age profiles are adjusted so that the aggregate flows are consistent with those measured in national accounts. For some countries, household production satellite accounts exist that can be compared to our estimates. Still, these satellite accounts are monetary-valued, so there is no proper aggregate control on the time-valued age profiles. Also, full household production satellite accounts include an estimate of the value produced by household-owned capital that is part of household production, which is not included in NTTAs. Still, research teams in countries that do have these aggregates should make sure to understand them and compare them with NTTA estimates. This will be discussed further in the sections on monetary-valued estimates.

Recommended sensitivity tests

In producing NTTA age profiles, we want to know how different methodological choices may impact results. Sometimes, a different version of the calculations is desired to provide upper and lower bounds on estimates, to gauge how different those levels might be and to determine their degree of accuracy. The following are additional research questions recommended for teams exploring and documenting results:

- If it is not clear whether some activities should be included in NTTA estimates, how much of a difference does it make to the overall profiles to include or exclude them?
- If extensive data cleaning was needed to correct inconsistencies in respondents' time-use data, or if many observations were dropped because the data was inconsistent or unrealistic, how does varying the criteria for these adjustments impact the final age profiles?
- If the time-use data has information on simultaneous activities, how does including that information impact results? Can alternative estimates, including supervisory care responsibilities, be constructed?
- Are there other data sources that can be compared to NTTA estimates?

3.4 Measuring consumption in units of time

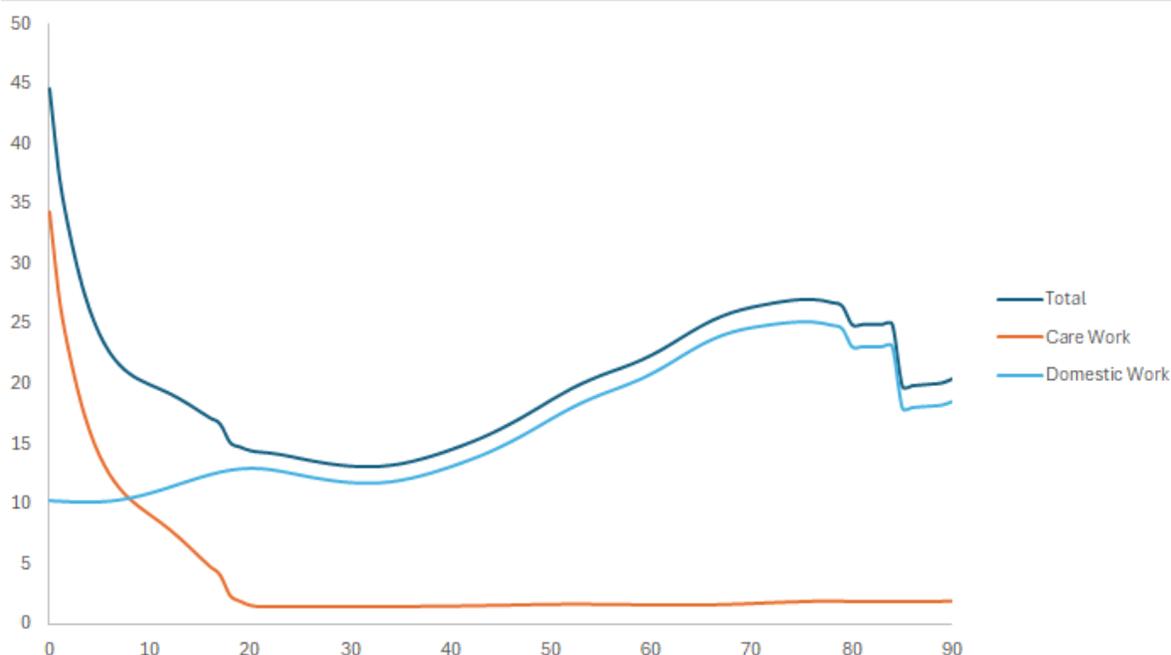
3.4.1 Conceptual basis for imputing NTTA time consumption

The value of time is not directly observed for those who consume it in the NTTA production age profile. Instead, assumptions are used to impute the value of time consumed in each household from the observed value of time produced mostly by persons in the same household. In some cases, consumers of time do not share a household with the time producer, such as care provided for non household members, and different assumptions are used to impute the value of this type of consumption. Once these imputations are made, the calculation of consumption age profiles is similar to the calculation of production age profiles.

Figure 3.5 shows the estimated consumption of hours of UHSW (care work and domestic work) for the United States of America in 2009. These are the recipients of the hours of UHSW produced by caregivers as shown in Figure 3.4. Note that domestic work is sometimes referred to as housework. The largest consumers of the hours invested in unpaid care are infants. On average, they require 45 hours of care – 35 hours in care work and 10 hours in domestic work. Care work is the main form of care received until age 8, after which domestic work dominates. There are two periods of peak receipt of hours of care – infancy, and later in life around age 77.

For the general activities within the household that we refer to as domestic work (cooking, cleaning, maintenance etc., defined as groups 1–9 and group 13 in Table 3.2), the time produced is divided equally among all household members. For example, if time-use data for a household of four persons shows one of the household members produces an hour of cooking in a day, it is assumed that each person consumes 15 minutes of cooking time, including the person who did the cooking.

Figure 3.5
Consumption of unpaid household service work per week by age (hours), United States of America, 2009



Source: Counting Women's Work (<https://www.countingwomenswork.org/>).

This assumes that household members consume equally, which may not be completely accurate, but the data to make finer consumption distinctions is not available. There is also a conceptual question of what it would mean to make a different allocation. For example, certain age groups in the household may make more of a mess, requiring more household cleaning to be done on their behalf. Still, all household members consume the same clean house equally regardless of who made the mess, or if not equally, then the data to make a better assumption – for example, how much time each household member spent in the home – is not available. Food consumption is another example. With ideal data, it would be possible to know how much each person in a household ate and be able to apportion a time producer's time spent cooking as consumption based on the proportions of food consumed by each household member. However, that level of specific data is likely not available in surveys. Instead, it is assumed that consumption is collective and that each household member consumes the same.

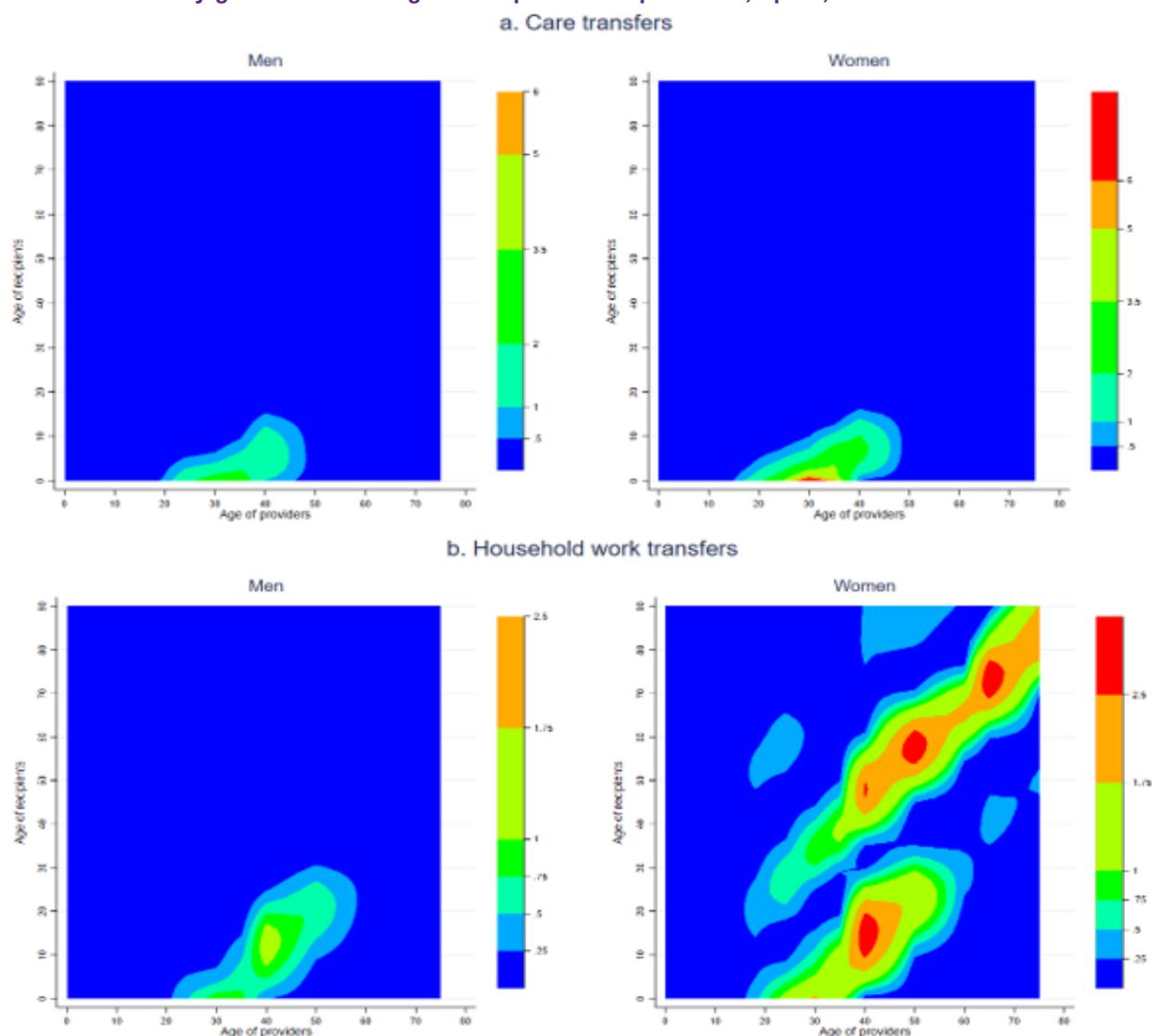
With this assumption, then, consumption estimates for domestic work are straightforward. For any domestic work activity group, the consumption is the total time produced in each household in that activity group, divided by the number of persons in the household.

For age-targeted care work in the household, such as childcare, care of sick persons or persons with disabilities, and eldercare, however, an assumption of equal consumption is inappropriate, and the methods are more complex. Individuals at some ages likely require more care than others, so if they share a household, some age groups are more likely to be consuming the care we see produced than others. A household with an infant is an obvious example. No matter who else lives in that household, the infant is likely the largest consumer of care. At the other end of the age range, we know that the older a person is, the more likely he or she is to have health problems or limitations that require care. So, if two older persons live in a household whose members produce a lot of eldercare, it is likely that the oldest person is the consumer of more of that care than the younger one. Instead of making a single assumption for age-targeted care, we let the data guide our consumption imputations for care work of household members. Details are given in section 3.4.2.

Care work where the care is for non-household members is the final category of care whose consumption needs to be imputed. This includes age-targeted care for non-household members and volunteering, which we assume is not age-targeted but benefits all people equally. Details for this set of imputations are in section 3.4.3.

First, however, it is interesting to look at the age of providers and recipients combined in one chart, knowing which age group gives to which age group. Figure 3.6 shows the result of this exercise for transfers of care and household work in Spain (the chart published by Rentería et al., 2016, used monetary values; here, the transfers are expressed in time). In the case of care, we observe mainly care given to children by their parents, as there are difficulties in identifying inter-household transfers of care given by relatives residing in other households (mainly grandparents) in the Spanish Time Use survey. There are sizable differences among genders in the intensity of care. In the case of transfers of household work, differences are observed all through the age profile. Women become net providers once they grow up and remain so through the rest of their lives, first providing care to children and parents and later to their spouses. Men, in contrast, only transfer time to other members while they are parents of small children.

Figure 3.6
Time transfers by gender and the age of recipients and providers, Spain, 2009



Source: Rentería et al. (2016).

Note: The original chart used monetary values; here, the transfers are expressed in time.

3.4.2. Imputing consumption of care work to household members

Analogy to NTA consumption imputation for private health and education consumption

To impute consumption of age-targeted care work intended for household members, we use a similar regression approach to that used in NTAs to apportion household-level consumption of private health and education to the individuals in that household.

To review the NTA method for private education, we perform a household-level regression where the total amount of money consumed by the household for private education is the dependent variable, and household structure (number of persons by age group or by age and sex group) and a utilisation indicator for private education (enrollment in a private educational institution) are combined as independent variables. The regression generates coefficients on the age and sex group indicators which can be used as weights to apportion the total amount of private education spending in each household to the individuals in that household. For the private health imputation, the total out-of-pocket expenditure on a particular type of healthcare, such as hospital stays, is regressed on the age group indicators and utilisation indicator. For the hospital stays example, a utilisation indicator would be any survey information on whether a household member had been admitted to a hospital in some reference period.

The utilisation indicator for care work of household members is membership in the target age group. This is why the full household roster must be filled with information on the age and sex of each household member, whether they are a time-use respondent or not. See Appendix C of the NTA manual (United Nations, 2013) for how to proceed if a household survey does not have a full, individual-level household roster. The target age group will be determined by how the survey was conducted. If the survey defines “childcare” as care for those aged 0–18, for example, then the regression equation will include membership in age groups for ages 0–18 as independent variables. Alternatively, if the definition of a child is only ages 0–16, then only those ages are included. Sex is also included as part of the household structure indicators. The total amount of care produced for that age group in the household is the dependent variable. Note that this is for care intended for household members, and care intended for non-household members will be discussed in a subsequent section.

Excluding care producers from regression

Care producers are excluded from the household structure indicators in the regression estimation because they cannot be consumers of this type of care. This will usually not be important for care produced by a parent and consumed by a child because the parental care producer is out of the age range of the potential care targets. In other words, the utilisation indicator would zero them out of the regression. It could, however, be an issue for care that is transferred between people of similar ages, such as adult to adult or older person to older person. If the time-use survey only collected time-use data from one person in the household, there is only one care producer per household, and that person cannot just be counted in the household structure indicators by age and sex. If there are multiple potential care producers in a household, the regression will need to be altered so that it is not a household-level regression but rather a care-producer level regression where the dependent variable is the care produced by each individual who gives time-use data and the independent variables are the household structure indicators for the ages that can receive that type of care, excluding the individual providing the time-use data.

Running the regression and using coefficients to impute consumption

If the time-use survey has sufficient observations, each single year of age can be accounted for separately in the household structure indicators in the regression. More commonly, though, single-year age groups will yield coefficients with too much variation. In this case, ages can be grouped into two- or three-year groups, increasing the group size until the resulting coefficients are somewhat smooth by age. The final set of age- and sex-specific coefficients are used as weights in allocating the household amount to individuals.

Some coefficients may be negative if the average care consumption for a particular group by age and sex is close to zero. Negative coefficients should be replaced by a positive number close to zero but not zero, and lower than the lowest positive coefficient. Negative coefficients should not be zeroed out because there may be some households with care production intended only for a person in the zeroed-out group whose care production will not be assigned to anyone. In that case, the balance of care production and consumption would not be maintained in the household, causing an error.

Limitations of the regression method and alternatives

The regression approach cannot capture all potential differences in care consumption by age and sex, as it only works by detecting the variability between households of different age and sex composition, not actual differences within households of similar age and sex composition. While limited, it is at least no worse than the equal allocation assumption. Our testing of the methodology gave similar results in countries where fertility is low and there is little intergenerational co-residence because there is less potential variability across households that can be missed. Note that some surveys indicate exactly which household members were being cared for during any activity. These can be used to directly allocate the time produced to the consumer of that time. If such data is available, it would be very instructive to estimate both a regression method allocation and a directly observed allocation to compare the two.

One alternative method to assign care work consumption that makes sense in some contexts is to use age-targeted care produced in households with only one person in the target age group to provide weights to distribute care. For example, if there is a care variable that gives the time spent on childcare for persons aged 0–18, take a subset of households with only one person aged 0–18 in each household, calculate the average time spent on childcare in those households by the age of the child in the household, and then use this average schedule as weights to impute the consumption of all the childcare produced in households with more than one child. Similarly, if a time-use dataset has a variable for eldercare, use the age schedule of care consumed in households with only one potential eldercare consumer to provide weights to apportion care in households with more than one older person. This method will work well in contexts with relatively low fertility and small household size. In countries with very high fertility or complex household structures, however, a sample of very small households with only one child or older person in them may give allocation rules that are not generalisable to the rest of the households in the population. Research teams are encouraged to experiment with different possibilities as data allows and share their experience with others in the NTA research network.

3.4.3 Imputing consumption of care to non-household persons

For time spent producing age-targeted care for persons outside of the household, the age and sex of the person targeted to receive that care are not generally known. However, depending on how detailed the survey data is, the broad age group that is the target of that care may be known. For example, “care for non-household children” will be targeted at whatever age group is defined as “child” for that survey. The same will be true for “care for non-household adults”, or “non-household older persons” or whatever terminology is used. If these items are available, they will generally mirror the age groups asked about care items for household members.

In these cases of age-targeted care work for non-household members, the exact ages or sex for targeting care are not known. Still, sex-specific age profiles for care of household members provide an excellent way to guess the overall age and sex distribution of age-targeted care. To make this guess, calculate the aggregate amount of this type of care provided by all care providers in the population and distribute it as consumption across the age-target population so that it has the same relative pattern by age and sex as the type of care for household persons, but the correct aggregate amount to match the aggregate non-household targeted production.

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For example, if the total population aggregate production of care work for household children is 2 million hours, and for non-household children is 0.01 million hours, the age- and sex-specific profiles for care work of non-household children are just the age- and sex-specific profiles for care work of household children multiplied by $0.01/2 = 0.005$.

If nothing is known about the care targets, as for general community care provided through volunteering, the care should be divided equally across the total population. In other words, the population-level aggregate amount of volunteering produced is divided by the total population, and everyone is assigned this same level as their consumption of volunteering.

Because the completed age profiles for consumption of care provided to household members are needed to make the allocations of age-targeted care for non-household members, these profiles should be the last step in creating consumption age profiles. Thus, researchers should follow the steps in section 3.4.4. for all consumption profiles for household member care exchange first, i.e., within-household care exchanges, and then go back and make the out-of-household care consumption profiles, i.e., care exchanges between people who do not live in the same household.

3.4.4 Estimating consumption age profiles in time units

Once all of the production of care provided to household members is allocated as consumption (this includes all domestic work plus care work for household members), then producing the age- and sex-specific profiles is very similar to the procedure for production after the productive activities were identified. The sections below will repeat procedures from the sections starting from 3.3.3, “Estimating production age profiles in time units” because the same steps apply.

Calculate single-sex and sex-specific age means

As with production, results for domestic work and within-household care work are collapsed to means by age, and by age and sex, making sure to include zeros in the average for people who had no consumption of this activity group, and to use survey weights if provided.

For production profiles, younger persons without data in the time-use survey were assigned zeros for those age groups in the age means. This is not the case for consumption profiles. The only groups assigned zeros for consumption profiles are for those types of care with age ranges. For example, the age profiles for the consumption of childcare will have zeros for ages older than the child definition given by the survey. Similarly, consumption of adult or eldercare will have zero values outside of the defined age ranges for that type of care.

For the comparative age profiles (education and paid work and any others that the research team is interested in exploring), there is no procedure for consumption, so there is no additional work to do for those non-NTTA age profiles. However, future work could explore turning NTA monetary-valued consumption profiles into time-valued consumption profiles, indicating how much labour-force time is required for each age group’s consumption.

Smoothing

The smoothing procedure is the same as that described for production. The same caveats apply about not including age ranges which are zero by definition in the smoothing procedure and using visual inspection to verify that the smoother is doing its job. For each activity group, smooth the single-sex age profile and the sex-specific age profiles. Details on smoothing are in Appendix B of the NTA manual (United Nations, 2013).

Adjust sex-specific smoothed age profiles for consistency with single-sex smoothed age profile

The procedure here is the same as in section 3.3.3 to calculate age-specific adjustment factors and apply to male and female age profiles.

Adjusting to aggregate controls

As was the case for the production estimates, there is no proper external control on the consumption estimates. However, in the monetary-valued sections (section 3.6), we will discuss comparing to household production satellite accounts if these exist for the country.

Aggregate consumption must equal aggregate production for each type of care work. Therefore, if the methodology is followed correctly, that result must be obtained for the case of the unsmoothed profiles weighted to the aggregate population, which is an important check that should be included in calculations. For domestic work and care work for household members, this balance will also exist within each household before collapsing to means because imputing these types of consumption is just assigning production to each individual.

The exact balance can be altered, however, if sampling weights are different within households and will also be changed by smoothing the profiles. To correct this, a single adjustment factor should be applied to both sexes. Because the time-use surveys are designed to produce accurate estimates for time production, we treat production as the correct aggregate amount and adjust consumption to match the production. Mathematically, if P_{agg} is aggregate UHSW produced for a particular activity (i.e., the sum of population-weighted production for all ages) and C_{agg} is the aggregate consumption (again, sum of population-weighted consumption across all ages), the multiplicative adjustment factor on consumption, $\theta = P_{agg} / C_{agg}$.

The adjustment factors should be small (less than 5 per cent) because they mainly adjust for differences that arise through smoothing. This slight difference will also not impact the consistency of the male and female profiles with the single-sex profiles. If the adjustment factors are too large, though, something may be wrong with the smoothing procedure or the calculation of the unsmoothed profiles.

Recommended checks and sensitivity tests

As mentioned earlier, checking the balance of consumption and production at the aggregate level and within households (excluding care work for non-household members, which is not within the household) is an important way to verify that the imputation procedures have worked as expected. Some other questions to examine to ensure the robustness of results to methodological choices include:

- If you grouped ages were used in the regressions, are results sensitive to the age groupings?
- Are consumption age profiles very different if the one-child or one-older-person method is used to impute consumption of care work within households?

3.5 Measuring transfers in units of time

For some research questions, we want to know not just production and consumption age profiles but also the transfers. Because there is no way to store unpaid household service work in an asset or transfer it over time, net transfers must equal consumption minus production. In reality, there may be a small portion of net time production that goes over a national border, which would mean that in-country aggregate consumption would not equal in-country aggregate production, and there would be some net transfer to the rest of the world (a net inflow or outflow). Examples could be volunteering for the benefit of persons in other countries or care for non-household persons who live in another country. Still, these are likely so small in the context of the entire UHSW economy that they can be assumed to be zero. If there is a specific reason to believe that a net rest-of-world care transfer is high, such as a refugee crisis or a very small country with many cross-border families, then special measures would need to be taken to estimate net transfers accurately because assuming they were simply equal to consumption minus production would not be reasonable.

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If the assumption of no significant cross-border transfers can be relied upon, net transfers are a simple calculation, and if all that researchers require are net transfers, then the transfer calculation is finished. However, if transfer inflows and outflows need to be examined, there are more issues to consider.

All care work production and consumption can be seen as transfer outflow and transfer inflow, respectively, so no additional calculations are needed. The reason is that the producer cannot consume care work, so it is all transferred to others. Any care provided to oneself is self-care, not UHSW.

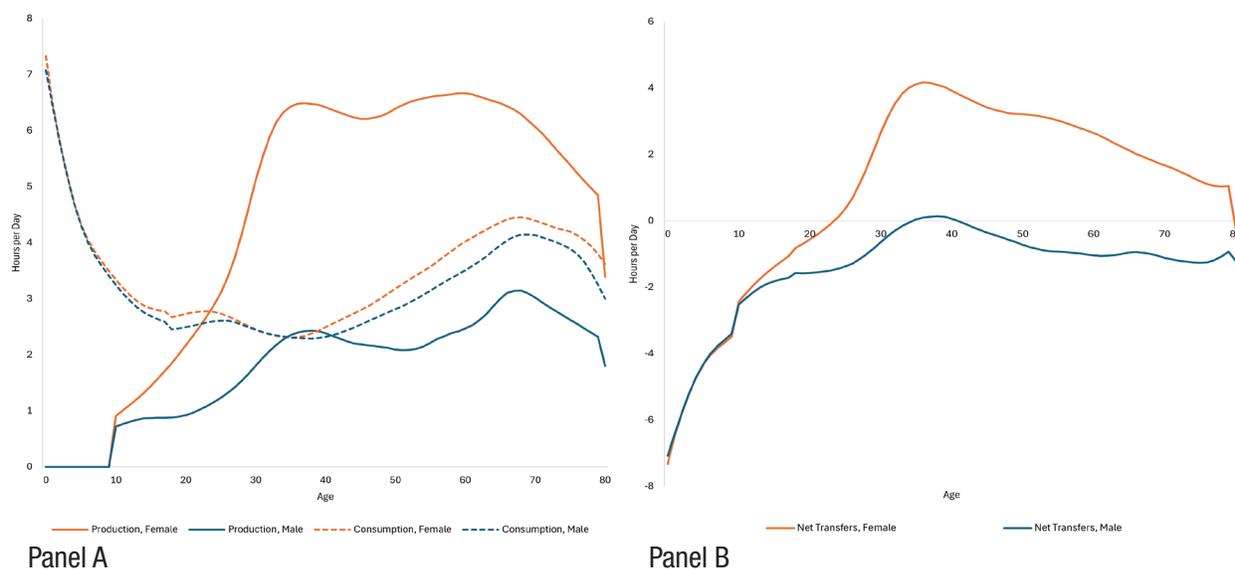
Domestic work is a different case. Recall the example of the household of four with one person producing an hour of cooking time, and each family member consuming 15 minutes of that time. The cook only transfers 45 minutes of that hour because 15 of the minutes were for their own consumption, which does not involve a transfer. So, the portion of domestic work production that is a transfer outflow is domestic work production, excluding that portion of the production the producer consumes themselves. Similarly, the share of domestic work consumption that is a transfer inflow is domestic work consumption, excluding that portion of the consumption that the consumer produced themselves.

In practice, NTA transfer inflows and outflows are usually not the focus of much attention because the overall net transfer is easily accessible by taking the difference between the production and consumption profiles.

Figure 3.7 illustrates the nature of these flows of care (measured in hours) between individuals in the care economy. Panel A shows the production and consumption of UHSW by age and sex. The difference between production and consumption at each age measures the net transfer of unpaid care. This is shown in Panel B by age and sex. Men are net recipients of care for most of their lives, save for a few years in their late 30s. Women become net providers of care as young adults around age 24 and continue to be net providers of care until very late in life, after age 80.

Figure 3.7

Production, consumption, and net transfers of unpaid care (hours per day), Spain, 2003



Source: Vargha et al. (2016).

3.6 Measuring age profiles in monetary units by using imputed wages

3.6.1 Overview

Before moving on to monetary-valued estimates, a short discussion of the value of time-valued estimates is warranted. After identifying and creating the time-valued age profiles, researchers should explore the time-use data by age and sex before moving on to imputing a wage. Age profiles of productive time use alone are worth exploring and can tell us many things. They indicate the degree of specialization by gender in an economy. Results in terms of time will relate to the lived experience of work as much as results valued in monetary terms. Time-valued estimates also have some advantages conceptually over monetary-valued ones, such as the fact that everyone has 24 hours of time per day while the amount of money people have varies widely. It is also essential to examine the time-valued accounts to understand the challenges faced in valuing that time by a wage. The greater the specialization in time use by gender, the harder it will be to impute a proper wage because there will be greater differences between the economy represented in national accounts and that within the household. This should be part of any discussion of NTTA results.

Monetary-valued estimates of household production, however, are also very important and are often the focal point of research. Household production satellite accounts are valued in money, not hours. Much of the advocacy around understanding UHSW gains its power from comparisons to other monetary-valued estimates such as GDP, demonstrating how large the unpaid household service work economy is compared to the market economy. Also, interest in understanding efficiency and productivity in the UHSW economy requires monetary valuations. The following sections explore how to estimate the monetary value of time devoted to UHSW.

3.6.2 Valuing inputs versus outputs

To compare NTTAs with NTAs, we want to understand how much NTTA activities would be worth if included in national income. If everyone decided to purchase all household services instead of doing these activities themselves as UHSW, how much would the market economy grow? The particular valuation method chosen greatly impacts the final NTTA accounts.

National income includes the total value of production, which is determined in the market when someone purchases a produced good at a particular price. The inputs to production are labour and capital. Wages indicate the value of the labour inputs, and the value of the capital services is left over from selling goods after the labour has been paid. To make NTTAs comparable to NTAs based on national income, we would ideally want to value what is produced in the time spent (Abraham and Mackie, 2005) and determine what the price of each service would be. For NTTAs, the data on the market price of each service is more difficult to find compared to the usually more-available wages by occupation. To value outputs of time, we would need additional data sources on the price and quality of each output activity.

For example, an hour of childcare would be valued by what the parents paid, not by what the childcare worker received. The childcare worker's wage would be included, of course, but it would also include the costs of maintaining the childcare centre, profits for the owners of the business, and some income from the assets owned by the childcare centre that provided value to the product of an hour of childcare. This means that only the childcare worker's wage is something NTTAs can hope to find in a roughly similar fashion across the many countries in which we are attempting to measure UHSW.

For this reason, we estimate the value of the labour inputs only in NTTAs and value the time spent by the wage that would be earned by someone doing the activity instead of the price that someone would pay to have that activity

performed. This decreases the data burden and removes many other methodological problems, such as how to avoid double counting production that involves purchased and un-purchased inputs. An example of this would be valuing a home-cooked meal, where national accounts already include the value of the raw food inputs, so the question arises of how to identify a comparable price in the market for just the cooking inputs. Thus, NTTA time inputs will be valued by their wage value, not their production value.

This may mean that NTTA estimates are biased downwards, but at least they provide a way to produce a downward-biased estimate that is roughly comparable across countries.

3.6.3 Valuing time inputs in NTTA: the specialist replacement method

Following NTAs' focus on measurement, the "specialist replacement" method is used to value time inputs, meaning determining how much it would cost if the person had to pay someone else to perform each task. An appropriate wage for persons in the market performing each activity is found in Table 3.2, with a different wage for cleaning, cooking, childcare etc. A study or survey on labour and earnings for the period in question will be able to give average hourly wages relevant to each activity in Table 3.2, either by estimating it from the microdata or accessing a table of wages by occupation produced from the survey.

An average of babysitter, childcare worker and early education teacher wages would apply to time spent doing childcare; a maid or janitorial service wage would apply to time spent cleaning; and a food service wage would apply to time spent preparing food, serving it and cleaning up after. Researchers should choose wages for jobs which an average person could do. For example, time spent fixing the house should be valued at a handyman's wage instead of a skilled carpenter's or an electrician's or a plumber's, depending on the job. Certainly, some persons fixing their own houses may have the skills of a trained carpenter, electrician or plumber, but most will not. Of course, broad classifications of activities will involve broad levels of skill. For example, some home cooks will approximate the production of an executive chef, and some a short-order cook. Where possible, using population-weighted average wages across various levels of occupations will address this issue. Taking the average wage across all food service occupations will include the wages of a few executive chefs but many more short-order cooks and even more dishwashers. Weighting the average by the number of people employed in each occupation level gives some measure of likely distribution by which skill levels and particular types of activities are also distributed across households.

Researchers should use their country-specific knowledge to imagine what kind of worker a householder would hire to replace their own time inputs. For example, in some countries it is common for middle-class persons to hire one domestic worker to do all domestic work tasks and some care activities. In that context, one wage for domestic help would apply to multiple activity groups. In other contexts, however, only the wealthiest households hire domestic help. In this case, a housekeeper's wage would likely overestimate the cost of these services in the market to a middle-class household. Research teams will be best able to understand their country contexts and which wage would represent an average household's access to care work and domestic work in the market.

Note that the same imputed wage is used regardless of the gender of the person doing the same task. While we cannot eliminate gender bias in wages because it is a legacy of sex-segregated occupational segregation, we can at least not replicate it within each activity group.

Before moving on to more specifics, a final note about selection bias is warranted. Any imputation of wages for unpaid work based on data from paid work is bound to have selection bias, in that a sample of experience in the market is bound to be different from the conditions outside the market. There may be systematic differences in productivity, use of capital and investment between the paid workplace and the household. Different people with different skills and abilities may specialize in home production versus market production. This is often discussed regarding market-based service providers being much more productive than unpaid providers of the same service,

but this is debatable. While market-based providers may possess specialized physical and human capital relative to a particular task like laundry, they will not have all of the information about laundry that a household-based provider of this service does. Knowing which clothes need to be cleaned when, which type of clothing belongs to which person in the household and the proximity of the clothing in question to in-home capital like a washing machine would enhance the productivity of an in-home provider of this service, compared to a market-based provider. There are thus no grounds to make an a priori assumption that market-based providers are more productive than unpaid care providers. The situation is even more prominent regarding the in-home care providers favour for many care work interactions where knowing the care recipient intimately enhances the quality of the care a great deal.

3.6.4. Taxes and other adjustments for total labour costs

An issue in valuing time is whether the valuation should be on a pre-tax or post-tax basis. As a default, NTTA accounts will be based on pre-tax imputed wages. Therefore, pre-tax values are relevant to questions involving the total cost of care.

In addition to taxes paid by the person performing the service, there are other payments which may make the market wage different from the value of the time spent in the market. If employers must pay payroll taxes for each employee, or if fringe benefits are an important part of total compensation, then the employee's wage is smaller than the actual amount earned. If an employer paid an additional amount to the government for each employee for social protection insurance or fringe benefits, that would be considered part of the value of the employee's time input, even if the employee does not see that cost on their paycheck as part of their wage. For example, in the United States of America, employers match employees' contributions to Social Security and Medicare programmes. However, this is not part of the wages employees see on their paychecks. In addition, the employer often pays healthcare insurance premiums, at least in part. In NTTAs, we want to make sure imputed wages valuing household production are increased to reflect that if this activity were done in the market, the value of the labour input would be higher than just the average wage as observed in a labour force survey. A similar correction should be implemented if large fringe benefits are accruing to market wage-earners that would not be observed in a paycheck. If, however, such fringe benefits are usually only paid to workers in other sectors of the economy than household services, adjustments for fringe benefits should not be made.

Finally, there is an issue of whether to adjust wages for potential differences in productivity either by sector or by the age of the person performing the UHSW. NTTAs do not adjust estimates for differences in quality or efficiency in home production versus market production or for potential differences in efficiency by age. Although there are compelling arguments for these adjustments, there is no feasible empirical method for determining their magnitude that can be applied cross-nationally.

3.6.5. Comparing to opportunity cost method

As for sex-specific NTA accounts, the results for NTTA accounts may be very sensitive to the choice of methods and the specific implementation of a method in a particular context with a particular data source. The wage imputation method is particularly powerful in determining the overall level of monetary-valued NTTA estimates. Researchers may want to implement alternative estimates using opportunity cost wage imputation rather than specialist replacement, because this will likely produce the largest difference in results and give a range of values.

An hour of time can be valued by the person's opportunity cost by using hourly market wages if the person also has a paid job or by imputing an hourly wage based on their characteristics if not. The imputation takes place in two steps. First, a regression is estimated using the wages and characteristics of those who receive wages:

$$\log(W_i) = \beta_0 + \beta_1(\text{age}_i^2) + \beta_2(\text{educ}_i) + \beta_3(\text{age}_i \times \text{educ}_i) + \varepsilon_i$$

where W_i is wage rate of person i , and age_i and $educ_i$ are age and education. Second, the estimated model is used to predict the wage rate of persons not receiving wages based on age and education.

While it may seem like sex should also be included in this equation, that would introduce the same gender bias found in the paid work world into the unpaid work world. It could be just this gender bias that explains some of the gender-based specializations in paid or unpaid work. Of course, some gender differences in paid work may be ascribed not to discrimination but to observed patterns in attachment to the paid labour force. For example, in a study of professionals in the United States of America, similar women earned less than men because they worked fewer hours and had periods of withdrawal from the labour force due to childbearing and raising young children (Bertrand et al., 2010). It is unclear how this result from the market work world should be reflected in imputing wages to work done in the household.

3.7 Documenting and archiving estimates

In practice, all underlying detail in the NTA profiles should be preserved, even if only aggregated profiles are reported for comparison and analysis. Keeping the lower-level profiles helps in the case of a revision in the methodology for a lower-level profile, as the researcher can fix that profile and not have to reestimate all of the other ones. The lower-level details may also be of substantive interest for particular research questions, such as attributing higher-level differences. Higher-level profiles should always be made by summing lower-level smoothed profiles, not by summing unsmoothed lower-level profiles and then smoothing.

Glossary

Activity coding scheme: An exhaustive list of activities used to classify different tasks for the collection of time use data.

Age dependency ratio: A measure that compares the number of dependents (youth and elderly) to the working-age population, indicating the level of burden on a country's labor force.

Age pattern: An age schedule showing how relative levels of an economic flow vary by age, either market-based or non-market.

Age profile: In NTA, an economic flow by age in a particular year for a country which is consistent at the national level with the value of that flow as measured in that country's national accounts. Expressed in per capita or aggregate terms.

Age reallocations: Economic flows that shift resources from one age to another. In NTA, age reallocations include transfers and asset-based reallocations. NTTA includes only transfers because time cannot be borrowed or saved in the form of an asset.

Aggregate control: See macro control.

Asset income: The return to assets, including the operating surplus of corporations, estimates of the return to capital from unincorporated firms, the value of in-kind services flowing from owner-occupied housing and net property income. Part of NTA, not NTTA.

Capital Income: Returns to capital held by corporations and households.

Care economy: A sector of the economy that includes paid and unpaid household service and care work related to the care of children, older persons, the sick and disabled, and maintenance and management of households. Often invisible in traditional economic measures but critical to societal well-being.

Cohort: All members of a population born in the same year (birth cohort); those experiencing some other designated event, such as marriage or immigration, in the same year.

Consumption: In NTA, goods and services that satisfy the needs and wants of residents. In NTTA, the share of unpaid household service work one is assumed to receive plus all unpaid care services transferred to one by other household or community members.

Control total: See macro control.

Counting Women's Work (CWW): A project within the NTA framework aimed at measuring the full economic contribution of women, men, girls, and boys, including both market labor and unpaid household service work.

Deficit: The amount of one's own consumption above production. Can exist in the market economy in terms of consumption less labor income, or in the non-market economy in terms of time received in unpaid household service and care work produced above that produced.

Economic demography: A field within economics that studies how population structures, particularly age and sex, influence economic outcomes such as economic growth, labour markets, consumption patterns, and resource transfers.

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Economic lifecycle: The pattern of production and consumption throughout an individual's life, typically showing higher consumption and lower production in youth and old age, and higher production in middle age, although in the non-market economy production levels can stay high even in very old ages. In principle the concept is longitudinal, but is sometimes used to refer to a cross-sectional age pattern.

Generalist replacement wage: See replacement method.

Gendered economy: How one's interaction with an economy is shaped by gender, affecting participation in unpaid household service work and market work, and the institutions that sustain this division of labor, or other economic flows based on gender.

Generational economy: (1) The social institutions and economic mechanisms used by each generation or age group to produce, consume, share and save resources; (2) the economic flows across generations or age groups that characterize the generational economy; (3) explicit and implicit contracts that govern intergenerational flows; and (4) the intergenerational distribution of income or consumption that results from these flows.

Household: A unit of economic organization within which time and resources such as a shared dwelling and the income of household members are shared. Often a household will be occupied by one family group, but there can be non-family members included or a household may be made up of all non-relatives.

Household production satellite accounts: A set of accounts that extend national accounts by including the value of household production, especially unpaid domestic and care work, which is typically excluded from standard measures like GDP.

Imputed consumption: The estimated value of goods or services consumed by individuals that are not directly measured, but estimated based on assumptions or models.

Intergenerational transfers: Transfers between different age groups.

Inter-household transfers: The flow of resources between members of different households, including both market-based and non-market unpaid household service and care work.

Intra-household transfers: The flow of resources between members of the same household, including both market-based and non-market unpaid household service and care work.

Labour income: The value of the work effort of employees, the self-employed and unpaid family workers. Labour income is measured by earnings, the value of employer-provided benefits and an estimate of labour's share of income from unincorporated business. It also includes a portion of indirect taxes less subsidies, and so reflects basic prices instead of market prices.

Macro control: In NTA, a value from national accounts indicating the annual national total for a particular type of economic flow, used to adjust estimated age patterns so that NTA age profiles are consistent in the aggregate with national accounts. For NNTA, aggregate amount of unpaid household service and care work time produced that can be used to adjust time consumed so that they are consistent in the aggregate.

Market economy: The economy measured in traditional national accounting measures such as Gross Domestic Product. Includes goods and services traded for money and goods produced by households for their own use that are not traded, such as food grown for own consumption or the consumption of housing services produced by an owned house.

Monetary based age-profiles: In NTTA, the conversion of time-use profiles into monetary values using imputed wages, providing a way to compare unpaid labor to market-based economic activity.

National accounts: Accounting techniques for measuring the total amount of various types of economic activity at the national level.

National Time Transfer Accounts (NTTAs): An extension of NTAs that measures the production, consumption, and transfer of unpaid household service work, offering a comprehensive view of the “gendered economy” and contributions outside the formal market.

National Transfer Accounts (NTA): A system of macroeconomic accounts that measures current economic flows by age in a manner consistent with the United Nations System of National Accounts. NTA measures age-specific labour income, asset income, consumption, transfers and saving, accounting for flows within households, between households, through the public sector and with the rest of the world.

National Transfer Accounts Project: A network of research teams working in universities, international organizations and private and government research institutes in more than 40 countries. The Center for the Economics and Demography of Aging at the University of California at Berkeley and the East-West Center in Honolulu serve as the lead institutions.

Non-market economy: In NTTA, unpaid household services and care work that is not included in traditional measures of economic activity. Outside of NTTA, can also include other untraded goods or services such as the flows of services provided by the natural environment.

Opportunity cost method: A method for valuing unpaid labor (such as household work) by estimating the market wages that the individual could have earned if they had spent the same time working in the labor market at a job consistent with their level of human capital.

Private sector: Individuals, households and non-profit institutions that serve households and state-owned enterprises.

Public sector: All levels and all sectors of government, including public education, pensions, publicly funded health care and all other cash and in-kind transfers. The state-owned enterprise sector is considered part of the private sector.

Regression allocation method: A method used in NTA and NTTA to allocate household-level data to individuals based on household composition by age and sex, used when individual-level data is not available.

Replacement wage method: A valuation method for unpaid care and service work that uses the market wage rate of a professional doing similar tasks to estimate the monetary value of time spent on the task on an unpaid basis. Can be a generalist method where the professional would be doing many of the tasks, such as a housekeeper or general domestic servant. Alternatively, can be a specialist method where each task is valued by workers who perform that task only. The choice of generalist versus replacement is made based on which is more appropriate for a particular country.

Saving: The portion of current market-based income used to accumulate assets, calculated as primary income plus net transfers less consumption.

Specialist replacement method: See replacement wage method.

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Supervisory care: Care work in which one is responsible for the well-being of another, but may not be interacting directly with the person. Important in estimates of unpaid care because supervisory care may not be coded in time use data as care, but constitutes a necessary obligation that may keep the caregiver from engaging in other activities.

Surplus: The amount of production above what is needed for one's own consumption. Can exist in the market economy in terms of labor income above consumption, or in the non-market economy in terms of time spent in unpaid household service and care work produced above that consumed.

Taxes: Compulsory, unrequited payments, in cash or in kind, made by the private sector to the public sector, including social contributions.

Third-party criterion: Concept helpful in defining unpaid household service and care work: a task that can be outsourced to a third-party while still receiving the benefit of the task.

System of National Accounts (SNA): An international statistical standard for estimating national accounts adopted by the United Nations.

Time-use surveys: Data collection instruments used to measure how people allocate their time to various activities, including unpaid household service work and care work. These surveys are essential for estimating NTA age profiles.

Transfer inflows: Transfers received by individuals or age groups.

Transfer outflows: Transfers made by individuals or age groups.

Transfers: Cash, in-kind, and time flows to and from individuals or age groups that involve no explicit quid pro quo.

Unpaid household service work (UHSW): Non-market activities like household management, caregiving, and other domestic chores. These tasks are crucial for societal function but are traditionally invisible in standard economic measures like GDP.

References

- Abraham, E., and others (2014). Father's brain is sensitive to childcare experiences. *Proceedings of the National Academy of Sciences*, vol. 111, pp. 9792–9797.
- Abraham, K. G., and C. Mackie (2005). *Beyond the Market: Designing Nonmarket Accounts for the United States*. Washington, D.C.: National Academies Press.
- Auerbach, A., L. J. Kotlikoff, and W. Leibfritz (1999). *Generational Accounting Around the World*. National Bureau of Economic Research Project Report. Chicago: University of Chicago Press.
- Bertrand, M., C. Goldin, and L. F. Katz (2010). Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors. *American Economic Journal: Applied Economics*, vol. 2, No. 3, pp. 228–55.
- Braverman, H. (1974). *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*. New York: Monthly Review Press.
- Browning, M., and P. A. Chiappori (1998). Efficient Intra-Household Allocations: A General Characterization and Empirical Tests. *Econometrica*, vol. 66, No. 6, pp. 1241–1278.
- Carson, C. (1975). History of the United States National Income and Product Accounts: The development of an analytical tool. *Review of Income and Wealth*, vol. 23 (June), pp. 153–181.
- Deere, C. D., and others (2015). *Gender, Remittances and Asset Accumulation in Ecuador and Ghana*. New York: UN Women.
- Donehower, G. (2019). Methodology of the National Time Transfer Accounts. In *Time Use and Transfers in the Americas: Producing, Consuming, and Sharing Time Across Generations and Genders*, B. Piedad Urdinola and Jorge A. Tovar, eds. Cham, Switzerland: Springer, pp. 5–40.
- Donehower, G. (2023). Gender and the Total Work of Older Workers in Asia. Asian Development Bank Economics Working Paper Series No. 687 (23 June 2023). Manila: Asian Development Bank.
- Friedman, J. H. (1984). *A variable span smoother*. Laboratory for Computational Statistics Technical Report No. 5. Palo Alto, California: Department of Statistics, Stanford University.
- Gál R. I., P. Vanhuyse, and L. Vargha (2018). Pro-elderly welfare states within child-oriented societies. *Journal of European Public Policy*, vol. 25, No. 6, pp. 944–958.
- International Labour Organization (2018a). *Care work and care jobs for the future of decent work*. Geneva: International Labour Organization.
- International Labour Organization (2018b). Own Use Production Work. http://www.ilo.org/global/statistics-and-databases/statistics-overview-and-topics/WCMS_470307/lang--en/index.htm. Accessed 15 June 2018.
- Istenič, T., and others (2016). European National Transfer Accounts. Available at: <http://www.wittgensteincentre.org/ntadata>. Accessed 6 December 2024.
- Jesus, J., S. Wajnman, and C. Turra (2021). Trabalho doméstico não remunerado e as transferências intergeracionais de tempo no Brasil. In *A arte de tercer o tempo: Perspectivas feministas*, Hidelte Pereira de Melo and Lorena Lima de Moraes, eds. São Paulo: Pontes Editores.

Measuring and Analysing the Gendered Economy

- Kelly, R. M. (1991). *The gendered economy: Work, careers, and success*. Thousand Oaks, California: Sage Publications, Inc.
- Landefeld, J. S., B. M. Fraumeni, and C. M. Vojtech (2009). Accounting for household production: A prototype satellite account using the American Time Use Survey. *The Review of Income and Wealth*, vol. 55, No. 2, pp. 205–225.
- Lee, R. D., and Mason A., eds. (2011). *Population Aging and the Generational Economy: A Global Perspective*. Cheltenham UK and Northampton MA: Edward Elgar.
- Madore, K. P., and A. D. Wagner (2019). Multicosts of Multitasking. *Cerebrum*, 1 April 2019.
- National Transfer Accounts (2017). Counting Women’s Work: Measuring the gendered economy in the market and at home. National Transfer Accounts Research Project Bulletin #11 (January 2017). Honolulu: East-West Center.
- Pan American Health Organization (2010). *The Invisible Economy and Gender Inequalities: The importance of measuring and valuing unpaid work*. Washington DC: World Health Organization.
- Phipps, S. A., and P. S. Burton (1998). What’s Mine is Yours? The Influence of Male and Female Incomes on Patterns of Household Expenditure. *Economica*, vol. 65, pp. 599–613.
- Reid, M. (1934). *Economics of Household Production*. New York: Wiley.
- Rentería, E., and others (2016). Intergenerational money and time transfers by gender in Spain: Who are the actual dependents? *Demographic Research* vol. 34, pp. 689–704.
- Suh, J., and N. Folbre (2016). Valuing Unpaid Child Care in the US: A Prototype Satellite Account Using the American Time Use Survey. *Review of Income and Wealth*, vol. 62, No. 4, pp. 668–684.
- Terkoğlu, Ö. İ., and others (2017). *The UN Women Gender and Economics Training Manual*. New York: UN Women.
- United Nations (2009). *System of National Accounts 2008*. New York: United Nations.
- United Nations (2010). *Developing Gender Statistics: A Practical Tool*. Geneva: United Nations.
- United Nations (2013). *National Transfer Accounts Manual: Measuring and analysing the generational economy*. New York: United Nations.
- United Nations (2016). *International Classification of Activities for Time use Statistics 2016*. New York: United Nations.
- United Nations Department of Economic and Social Affairs Statistical Division (UN DESA SD) (2016). Integrating a Gender Perspective into Statistics. Studies in Methods, Series F No. 111. New York: United Nations.
- United Nations Economic Commission for Europe (UNECE) (2017). *Guide on Valuing Unpaid Household Service Work*. New York and Geneva: United Nations.
- United States Bureau of Economic Analysis (2008). FAQ: “Why does GDP include imputations?” <https://www.bea.gov/help/faq/488>. Accessed 6 December 2024.
- United States Bureau of Labor Statistics (2011). American Time Use Survey User’s Guide. <http://www.bls.gov/tus/atususersguide.pdf>. Accessed 6 December 2024.

- Urdinola, P., and J. A. Tovar, eds. (2019). *Time Use and Transfers in the Americas: Producing, Consuming, and Sharing Time Across Generations and Genders*. Cham, Switzerland: Springer.
- Vargha, L., and others (2016). European National Time Transfer Accounts. Available at <https://dataexplorer.wittgensteincentre.org/nta/>. Accessed 6 December 2024.
- Vargha, L., B. Hammer, and G. Donehower (2023). Time Transfers by Age and Gender in 28 Countries. *Socius*, vol. 9.
- Vargha, L., and G. Donehower (2019). The quantity-quality tradeoff: a cross-country comparison of market and nonmarket investments per child in relation to fertility. *Population and Development Review*, vol. 45, No. 2, pp. 321–350.
- Vargha, L., R. I. Gál, and M. O. Crosby-Nagy (2017). Household production and consumption over the lifecycle: National Time Transfer Accounts in 14 European countries. *Demographic Research*, vol. 36, No. 32, pp. 905–944.
- Waring, M. (1999). *Counting for nothing: what men value and what women are worth*. Toronto: University of Toronto Press.

ISBN 978-92-1-003367-1



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