TECHNISCHE
UNIVERSITÄT
WIEN
Vienna University of Technology

DISSERTATION

The Economic Life Course: An Examination Using National Transfer Accounts

Ausgeführt zum Zwecke der Erlangung des akademischen Grades eines Doktors
der Sozial- und Wirtschaftswissenschaften
unter der Leitung von

Univ.Prof. Dipl.-Ing. Dr.techn. Alexia Fürnkranz-Prskawetz
E-105
Institut für Wirtschaftsmathematik

in Zusammenarbeit mit

Jože Sambt, Ph.D.
Universität Ljubljana

eingereicht an der Technischen Universität Wien
Fakultät für Mathematik und Geoinformation

von

Bernhard Hammer
0103294
Rosensteingasse 60/2/28, 1170 Wien

Wien, am 11.02.2014

Kurzfassung

Die Intensität und die Art der ökonomischen Aktivitäten von Individuen sind sehr stark von deren Alter abhängig. Besonders die Erwirtschaftung von Arbeitseinkommen ist im Alter von etwa 20 bis 60 konzentriert. Der durchschnittliche Wert der konsumierten Güter und Dienstleistungen dagegen ist in jeder Altersgruppe ähnlich, auch wenn sich die Art der konsumierten Güter unterscheidet. Kinder und ältere Menschen sind ökonomisch abhängig in dem Sinne, dass ihr durchschnittliches Arbeitseinkommen nicht ausreicht um ihren gesamten Konsum zu finanzieren. Dieses Muster erfordert die Umverteilung ökonomischer Resourcen über das Alter, entweder in Form von Transfers zwischen Individuen verschiedenen Alters oder in Form von vermögensbasierter Umverteilung. Bevölkerungsalterung und der Anstieg des Anteils der älteren, ökonomisch abhängigen Bevölkerung an der Gesamtbevölkerung erfordert auch eine entsprechende Anpassung des wirtschaftlichen Verhaltens und des Verteilungssystems. Entscheidungen in Bezug auf die Organisation der Umverteilung von Resourcen über Altersgruppen erfordern Information über die involvierten Mechanismen sowie über die Beziehung zwischen ökonomischer Aktivität und Alter. Eine der wichtigsten wirtschaftlichen Datenquellen ist die Volkswirtschaftliche Gesamtrechnung (VGR). Die VGR misst einen großen Teil der Produktion in einer Volkswirtschaft, das Einkommen welches aus diesen Produktionsaktivitäten entsteht, dessen Umverteilung über institutionelle Einheiten sowie die Verwendung des verfügbaren Einkommens für Konsum und Sparen. Nationale Transferkonten (National Transfer Accounts - NTA) sind ein System von VGR-Satellitenkonten mit welchem Information über Alter und ökonomischer Ativität in das VGR-Kernsystem integriert werden. Dabei werden VGR-Größen nach Alter aufgesplitted: NTA messen wieviel Arbeits- und Vermögenseinkommen jede Altersgruppe generiert, wie dieses Einkommen über Altersgruppen umverteilt wird, und wie jede Altersgruppe die verfügbaren Ressourcen für Konsum und Sparen verwendet. Diese Daten ermöglichen es, die ökonomischen Auswirkungen weitreichender demographischer Veränderungen zu verstehen und abschätzen zu können. Ein zentraler Teil der Dissertation ist die Erstellung von österreichischen NTA für die Jahre 1995, 2000, 2005 und 2010. Der erste Teil dieser Dissertation bietet eine Einführung in die Methode, eine Beschreibung der verwendeten Daten sowie eine Präsentation der Ergebnisse.

Öffentliche Transfers ermöglichen die Entkoppelung von Produktion und Konsum über lange Zeiträume, ein besonders wichtiges Bespiel sind Pensionen. Die Gestaltung des öffentlichen Transfersystems beeinflusst die wirtschaftlichen Aktivitäten jeder Altersgruppe und daher auch die ökonomische Abhängigkeit von Kindern und der älteren Bevölkerung. Im zweiten Teil der Arbeit wird das Lebenszyklus Defizit, ein ökonomisches Abhängigkeitsmaß welches

auf den NTA Daten basiert, verwendet um das öffentliche Transfersystem in Österreich und Schweden zu vergleichen. Dieses Maß berücksichtigt altersspezifischen Konsum und altersspezifische Produktion, beziehungsweise den Beitrag sowie die Leistungen aus öffentlichen Transfers. Obwohl Österreich und Schweden in vielerlei Hinsicht ähnlich sind, gibt es beachtliche Unterschiede in der Gestaltung des öffentlichen Transfersystems und dessen Finanzierung. Die schwedische Bevölkerung trägt bis in ein höheres Alter zum System bei, daher ist die ökonomische Abhängigkeit der älteren Bevölkerung geringer. Das ermöglicht eine bessere Unterstützung von Familien und höhere Transfers zu Kindern und Jugendlichen.

Insbesondere Dienstleistungen welche von Haushalten für deren eigenen Konsum produziert werden sind in der VGR nicht erfasst. Diese Dienstleistungen sind im Besonderen auch in den NTA relevant, da ein großer Teil davon anderen Personen zur Verfügung gestellt wird, sie stellen damit wichtige Transfers dar. Haushalts-Satellitenkonten erweitern die VGR Produktionsabgrenzung zu Dienstleistungen welche in den Haushalten für deren eigenen Konsum produziert werden, oder welche ohne Entgelt anderen Haushalten oder Institutionen (z.B. gemeinnützigen Vereinen) zur Verfügung gestellt werden. Im dritten Teil wird ein Haushalts-Satellitenkonto für Österreich basierend auf der Zeitverwendungserhebung 2008/09 erstellt. Dieses Konto enthält nicht nur Informationen über den Gesamtwert der Haushaltsproduktion, sondern integriert das Haushaltskonto in das NTA System. Es beinhaltet Information über die nicht-VGR Produktion nach Alter und Geschlecht, sowie über Transfers zwischen verschiedenen Altersgruppen und den altersspezifischen Konsum dieser Güter und Dienstleistungen. Gemeinsam mit der Information aus den NTA ermöglicht das altersspezifische Haushaltskonto eine umfangreiche Darstellung der Produktionsaktivitäten in jedem Alter, der Umverteilung von Ressourcen zwischen Altersgruppen, sowie der altersspezifische Verwendung von Ressourcen für Konsum und Sparen.

Im vierten Teil wird zuerst, ähnlich wie im zweiten Teil, das Lebenszyklus Defizit als ökonomisches Abhängigkeitsmaß verwendet um ausgewählte europäische Länder hinsichtlich altersspezifischer Produktionsaktivitäten zu vergleichen. Die vergleichende Analyse zeigt große Unterschiede in der ökonomischen Abhängigkeit von Kindern und der älteren Bevölkerung. Diese werden zum großen Teil durch das Alter beim Eintritt in das Erwerbsleben und dem Pensionsantrittsalter bestimmt. Mittels der Europäischen Statistik über Einkommen und Lebensbedingungen (EU-SILC) und der Multinational Time Use Survey (MTUS) differenzieren wir zusätzlich nach Geschlecht und erweitern die Analyse durch die Einbeziehung von Haushaltsproduktion. Diese differenzierte Analyse zeigt großen Länder-Unterschiede in der Intensität, sowie im Typ altersspezifischer Produktionsaktivitäten, insbesondere jener von Frauen. Die Aufsplittung von NTA nach Geschlecht sowie die Einbeziehung unbezahlter Arbeit ermöglichen ein besser Verständnis der Länderunterschiede in altersspezifischer Produktion und im Umverteilungssystem über das Alter.

Acknowledgement

I would like to thank my supervisor Alexia Fürnkranz-Prskawetz for the friendly and encouraging guidance which left a lot of freedom regarding approach, methods and the exact topic of the research. I also thank her for her excitement about scientific activities in general which really motivates to contribute to the scientific discourse.

I am also grateful to my second supervisor Jože Sambt, who was the first who generated National Transfers for Austria (for the year 2000) and whose support and feedback was an invaluable help.

The work on this thesis has been funded through the Austrian Science Fund (FWF): project I 347-G16 *National Transfer Accounts and intergenerational redistribution in European institutional settings*. I acknowledge the financial support of the Vienna Chamber of Commerce (Wirtschaftskammerpreis 2011) for the work on chapter two and the funding through the European Commission's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 290647 for the work on chapter four.

Contents

List of Figures

List of Tables

Acronyms

ABR asset based reallocations
CES consumer expenditure surveys
CFC consumption of fixed capital
COFOG Classification of the Functions of Government
COICOP Classification of Individual Consumption by Purpose
DI disposable income
ECHP European Community Household Panel
ESA European System of Accounts
ESSPROS European System of Integrated Social Protection Statistics
EU-SILC European Union Community Statistics on Income and Living Conditions
GLM generalized linear model
HFCS Household Finance and Consumption Survey
HHSA household satellite accounts
ISCED International Standard Classification of Education
LCD life cycle deficit
LKF Leistungsorientierte Krankenanstaltenfinanzierung
MTUS Multinational Time Use Survey
NNI net national income
NTA National Transfer Accounts
NTHA National Transfer Household Account
NTTA National Time Transfer Accounts
NOS net operating surplus
NPISH non-profit institutions serving housholds
ROW rest of the world
SNA System of National Accounts
TUS time use survey

Preface

The type and the intensity of economic activities which are carried out by individuals, such as production, consumption and saving, are strongly related to their age. In particular the generation of income through paid work is very concentrated in the age from about twenty to sixty. The total value of the consumed goods and services on the contrary is rather similar at each age, even though the type of the goods and services differs considerably. Children and elderly persons are economically dependent in the sense, that their labour income is not sufficient to finance their consumption. This pattern of the economic life course requires the reallocation of resources across age in the form of transfers between individuals of different age and in form of asset based reallocations (saving). The needs in childhood in terms of care and consumption are usually provided by transfers from the parents, while formal education is financed by the public sector, constituting a transfer from the taxpayers (mainly in working age) to the children. People accumulate assets during working life; retirees are therefore able to finance part of their consumption by asset income. However, in most European countries, including Austria, the bulk of consumption at older ages is financed by public sector transfers such as public pensions and publicly provided health- and long-term-care services. The ageing of the population and the increase in the share of the dependent elderly population require accompanying changes in the economic behaviour of individuals and in the way how resources are reallocated across age groups. The basis for sensible decisions regarding the organization of age-reallocations is a thorough understanding of the involved institutions and mechanism, as well as a sound data-based analysis of the relation between age and economic activities.

One of the most important sources of economic data is the System of National Accounts (SNA). The SNA records a large part of production in the economy, the generation of income through these production activities, its subsequent redistribution among institutional units[1], as well as its use for consumption and saving. In particular the measure for total production, the *gross domestic product* (GDP), became one of the most important economic indicators and has been used not only as a measure of production, but also as an indicator for well-being and development. The critique on the use of GDP as a measure other than market production has been increasing in the last years: GDP does not account for negative consequences of production activities such as environmental devastation; it does not provide information on the desirability of the produced goods and services (e.g. military operations in foreign

[1] *An institutional unit is an economic entity that is capable, in its own right, of owning assets, incurring liabilities and engaging in economic activities and in transactions with other entities (SNA, 2009).* In particular households constitute institutional units.

countries); and GDP does not provide information about the distribution of income within the population. The limitations of GDP and the SNA have been widely recognized (see e.g. Stiglitz et al., 2009; Costanza et al., 2014), while recent developments such as climate change and demographic changes call for additional measures and indicators. As a consequence there are many attempts to introduce measures beyond GDP, which provide information about social developments and about the current state and the development of the economy and the environment. Examples are ecological indicators (e.g. EEA, 2013), indicators for well-being and happiness (e.g. Helliwell et al., 2013) and measures for production activities which do not fall within the production boundary of the SNA (see e.g. Abraham and Mackie, 2005). Some of these attempts try to establish new indicators; others aim to implement additional information into the framework of the SNA. Additional information is usually introduced into the SNA through so called satellite accounts: satellite accounts are linked to the central system, but provide the new information in a way which does not interfere with the results in the core accounts.[2]

National Transfer Accounts for Austria

National Transfer Accounts (NTA) are a system of satellite accounts which break down SNA quantities by age, and thereby introduce information on the relation between the age of individuals and their economic activities into the SNA framework. NTA measure how much income each age group generates through labour and through the ownership of capital, how income is redistributed across age groups through public and private transfers and how each age group uses the disposable resources for consumption and saving. The dataset consists of an extensive number of age profiles containing the age-specific averages of labour income, asset income, public transfers, private transfers, consumption and saving. NTA measure and illustrate important aspects of the role of age and age-reallocations in the economy. They constitute an important input for the development of informative economic and demographic indicators and for further economic analysis (e.g. economic modelling, projections). A central part of my thesis is the development of Austrian NTA for the years 1995, 2000, 2005 and 2010. The first chapter describes the methodology as well as the data sources and presents the results. It contains also a section in which the results from Austria are compared with those from other European countries.

The Public Reallocation of Resources Across Age: A Comparison of Austria and Sweden

There is a strong interdependency between public transfers and age-specific economic activities, because these transfers facilitate and enable the decoupling of production activities and

[2]For an overview of the satellite account concept see SNA (2009) p.542f.

consumption over long time periods, most notably in retirement. The demographic elderly dependency ratio[3] is often used to illustrate the consequences of population ageing for the funding of public transfers. However, this measure is purely demographic and does not account for the economic ability of the working age population to support the dependent population, nor does it account for the degree of economic dependency of elderly persons. The second chapter of the thesis consists of a paper (Hammer and Prskawetz, 2013) in which economic dependency ratios based on NTA data are used to compare the age-reallocation through public sector transfers in Austria and Sweden. These dependency ratios are based on age-specific consumption and labour income and on the age-specific public contributions/benefits. Sweden is exceptional among the European NTA countries because the average retirement age is much higher than in the other countries. The Swedish data is therefore predestined to study the effect of a higher retirement age on the aggregate economic dependency of the elderly population. The analysis illustrates, that the financial sustainability of the public transfer system depends, beside the demographic developments, strongly on its design. Austria and Sweden are very similar economies in terms of production, income and the size of the public sector. However, the funding of the public transfer system is considerably more sustainable in Sweden. The later retirement in Sweden implies that the public sector funding is based on contributions from a wider range of age groups, and that the share of transfers to the elderly is lower. This allows to provide more support to younger generations, helping them to invest in children of their own.

A National Transfer Household Account - The Role of the Family in the Age-Reallocation System

NTA are based on data, definitions and concepts from the SNA and use the advantages of the SNA, which constitutes a well developed, coherent and consistent accounting system which is comparable over time and countries. NTA simply add information into the SNA framework. But satellite accounts allow also the use of alternative concepts and definitions. Household satellite accounts extend the SNA production boundary to include also the goods and services which are produced by households for their own consumption, or which are provided free of charge to other households. Important examples are the preparation of meals, cleaning, childcare, elderly care and voluntary work. These goods and services are of particular relevance in the NTA framework as they are provided also to other persons and therefore constitute important transfers. Ignoring this type of production and transfers gives an incomplete and biased picture of the role of the family in the transfer system and of women's contribution to total production. In Chapter 3 of the thesis I develop a household satellite account (HHSA)

[3]The elderly dependency ratio relates the number of the people above age 65 to the population aged 20 to 65. The exact age borders differ; EUROSTAT, for example, uses the age borders 15 and 65.

based on the Austrian time use survey from 2008/09. The HHSA provides information on the total value of non-SNA household production, as well as information about the type and the amount of goods and services which are used as inputs in the production process. This satellite account is then integrated into the NTA framework and includes information about non-SNA production by age and gender, as well as information on transfers between age groups and on the age- and gender-specific consumption of these goods and services. This work elaborates the methodology for generating age-specific transfer accounts for household production, so called National Time Transfer Accounts (NTTA). The age-specific household account together with the results from the NTA core system it provides a comprehensive picture of production activities at each age, the redistribution of resources between age groups and the age-specific use of resources for consumption and saving.

Production Activities by Age and Gender in Europe: A Cross-Country Comparison

The last chapter of the thesis consists of a paper which I wrote together with Alexia Fürnkranz-Prskawetz and Inga Freund and which is currently submitted to the *Journal of the Economics of Ageing*. A working paper version of this paper has been published in the working paper series of the WWWforEurope project (Hammer et al., 2013). National data from the NTA project show, that there are large cross-countries differences in the degree of economic dependency of children and the elderly population, as well as in the economic ability of the working age population to support the dependent population. A part of these differences is due to demographic factors. We try to identify how much of these differences can be explained by the age- and gender-specific levels of production and consumption. For this purpose we use a gender-specific economic dependency/support ratio which is based on NTA data, data from the European Community Statistics on Income an Living Conditions (EU-SILC) and data from the Multinational Time Use Survey (MTUS). In the first step the focus is on market production. We find that the cross-country differences in the economic dependency of children and elderly persons are largely determined by the age at which people enter, respectively exit, the labour market and by the overall level of consumption relative to income. The ability of the working age population to support the economically dependent population in turn is strongly influenced by the participation of women in paid work. Taking also unpaid work into account leads to a decrease of the gender differences in production activities, but does not affect the economic dependency of elderly persons. There are large differences across countries in the level and type of production activities; particularly high are the cross-country differences for women. The analysis highlights that the breakdown of NTA by gender and the consideration of unpaid household work is crucial for the understanding of cross-country differences in NTA and for a comprehensive understanding of the age-reallocation system.

References

Abraham, K. G. and Mackie, C. D. (2005). *Beyond the Market: Designing Nonmarket Accounts for the United States*. National Academies Press, Washington,D.C.

Costanza, R., Kubiszewski, I., Giovannini, Enricoand Lovins, H., McGlade, J., Pickett, K. E., Ragnarsdottir, K. V., Robetrts, D., De Vogli, R., and Wilkinson, R. (2014). Time to leave GDP behind. *Nature*, 505:283–285. `http://www.nature.com/news/development-time-to-leave-gdp-behind-1.14499` (accessed 20 January 2014).

EEA (2013). *Environmental Indicator Report 2013: Natural Resources and Human Well-Being in a Green Economy*. European Environment Agency. Download from: `http://www.eea.europa.eu/publications/environmental-indicator-report-2013` (accessed 2 January 2014).

Hammer, B. and Prskawetz, A. (2013). The public reallocation of resources across age: a comparison of Austria and Sweden. *Empirica*, 40(3):541–560.

Hammer, B., Prskawetz, A., and Freund, I. (2013). Reallocation of resources across age in a comparative european setting. Download from: `http://www.foreurope.eu/fileadmin/documents/pdf/Workingpapers/WWWforEurope_WPS_no013_MS12.pdf` (accessed 16 January 2014).

Helliwell, J., Layard, R., and Sachs, J., editors (2013). *World Happiness Report 2013*. Download from: `http://unsdsn.org/files/2013/09/WorldHappinessReport2013_online.pdf` (accessed 7 January 2014).

SNA (2009). *System of National Accounts 2008*. European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank. Download from: `http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf` (accessed 20 January 2014).

Stiglitz, J. E., Sen, A., and Fitoussi, J.-P. (2009). Report by the Commission on the Measurement of Economic Performance and Social Progress. Download from: `http://www.stiglitz-sen-fitoussi.fr/documents/rapport_anglais.pdf` (accessed 1 November 2013).

Chapter 1

National Transfer Accounts for Austria

1.1 Introduction

The rapid increase in the population's average age in many countries all over the world shifts the design of the economic life course (the type and intensity of economic activities carried out at each age) and the corresponding transfer systems into the focus of policy makers and scientists. This is by no means surprising, given the economic dependency of the growing share of retirees in the total adult population. The fundamental changes in the age structure of societies require therefore also changes in the economic behaviour of individuals and in the way how resources are reallocated across age groups. The basis for sensible decisions regarding the organization of age reallocations is a clear understanding of the involved institutions and mechanism as well as a sound analysis of the relation between age and economic activities.

National Transfer Accounts (NTA) provide the tools and the data to measure, depict and analyse important aspects of the role of age and age reallocations in the economy. NTA measure how much labour- and asset income each age group generates, how income is redistributed between age groups through public and private transfers, and how each age group uses the disposable resources for consumption and saving. The values in NTA are consistent with the System of National Accounts (SNA): National Transfer Accounts allocate the SNA quantities to age groups and provide additionally estimates for transfers between members of the same household, e.g. from parents to children. These flows are not captured in the SNA but they obviously constitute a fundamental part of the age reallocation system. NTA record the average values for each age. There is a large individual variation in the design of the economic life course. However, individual life courses are strongly influenced by country-specific norms, practices and institutions which regulate the access to economic resources at each age. These norms and practices affect individuals of the same age in a similar way; as a consequence we observe typical patterns of individual life courses. These patterns can be well investigated by analysing averages at each age.

National Transfer Accounts for Austria have been constructed for the year 1995, 2000, 2005 and the year 2010. So far there exist only accounts for current (regular) flows; capital transfers such as bequests, capital gifts or dowries are not yet included. It should be clear that the age patterns in NTA do not refer to the life course of a specific or average person, but represent cross-section patterns of economic activities at each age. This chapter provides a description of the methodology, of the data sources and of the results for Austria. It also provides a short overview over the results from other countries. A more detailed description of the NTA methodology can be found in UN (2013). Lee and Mason (2011) provide a description of the methodology as well a presentation of the country results from all over the world, including a chapter on Austrian NTA from the year 2000 (Sambt and Prskawetz, 2011).

1.2 National Transfer Accounts: Basic Principles

The NTA dataset consists of an extensive number of age profiles containing the age-specific averages of labour income, asset income, public transfers, private transfers, consumption and saving. The broad estimation strategy for these profiles is, first, to derive the aggregate values from the System of National Accounts and related sources. In the second step the distribution over age groups is estimated using survey- and administrative data. All the age profiles are then adjusted by an appropriate factor, so that the per-capita averages for each age group summed up over the total population match the aggregate values. A smoothing procedure has been applied to most of the age profiles presented in the thesis, as smoothed profiles allow a clearer presentation of the fundamental age shapes.

The accounting identity in NTA states, that for each individual, and consequently for aggregates of individuals such as age groups and the total economy, the resources used for consumption (C) and saving (S) equal the disposable income consisting of labour income (YL), asset income (YA) and net transfer inflows (τ):[1]

$$C + S = \underbrace{YL + YA + \tau}_{\text{disposable income}} \tag{1.1}$$

The NTA dataset contains quite detailed information about the components of income, consumption, savings and transfers. In all the quantities NTA distinguishes between a public and private part:[2] consumption is divided into private consumption (C^p) and public consumption (C^g), the latter of which is also denoted as public in-kind transfers. Public transfers also include cash transfers (τ^g), such as public pensions and child benefits. The NTA methodology also distinguishes a private and public part in asset income (YA^p respectively YA^g) and saving (S^p respectively S^g). Private transfers are additionally divided into inter-household transfers (τ^{inter}), thus transfers between households (e.g. alimony payments, remittances), and transfers within the households (τ^{intra}). This decomposition is used to write Equation (1.1) in a more detailed form:

$$\underbrace{C^p + C^g}_{\text{consumption}} + \underbrace{S^p + S^g}_{\text{saving}} = \underbrace{YL + YA^p + YA^g}_{\text{labor- and asset income}} + \underbrace{\tau^{intra} + \tau^{inter} + \tau^g}_{\text{net transfers}} \tag{1.2}$$

In this chapter of the thesis I present the age-specific estimates for each of these quantities

[1] Transfer inflows and outflows are recorded from the individuals point of view: inflows are the benefits, outflows the contributions to the transfer systems. For example: public transfer inflows consist of benefits such as pensions, health services or child benefits, while the public transfer outflows consist mainly of taxes and social contributions.

[2] The private sector in NTA consists of households, financial and non-financial corporations as well as the non-profit institutions serving households such as religious organizations and charities.

and describe in detail the data sources, as well as the methodology which has been used to derive these results. For a compact illustration of the NTA concept a simplified version of the Austrian NTA for 2010 is presented in Table 1.1. It shows the per-capita averages of income, transfers, consumption and saving for three age groups (0-19, 20-59, 60+), as well as the aggregate values for the total economy. This table serves more to illustrate the NTA concept, there are also huge differences within these three age groups. The average disposable income amounted in 2010 to about €18,800 for those younger than 20, to about €25,700 for those in working age (20-59) and €28,500 for those in the age group 60+. Labour income is clearly very small for children and the youth population, because individuals until the age of 14 have virtually no labour income and only part of the youth aged 15-19 participate in the labour market. In the age group 0-19 labour income accounts for only about 9 percent of disposable income. Also private asset income is negligible for young persons, because these age groups have not yet accumulated assets and because of the NTA methodology which assigns asset income only to the household head. The disposable income in young age consists therefore mainly of transfers: by about 50 percent of private transfers from the parents (€9,255) and by about 41 percent of public sector transfers (€7.980, mainly in form of education). Both, the private and the public transfers are provided mainly by the population in working age. During working age average labour- and asset income exceeds by far the own consumption. The excess income is either used for saving or transferred to other age groups through public or private transfers. With retirement labour income falls again short of consumption: disposable income of the population older than sixty consists only to about 13 percent of own labour income (€3,823), to 25 percent of asset income (about €7000) and to 62 percent of public transfers (€17,704). This age group has the highest average disposable income and consequently, as in all age groups disposable income equals consumption and saving, the highest average level of consumption and saving.

Table 1.1: National Transfer Accounts Overview: Results for Austria 2010

	Per Capita Averages in Euro			**Total Economy**
	0-19 Years	**20-59 Years**	**60+**	**in Mill. Euro**
Labour income	1,638	32,551	3,823	163,606
Private asset income	108	7,743	7,516	51,249
Public asset income	-117	-491	-446	-3,380
Net national income	**1,629**	**39,803**	**10,893**	**211,475**
Public net transfer inflows	7,980	-10,756	17,704	-2,437
Inter-household transfers	0	52	64	370
Intra-household transfers	9,255	-3,358	-139	0
Net disposable income	**18,864**	**25,741**	**28,523**	**209,408**
Private consumption	8,772	16,979	17,175	128,567
Public consumption	10,251	4,952	7,363	55,439
Private saving	29	4,602	4,705	30,862
Public saving	-189	-793	-720	-5,459

Figure 1.1 presents the basic results from NTA by 1-year age groups for the year 2010. The

components of the net inflows of resources (if positive) are plotted on the positive y-axis: labour income is represented by the white area, public net transfer inflows by the dark-grey area, private net transfer inflows by the light-grey area and asset based reallocations (ABR) by the black area. The ABR are defined as asset income minus savings ($YA - S$). This term represent the economic resources which are available for consumption and transfers as a result of asset accumulation. The black line represents consumption. Those age groups for which the net inflows exceed consumption, use the excess resources for public and private transfers to other age groups or for saving. These flows represent net outflows and are plotted on the negative y-axis. The picture confirms the results from Table 1.1: the consumption of children is financed by private and public transfers, while the consumption of the elderly is almost exclusively financed through public transfers.

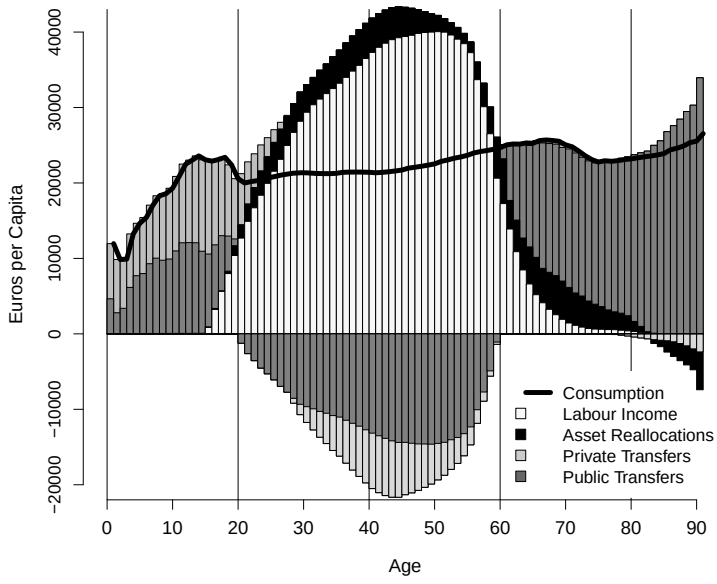


Figure 1.1: National Transfers Accounts - Results for Austria 2010

The role of asset based reallocations for financing consumption is also for the elderly quite low, as the high average asset income is accompanied by high saving rates. For the elderly above the age of 83 asset based reallocations are even negative. People in old age have a very high monetary income (long-term-care benefits), but, as far as we can observe them, a rather low expenditure for private consumption. However, the estimates for these age groups are problematic as a considerable share of the population lives in nursing homes. This part of the population is neither covered by the income surveys nor by the consumption expenditure surveys (both surveys are focusing on private households). Due to the absence of information it is assumed that the age-specific consumption of the institutionalized population is the same as of the population living in private households. This most likely underestimates the private

consumption of individuals living in care institutions, as they use a large part of their income for financing the accommodation and the care services. For a further discussion of this issue see the section on private consumption (Section: 1.4.2).

1.3 Aggregate Values

One of the advantages of NTA is the consistency with the System of National Accounts (SNA). The following section describes the relationship between the SNA and the measures of income, transfers, consumption and saving in NTA.

1.3.1 Income

The income measure in NTA includes the net primary incomes[3] which are generated by national institutional units. It represents *net national income*, i.e. the total income which is available in the economy before any transfers are implemented and after sufficient investment has been made to maintain the capital stock.[4] The components of NTA income are the *compensation of employees*, the *net operating surplus*, *net property income*, *mixed income* and the *other taxes on production*. The compensation of employees includes the cash and in-kind wages and salaries as well as the employers' social contributions. The net operating surplus is the income generated by incorporated enterprises after paying the cost of the labour input and the taxes which accrue during the production process (less the subsidies) and after replacing the consumption of fixed capital. It can be interpreted as return to capital in these enterprises. The net property income from the rest of the world (ROW) captures the flows of property income between national institutional units and the rest of the world: part of domestic production is used for compensating the foreign owners of assets which were at the disposal to national institutional units and is therefore not part of national income. National institutional units in turn receive property income for the provision of assets to institutional units in the ROW. Mixed income is the income which accrues from production activities by unincorporated enterprises and consists implicitly of the remuneration for work done by the

[3]Primary incomes are incomes that accrue to institutional units as a consequence of their involvement in processes of production or ownership of assets that may be needed for purposes of production (SNA, 2009). This includes e.g. wages, income from self-employment, property income and profits.

[4]Income in NTA corresponds by and large with net national income at basic prices. *The basic price is the amount receivable by the producer from the purchaser for a unit of a good or service produced as output minus any tax payable, and plus any subsidy receivable, on that unit as a consequence of its production or sale; it excludes any transport charges invoiced separately by the producer* ("basic price". OECD Glossary of Statistical Terms. `http://stats.oecd.org/glossary`. Accessed 17 November 2013). In NTA a slightly different definition of basic prices is used: taxes less subsidies which are not paid on the product but during the production process are treated as labour and asset income and included in the basic price (other taxes on production). But since the subsidies almost equal the tax payments the actual difference to the SNA/OECD definition is small.

owner and the return for the input of the owner's capital. The other taxes on production are taxes which are paid during the production process; they constitute resources which are generated through labour and capital input in production and are therefore included in the pre-transfer measure of income.

The NTA methodology distinguishes between labour- and asset income. The compensation of employees is clearly classified as labour income, net operating surplus and net property income clearly as asset income. The other components are divided into a labour and asset part: mixed income is divided into a labour- and asset share by assuming that two third of mixed income is labour income (also denoted as self-employment labour income) and one third capital income. A similar rule is applied to the other taxes less subsidies on production; they are assumed to be paid by labour (2/3) and asset income (1/3) and consequently added to labour and asset income, respectively.

1.3.2 Transfers

A transfer is defined as *"a transaction in which one institutional unit provides a good, service or asset to another unit without receiving from the latter any good, service or asset in return as counterpart"* (SNA, 2009). The unit which is analysed in NTA is the individual, we therefore replace *institutional unit* with *individual* in the above definition. NTA distinguishes between public and private transfers.

The public transfer outflows, i.e. the transfer flows from the private to the public sector, consist of *taxes*, *social contributions* and *other current transfers* (e.g. fines for administrative offenses). The public transfer inflows contain the *final consumption* of the government sector (public transfers in-kind), *social benefits other than social transfers in kind* (i.e. public cash transfers) and *other current transfers* (e.g. public payments to non-profit institutions serving households). The bulk of public transfers are flows between national units. Public transfers which involve the ROW include indirect taxes less subsidies paid by/to the ROW such as taxes paid to the European Union (e.g. GNP based fourth own resource), current international cooperation and social contributions/benefits paid by/to the ROW.

Private transfers are divided into intra-household transfers and inter-household transfers. The aggregate value of intra-household in- and outflows in NTA are solely based on survey estimates, as flows within institutional units such as households are not captured in the SNA. Inter-household transfers are recorded in the SNA and consist of direct flows between households (e.g. alimony payments, gifts) and of flows with a firm or a NPISH as intermediary (e.g. company pensions, insurance premiums/claims, donations). They include flows in the SNA categories such as *other current transfers*, *social contributions and benefits not in kind* (those which organized by the private sector), and *social transfers in-kind*, corresponding to

the consumption expenditure of non-profit institutions serving housholds (NPISH).

1.3.3 Consumption and Saving

After implementing transfers we receive the disposable income (DI), a measure for the value of resources which are available for the purpose of consumption and saving. Public consumption in NTA equals the final consumption expenditure of the public sector in the SNA. Private consumption is measured at basic prices and calculated as final consumption expenditure of national institutional units at market prices minus the taxes (less subsidies) on products. Saving in NTA equals net saving in the SNA.

The NTA aggregate values for the years 1995, 2000, 2005 and 2010 are listed in Table 1.2. There has been a decline in the share of labour income on net national income (NNI). In 1995 labour income accounted for 82% of NNI, compared to 76.3% in 2005 and 77.4% in 2010. Table 1.2 also illustrates the massive intervention of the public sector regarding the distribution of income. In 2010 and in 1995 about 56 percent of net income has been reallocated through public sector transfers, the value is with around 54 percent only slightly lower in 2000 and 2005. Although some of the benefits are received by the same person who pays the transfer, we will see later that public transfers constitute to a large degree a redistribution across age. The use of disposable income is rather constant over the years: around 12% of DI is used for saving, between 61.4% and 62% for private consumption and between 25.2% and 27.5% for public consumption.

Table 1.2: Aggregate Values of the Main NTA Variables

	1995		2000		2005		2010	
	Mill. Euro	%	Mill. Euros	%	Mill Euro	%	Mill. Euro	%
Labour income / % of NNI	106,612	82.0	122,208	79.9	137,296	76.3	163,606	77.4
Asset income / % of NNI	23,391	18.0	30,728	20.1	42,644	23.7	47,869	22.6
NTA net national income (NNI)	**130,003**	**100.0**	**152,936**	**100.0**	**179,940**	**100.0**	**211,475**	**100.0**
Public transfer outflows / % of NNI	72,928	56.1	82,443	53.9	96,294	53.5	118,357	56.0
Public transfer inflows	72,586	55.8	81,189	53.1	94,409	52.5	115,921	54.8
Public net transfers from ROW	-342	-0.3	-1,254	-0.8	-1,885	-1.0	-2,436	-1.2
Intra-household transfer outflows	17,157	13.2	20,690	13.5	21,468	11.9	24,543	11.6
Intra-household transfer benefits	16,217	12.5	20,124	13.2	21,947	12.2	24,913	11.8
Private net transfers from ROW	-940	-0.7	-566	-0.4	479	0.3	370	0.2
Disposable income (DI)	**128,721**	**100.0**	**151,116**	**100.0**	**178,534**	**100.0**	**209,409**	**100.0**
Private consumption / % of DI	79,501	61.8	93,422	61.8	110,733	62.0	128,567	61.4
Public consumption	35,461	27.5	39,610	26.2	45,068	25.2	55,439	26.5
Private saving	19,721	15.3	18,682	12.4	22,645	12.7	30,862	14.7
Public saving	-5,962	-4.6	-598	-0.4	88	0.0	-5,459	-2.6

1.4 Age Profiles: Methodology, Data and Results

1.4.1 Labour Income

Labour income in the NTA contains the part of net national income which is generated through the input of labour in production. As explained in the previous section, aggregate labour income includes gross wages including the employers' social contributions, self-employment labour income and the part of the indirect taxes less subsidies on production which are assumed to be paid out of labour income. The distribution of labour income over age groups is estimated using income surveys. Unfortunately there is no survey which covers all four years. For the year 1995 data from the 1996 survey (wave 3) of the European Community Household Panel (ECHP) is used; the age-specific estimates of labour income for the year 2000 are based on data from the consumer expenditure survey 1999/2000[5]; and for 2005 and 2010 on data from the European Union Community Statistics on Income and Living Conditions (EU-SILC) 2006 and 2011[6], respectively. Wages and income from self-employment is reported in the surveys for each individual, to compute the age profiles we simply take age group averages.

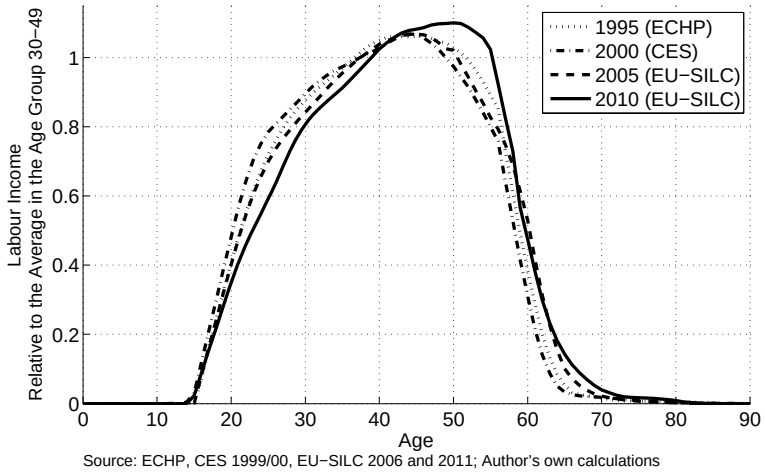


Figure 1.2: Average Labour Income by Year and Age

The average labour income by age is shown in Figure 1.2. To facilitate the comparison across years the age-specific values are measured in terms of average labour income in the age-group 30-49. The shape of the age profiles is very similar for the year 1995, 2000 and 2005: they increase sharply from the age of 15 onwards, reach their peak in the ages from 45 to 50 and decline very sharply around the age of 60. Smaller differences in the age shape do not necessarily indicate changes over time, they can emerge also due to random effects or due to methodological differences in the surveys. The 2010 estimates however indicate a shift to older ages; average labour income in the age groups from 45 to about 57 relative to the average in

[5] *Source:* Statistik Austria; Konsumerhebung 1999/00

[6] *Source:* Statistik Austria; EU-SILC 2006 and 2011

the age group 30 - 49 has been increasing. An analysis by gender indicates a more pronounced change for women than for men (Figure 1.3).

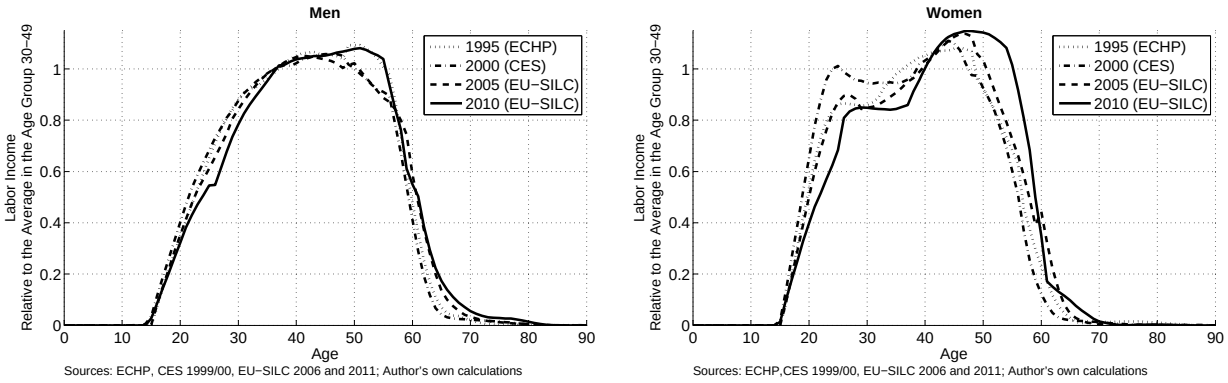


Figure 1.3: Average Labour Income by Gender, Year and Age

The change in the labour income age profiles for women reflects mainly a change in the labour force participation. Figure 1.4 plots the estimates of the age-specific participation rates. The rates in the upper two graphs are based on the income surveys, the rates in the lower two graphs on the much larger labour force survey.[7] In the income surveys I define a person as participant in the labour force if he/she received labour income in the respective year. This definition is different from the usual definition in the labour force statistics (lower graphs), which regard a person to be participating in the labour force also if he/she is unemployed or temporarily absent from work such as on maternity leave. This is the main reason why the female participation rates at age 25 - 40 are higher in the lower graphs. We clearly observe the increase in the labour force participation of women aged 35 to 60 over time. The male-breadwinner female-housewife family model became a rather uncommon arrangement in the last decades; women re-enter the labour market after two to three years of maternal leave. The increase in the participation rates reflects therefore more a cohort- than an age-effect. The largest increase in the participation rates are in the age-group from 50 to 59. This increase can in particular not be explained by a higher retirement age: the average retirement age for women is rather constant around 57 since the year 1995 (SV, 2013, p.23).

The changes in the labour income age profiles for men do not correspond well with the changes in the participation rates. The labour income age profile for 2010 indicates an increase in the participation at age 51-55 between 2005 and 2010. However, this is not reflected in the age-specific participation rates which are based on EU-SILC, they are rather similar for all four years. The participation rates which are based on the labour force survey on the contrary indicate an increase in the participation of the age groups from 55 to 64 between 2005 and 2010. This increase in turn is not visible in the 2010 age profile of labour income.

[7] *Source:* EUROSTAT - Statistics by theme - Labour market - Employment and unemployment

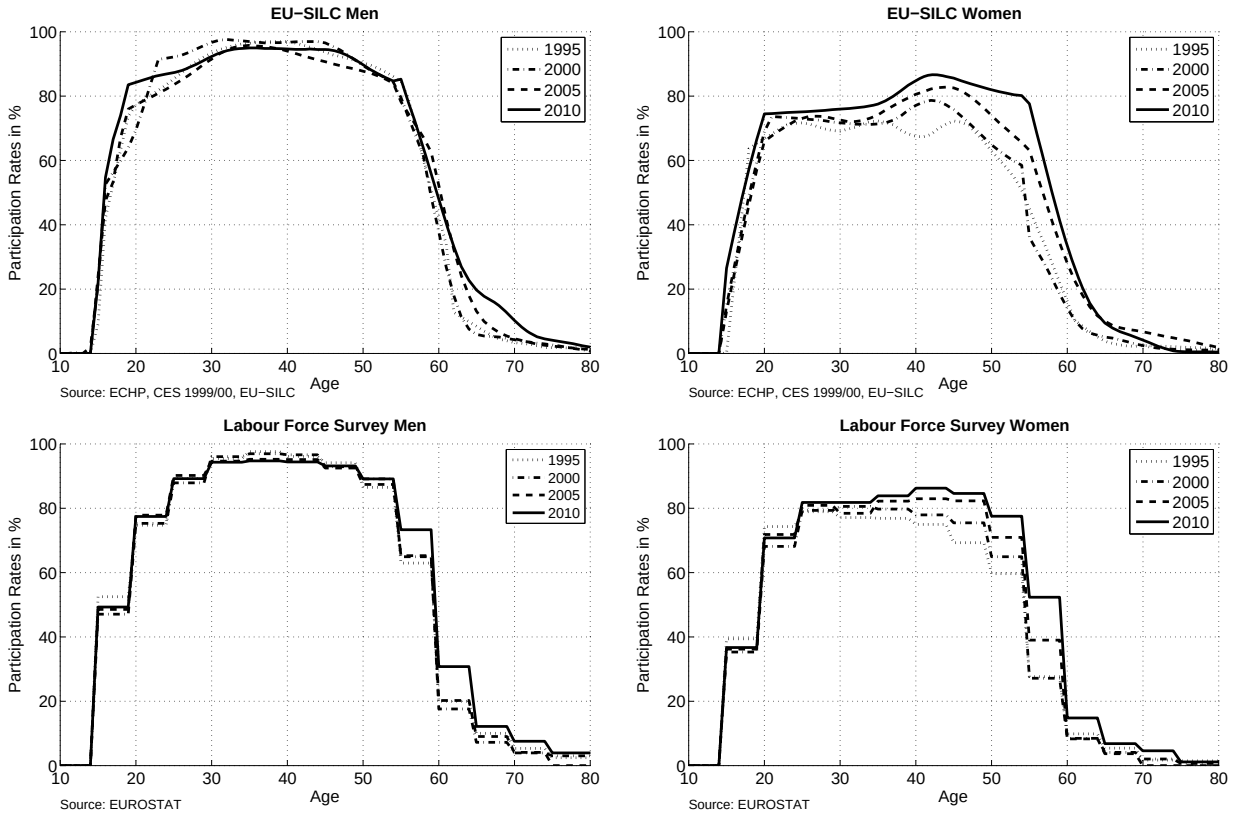


Figure 1.4: Labour Market Participation Rates by Gender, Year and Age

The differences in the development of the age-specific participation rates and the average labour income for men raise the question of the reliability of the age profiles. One way to verify the age profiles of labour income is the comparison with official data from the tax statistics.[8] The wage tax statistics allows an analysis of gross income from employment by age, which contains about the same components as gross income from employment in EU-SILC. Figure 1.5 plots the age profile which is based on data from the wage tax statistic 2010 together with the smoothed age profile which is estimated from EU-SILC 2011 (income reference period 2010). The two age profiles for men and women combined are very similar, suggesting that the estimates based on the survey are reliable. There are deviations in the gender- and age-specific estimates. As the sample size in each of the age groups gets smaller, the profiles become prone to random effects. While the overall profile resembles well the "true" shape, we have to be careful in interpreting the smaller differences in the gender-specific profiles.

[8] *Source:* Statistik Austria; Lohnsteuerstatistik 2010.

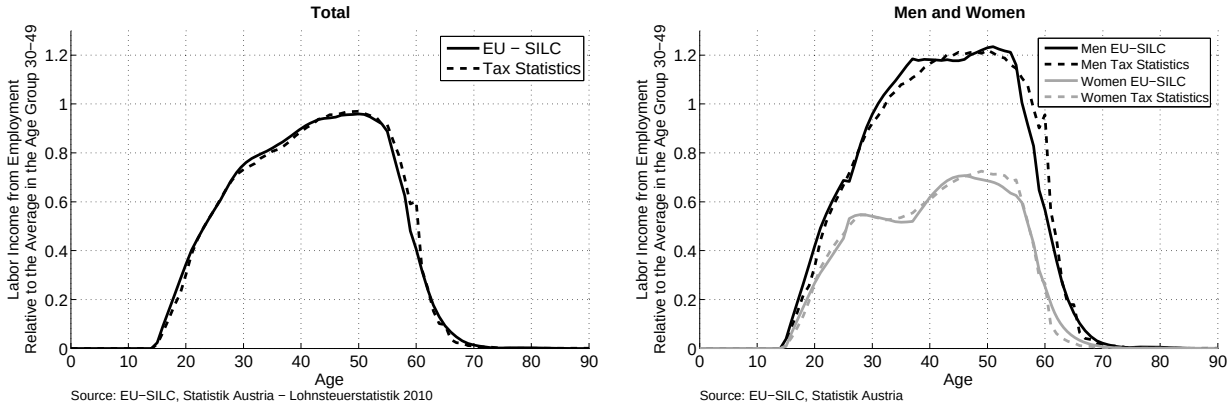


Figure 1.5: Comparison of EU-SILC and Tax Statistics: Gross Income from Employment by Age 2010

An important application of NTA lies in the evaluation of the economic consequences of population ageing. By multiplying the age group averages with the corresponding population we receive the aggregate age profiles. These profiles measure the total economic activity of each age group, reflecting the age-specific intensity of the activity as well as the population number. The aggregate age profiles show very clearly how the aggregate values depend on the age-structure of the population: a high share of people in working age corresponds with a high level of total production, high labour income and as a consequence also with high tax revenues and high social contributions. In the context with the demographic transition from high to low fertility this effect is also known as first demographic dividend. Austria passes through such a period from the 1980s to the 2020s when baby-boomers born between 1960 and 1970 are in working age. This is clearly visible in the aggregate labour income age profiles for the years 1995, 2000, 2005 and 2010 in Figure 1.6. The age profiles show the contribution of each age-group in relation to total labour income. The baby-boomers cause the peaks at the age of 30, 35, 40 and 45 respectively, each of their age groups generates more than 3 percent of total labour income. They are now in an age with high participation rates and high average wages. Given the current age profiles these cohorts will retire from 2020 onwards, causing large drops in total production, in payroll based tax revenues and in social contributions, and a strong increase in public expenditure on pensions.

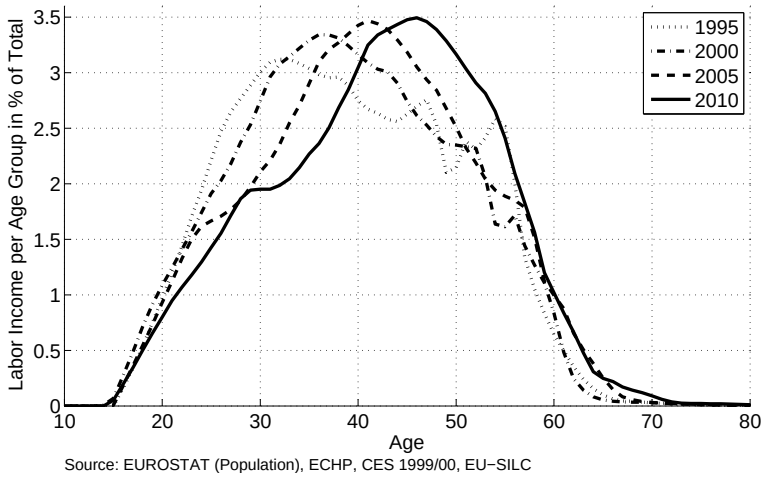


Figure 1.6: Aggregate Labour Income by Year and Age in Percent of Total Labour Income

1.4.2 Private Consumption

Private consumption in NTA represents the total consumption expenditure of domestic households and NPISH. It is divided into the subcategories *education*, *health*, *other private consumption* and *owner occupied housing*. The aggregate private consumption expenditure in the subcategories is derived from data on household consumption expenditure according to the Classification of Individual Consumption by Purpose (COICOP).[9] Table 1.3 shows how private consumption is distributed over the subcategories. Owner occupied housing accounts between 8.8 percent (1995) and 10.2 (2010) percent of private consumption. Private spending for health and education is rather small in Austria and similar for all four years: health consumption accounts for around 3.5 percent of private consumption and education for around 0.8 percent.

Table 1.3: Components of Private Consumption

	1995	2000	2005	2010
Private consumption in Mill. €	**79,501**	**93,422**	**110,733**	**128,567**
Education in % of private cons.	0.7	0.7	0.8	0.8
Health in % of private cons.	3.3	3.5	3.6	3.5
Housing (owner occupied) in % of private cons.	8.8	9.1	10.0	10.2
Other in % of private cons.	87.2	86.7	85.6	85.5

The age profiles of private consumption are based on the consumer expenditure surveys (CES)

[9] i.) *Source:* EUROSTAT - National Accounts detailed breakdowns; Statistik Austria

ii.) These values are an approximation, because COICOP refers to domestic consumption (it includes the domestic consumption expenditure of foreign households, e.g. tourists, but it does not include the consumption of domestic households abroad, e.g. expenditure of Austrians during holidays abroad). It also does not include the consumption of NPISHs.

from the years 1993/94, 1999/00, 2004/05 and 2009/10.[10] Problematic is, that the consumer expenditure surveys are representative for the population living in private households but not for the total population. This results in a potential bias of the age-specific values for the elderly population, as a large share of the population in these age groups lives in retirement homes. Information about the elderly population living in institutions is very scarce; we neither have information about the total number nor about the age composition. By assuming that the consumption of the institutionalized population is similar to the population in private households we probably underestimate their consumption, as persons living in nursing homes use a large part of their income for the housing and care services. At the same time it is likely that the consumption expenditure for care services is underestimated already for private households. The long-term-care allowance is often used to compensate children (or other persons) for the care they provide. The border between transfers and consumption becomes blurred; most likely only a very small part of these flows are captured as consumption in the CES.

In CES consumption expenditure is measured only at household level. To allocate total expenditure of the household to its members different methods are used for education, health and other consumption. These methods are described below. After allocating the households' consumption expenditure to the household members we compile the age profiles by taking the averages for each age group.

Other Private Consumption and Housing

Consumption expenditure in the category housing and other consumption is distributed to the household members using an equivalence scale, i.e. a fixed rule which assigns to each household member a share of total consumption depending on his/her age. The equivalence scale accounts for the lower consumption of children relative to adults and expresses the consumption of each member in adult equivalents: it is assumed that adults of age 20 and older consume the same amount, children until the age of four consume 0.4 times the value of an adult and that there is a linear increase between age 4 and age 20. The estimate for the consumption of children is therefore heavily influenced by this assumption. A comparison with other commonly used equivalence scales shows, that the NTA scale produces similar results as the ÖSTAT equivalence scale which is used in the publications of Statistics Austria (Figure 1.7). However, two other commonly used equivalence scales - the OECD equivalence scale and the adjusted OECD scale used by EUROSTAT - produce age profiles which are quite differently shaped. The main difference between the first and latter two scales is, that the NTA- and ÖSTAT scale assume a gradual increase of children's consumption until they are adult; the OECD scales give much less weight to older children. They assign therefore less

[10] *Source:* Statistik Austria.

consumption to children and more to the age groups of the parents. The NTA equivalence scale has been accepted by the NTA community to be closest to the true consumption needs of household members.

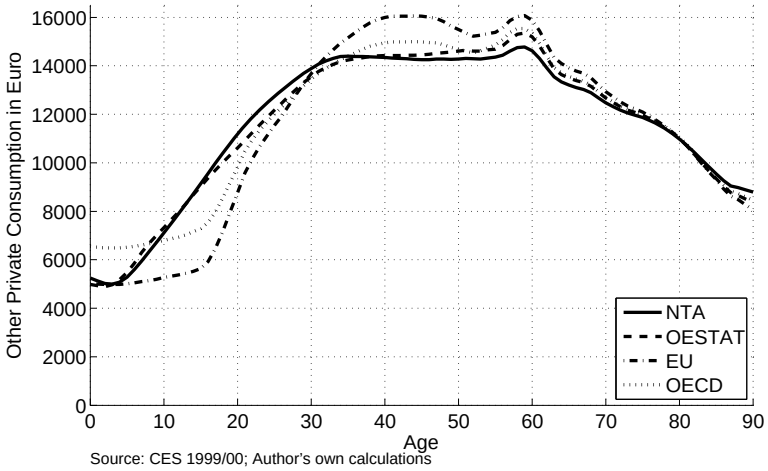


Figure 1.7: Comparison of Consumption Equivalence Scales: Other Private Consumption 2000

Private Education Consumption

In the CES from 2005 and 2010 we have very detailed information on education expenditure at household level. It is divided into expenditure on preschool, primary school, lower secondary school, upper secondary and tertiary education, school activities, and expenditure for vocational education and courses. The components of the education expenditure of a household are assigned to its members in the appropriate age group, expenditure on school activities are allocated in equal shares to all household members enrolled in education. Since for 2000 and in particular 1995 the categories of education expenditure are different, I do not compute age profiles for these years but use the shape of the 2005 age profile. Important to note is, that in the COICOP the expenditure in the category education consists almost exclusively of expenditure on educational institutions (school fees) and courses; it does not include school supplies and literature. The most important component of private education expenditure is expenditure on elementary schooling (kindergarten); private consumption expenditure for education is therefore concentrated in the age from four to six.

Private Health Consumption

For distributing the households' health expenditure to their members I use weights which are generated with an iteration method using information on the household's age-composition and the household's health expenditure. By using the iteration method first the age profile is estimated after distributing the households' health expenditure equally to all household

members. The estimated age profiles for private health consumption increase strongly with age, even when the households' expenditure is allocated to their members independent of age. In the second step the households' health expenditure is allocated to the household members using age-specific weights which are generated from the age profile that was the result of the first step. Again, the age profile is calculated and used as input in the third step, and so on. The procedure is repeated several times. See also (UN, 2013, p. 125). The estimated age profiles show the strong increase with age. Health expenditure accounts for less than 2 percent of private consumption in childhood, but for around 7 percent in the age groups older than eighty.

The estimates of age-specific private consumption by components are shown in Figure 1.8. Private consumption expenditure is increasing up to the age of thirty, then the age profile is flattening or even slightly decreasing until the age of forty/forty-five. This pattern can be explained by household composition: the average household with members in their 30s and 40s is larger due to the presence of young children. Part of the available resources is consumed by the children and consequently decreases the consumption of the parents. Private consumption peaks in the age groups from fifty to sixty; these age groups have the highest labour income while at the same time household sizes decreases as the (formerly dependent) children are leaving the common household.

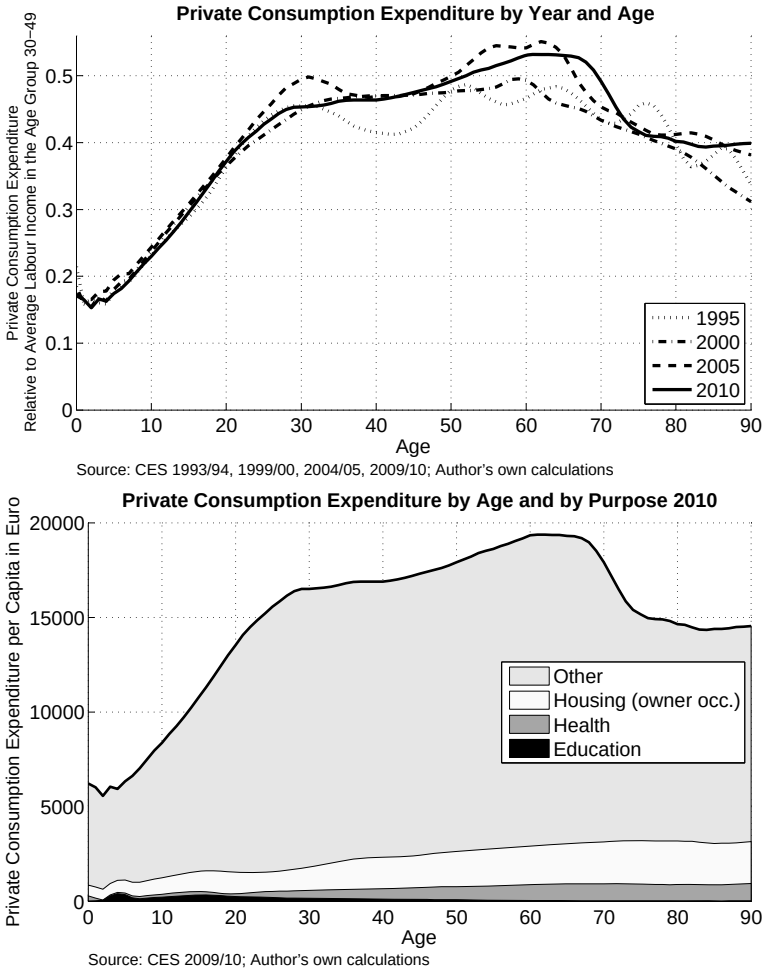


Figure 1.8: Private Consumption

1.4.3 Public Consumption (Public Transfer Inflows In-Kind)

Total consumption consists to about 30% of public consumption (Table 1.2). Similar as for private consumption, NTA distinguishes the categories education, health and other public consumption. The aggregate values in the subcategories correspond to consumption expenditure according to the Classification of the Functions of Government (COFOG).[11] While education and health account for a small share of private consumption, these categories constitute major parts of public consumption: around 26 percent of total public consumption expenditure is used for education, 28 percent for health and 46 percent for other public consumption such as administration, defence, etc. The values of public consumption in each of the subgroups are not fully comparable over time, because the classification of public expenditure changed from final consumption expenditure to other categories such as subsidies; in particular through the treatment of hospitals as market producers (since 1997), and a change in the legal capacity of universities (in 2002).

[11] *Source:* EUROSTAT - General government expenditure by function

Table 1.4: Components of Public Consumption

	1995	2000	2005	2010
Public consumption in Mill. €	**35,461**	**39,610**	**45,068**	**55,439**
Education in % of public cons.	25.8	26.3	25.3	25.7
Health in % of public cons.	27.7	26.5	28.8	28.1
Other in % of public cons.	46.5	47.2	46.0	46.2

Public Education Consumption

The by far largest component of public education consumption is the labour costs for teachers and other staff such as maintenance personnel. For computing the age profiles of public education consumption I use data on expenditure according to COFOG groups (which distinguish consumption expenditure for education by education level) and data on enrolment per age and education level according to the International Standard Classification of Education (ISCED)[12]. The COFOG classification of education levels correspond largely to the categories in ISCED. However, it does not distinguish between expenditure on pre-primary and primary education and between lower and upper secondary education. The shares in total expenditure by ISCED-level[13] are used to get aggregate values for consumption expenditure at all levels. The age profile for public expenditure on formal education (schools, universities) is compiled in two steps: first the average spending per enrolled person is calculated for each education level. In the second step the averages for each education level are weighted with the proportion of the age group which is enrolled at the respective level and summed up over all levels. Services supporting education (e.g. transport, food, accommodation, medical services) are distributed over age according to the profile of formal education; non-attributable education expenditure (e.g. education programs for adults) is allocated independent of age in equal shares to the whole population.

Public Health Consumption

To get an age profile of public health consumption I estimate separate age profiles each COFOG group, which distinguish the consumption expenditure for health by type of health service. That means, that separate consumption age profiles are estimated for *hospital services*, *outpatient services*, *medical products, appliances and equipment* and *other health expenditure*. The category *other* contains expenditure which cannot be attributed to certain persons and age groups (corresponding to the COFOG groups public health services, research and development and non-attributable health expenditure). The most important component of public health consumption are the stationary services. The corresponding age profile is estimated using

[12] *Source:* OECD - students enrolled by age; http://stats.oecd.org/
[13] *Source:* Statistik Austria - educational expenditure

data from the Leistungsorientierte Krankenanstaltenfinanzierung (LKF)[14], the Austrian version of a diagnosis related groups system. The financial compensation of hospitals for medical treatments is mainly based on the diagnosis, reflecting the expected efforts and expenses. A treatment however does not directly lead to a cash transfer; hospitals earn LKF-points instead, according to which the available resources are distributed. The LKF points can be evaluated according to the patients' age. To get an estimate for the age-specific per-capita spending, I divide the age group total in terms of LKF points by the population in the corresponding age group and adjust the profile to the aggregate value. The data covers hospitals financed by the regional health funds (Landesgesundheitsfonds). In 2005 it covered 48.958 or 77.4% of a total of 63.248 beds which were available in Austrian hospitals. Since the LKF system is in place only since 1997, I use for the 1995 age profile the data from 1997. The 2005 and 2010 age profiles in the category outpatient services and the category medical products, appliances and equipment are based on data from the health service information for insured persons (Leistungsinformation für Versicherte), which has been introduced in 2003. It is used to inform all persons in the mandatory health-insurance yearly about the cost of the used health services & products. For 2000 I use data from the FOKO data-base of the Upper Austrian Health Insurance (Oberösterreichische Gebietskrankenkasse). Unfortunately there is no similar data available for the year 1995; therefore the same profile is used as for 2000. Other public consumption expenditure on health is allocated as a lump-sum to the whole population.

"Other" Public Consumption

Most of the public consumption expenditure in the category "other" is collective consumption, such as general public services, defence and internal security. Of these services we assume that each person consumes the same amount. Other public consumption also includes part of individual consumption, thus the expenditure on social transfers in kind not education or health. These transfers are, wherever possible, allocated to individuals according to their age. Because there are no data about the age-specific use of public in-kind services in the category old age as well as in the category disability and sickness (e.g. institutional care, support in daily life activities) I use for these categories the age profile of the corresponding cash transfers (long-term-care benefits). For the age-specific estimates of in-kind services in the category unemployment data on age-specific unemployment as well as data on age-specific course participation are used.

The age profiles of the public consumption components are plotted in Figure 1.9. They are shaped by the expenditure for education in young age and the expenditure for health in old age. The public consumption of education is concentrated in the age groups 6-20 with a peak in lower secondary education. The per-capita expenditure for education relative to labour

[14] *Source:* Federal Ministry of Labour, Social Affairs and Consumer Protection

income in the age group 30-49 is somewhat higher in 2010 than in the other years, reflecting the combination of a constant share of education expenditure with a decreasing number of students. Like in private health consumption there is also a strong increase with age in public health consumption: for an average ninety year old person public health consumption expenditure is around six times higher than the expenditure for an average person in his/her twenties. The public consumption expenditure in the category "other" increases in old age due to expenditure for long term care.

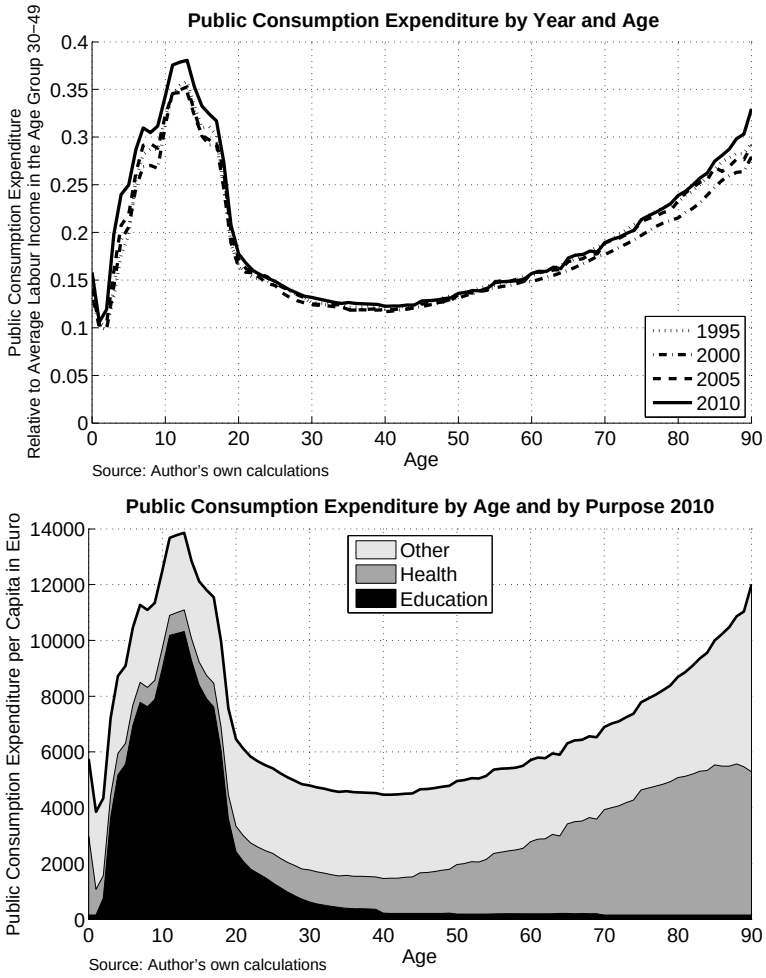


Figure 1.9: Public Consumption

Consumption by Gender

Figure 1.10 shows public as well as private consumption expenditure by gender. There are almost no differences between men and women. Private consumption is assumed to be equally distributed within households; smaller differences can arise through random effects. Also public consumption is rather similar for men and women. In the age 20-40 it is higher for females because of the use of public health services during pregnancy and for childbearing.

In old age public health consumption and consequently total public consumption is slightly higher for men.

Figure 1.10: Consumption by Gender 2010

1.4.4 Public Transfer Inflows in Cash

A bit more than one half (between 51.1% in 1995 and 52.3% in 2005) of total public transfers consists of transfers in cash, such as public pensions and child benefits. In NTA public transfers are grouped into the categories *education*, *health*, *pensions*, *unemployment*, *sickness and disability*, *family and children*, *housing*, *miscellaneous social protection* and *other public cash transfers*. To derive the volume of transfers in each of these categories I use data from the European System of Integrated Social Protection Statistics (ESSPROS)[15]. These data include very detailed information on type and volume of the transfers, the involved institutions and the funding source of the transfers. As the in kind transfers have been included in public consumption already, this section deals only with the cash transfers in these categories.

The most important cash transfers are clearly pensions, accounting for more than two thirds of total cash transfers (Table 1.5). The data sources for computing age profiles do not allow a distinction between different types of pensions, therefore I lump all type of pensions together. Cash transfers related to family and children accounted for 10.7 of public cash transfers in 2010 (12.4 percent in 1995), benefits related to unemployment for around 6 percent and benefits in the category disability and sickness (long-term-care allowance) for around 4 percent. The category "other public cash transfers" contain the transfers which could not be assigned to a certain age group, in particular flows in the SNA category *miscellaneous other current transfers* (e.g. transfers to NPISH). Table 1.5 gives an overview over the value of these transfers and the assignment of certain transfer programmes to categories.

[15] *Source:* Bundesministerium für Arbeit, Soziales und Konsumentenschutz. Download from: `http://www.bmask.gv.at/site/Soziales/Allgemeine_Sozialpolitik/Sozialausgaben_in_Oesterreich/29_Sozialschutzschemen_Oesterreichs` (4 April 2012)

Table 1.5: Public Cash Transfers by Function in Percent of Total

NTA Category	**1995**	**2000**	**2005**	**2010**	**Included Transfer Programmes**
Pensions	65.2	69.1	67.8	67.7	Pensionen
Family and Children	12.4	11.9	11.8	10.7	Familienbeihilfe, Kinderbetreuungsgeld, Karenzgeld, Unterhaltsvorschuss,...
Unemployment	5.7	4.7	6.3	6.0	Arbeitslosengeld, Notstandshilfe, Berufsausbildungsbeihilfe, Insolvenzentgelt,...
Sickness and Disability	4.4	3.9	3.7	3.9	Pflegegeld
Health	1.0	1.0	0.8	0.9	Krankengeld
Miscellaneous Social Protection	0.3	0.5	0.6	0.8	Sozialhilfe
Housing	0.3	0.4	0.4	0.5	Wohnbeihilfe
Education	0.4	0.4	0.4	0.4	Studienbeihilfe, Schlerbeihilfe
Other Cash Transfers	10.3	8.1	8.2	9.3	E.g. Transfers zu Non-Profit Institutionen
Total	**100.0**	**100.0**	**100.0**	**100.0**	
Public Cash Transfers in Mill. Euro	**37,124**	**41,579**	**49,341**	**60,481**	

Public cash transfers are heavily targeted at the elderly population. Pensions and long-term-care benefits account for around 70 percent of total public cash transfers. The age profiles of public transfer inflows are therefore mainly shaped by these transfers. This can be seen in Figure 1.11, in which the public cash transfer inflows in 2010 are decomposed into their most important components. The increase of public transfer inflows in old age (age 75+) is caused by the long-term-care benefits, which are not so huge in volume, but concentrated on the relative small share of elderly. Cash transfers to working age adults consist mainly of the family allowance, child care benefits and unemployment benefits. The age profiles for 2010 are based on EU-SILC and data from the wage tax statistics (pensions), the age profiles for 2005 solely on data from EU-SILC, those for the year 2000 on the CES from 1999/00 and the age profiles for 1995 are based on the ECHP. For the long-term-care benefits I use administrative data.[16]

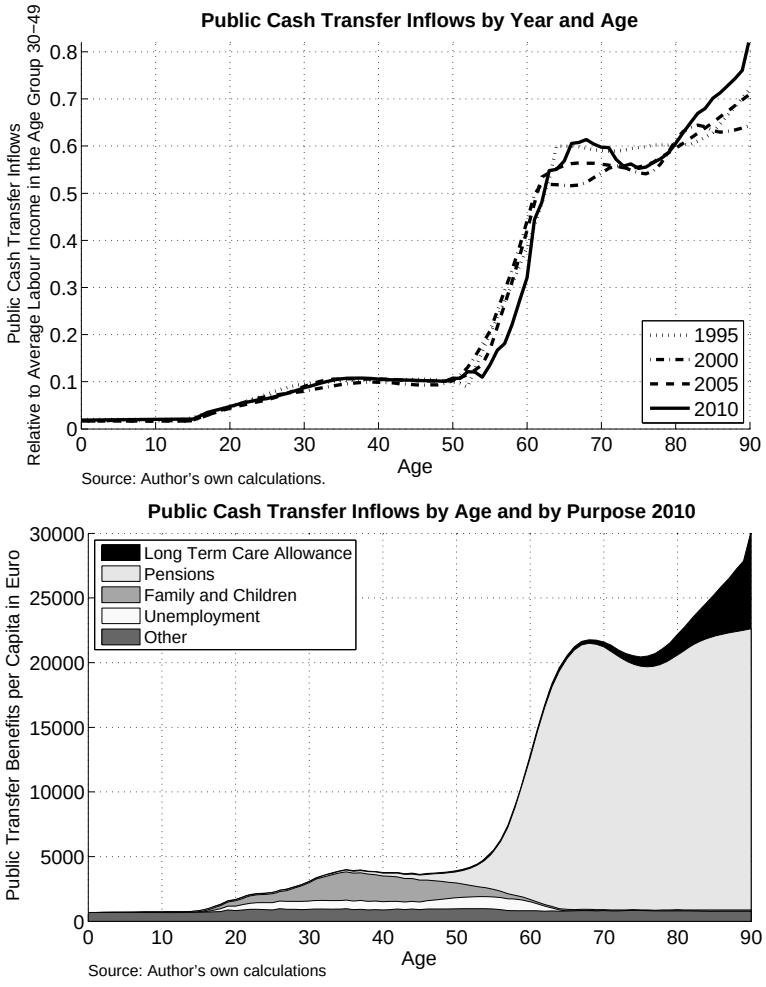


Figure 1.11: Public Transfer Inflows in Cash

[16] *Source:* Bundesministerium für Arbeit, Soziales und Konsumentenschutz.

1.4.5 Public Outflows

To provide a complete picture of age reallocations NTA does not only estimate the age-specific averages of the transfer inflows, but also of the outflows, thus the contributions of each age group to the public and private transfer system. In NTA the contributions to the public transfer system are categorized in two ways: once according to the type of outflow, distinguishing taxes, social contributions and other current transfers. And another time according to purpose, for each category of public transfer inflows (education, health, social protection, etc.) the corresponding outflow age profile is estimated.

Public outflows represent the total flow of resources from individuals to the public sector. These resources are mainly used for funding the public transfers to the households, thus public consumption and public cash transfers. However, parts of the outflows are used for net public transfers to the rest of the world (such as taxes collected by the European Union) and for public asset based reallocations such as interest payments on public debt. In 2000 and 2005 public asset based reallocations were negative; i.e. a part of taxes was used for interest payments on public debt. In the year 2010 and 1995 public asset based reallocations were positive (thus an inflow to the households); in these two years the inflows through new government debt was higher than the interest payments on the existing stock of debt.

Table 1.6: Public Transfers: Funding Structure

	1995	2000	2005	2010
Public outflows in Mill. Euro	**70,334**	**87,578**	**99,963**	**116,278**
Public outflows in % of NNI	54.1	57.3	55.6	55.0
Taxes in % of public outflows	56.2	57.7	58.1	57.4
Social contributions in % of public outflows	42.6	39.7	39.2	39.7
Other current transfers in % of public outflows	1.2	2.6	2.7	2.9
Transfers from the ROW in Mill. Euro	-340	-1,253	-1,885	-2,435
Public dissaving in Mill Euro	5,962	598	-88	5,459
Public asset income in Mill. Euro	-3,368	-5,733	-3,581	-3,380
Public transfer inflows	**72,588**	**81,190**	**94,409**	**115,922**
Public transfer inflows in % of NNI	55.8	53.1	52.5	54.8

The age profiles of public outflows are based on the sources of these flows: the age profile of taxes on payroll and workforce (e.g. wage tax, contribution to the family burden equalization fund) is based on the labour income age profile; the age-specific estimates of the income tax payments are based on the age profile of income from self-employment; the age-specific corporation tax payments are estimated using the age profile of asset income; and the payments of taxes on goods and services such as the value added tax are based on the age profile of private consumption. Social contributions are paid by employers and employees, self-employed persons and pensioners. The age-specific estimates for the payment of social contributions are therefore based on the labour income age profile, the profile for income from self-employment and the pension age profile.

The age profiles of total public outflows are shown in Figure 1.12. Outflows are small at young ages because they include only consumption taxes on private consumption. Public outflows are clearly highest for the age groups from 35 to 55, since in Austria around 59% of public outflows are paid out of labour income. In old age the public transfer outflows are again decreasing, because average private consumption, and consequently the revenue from consumption taxes, is decreasing with age. Furthermore are pensions smaller and less heavily taxed than wages.

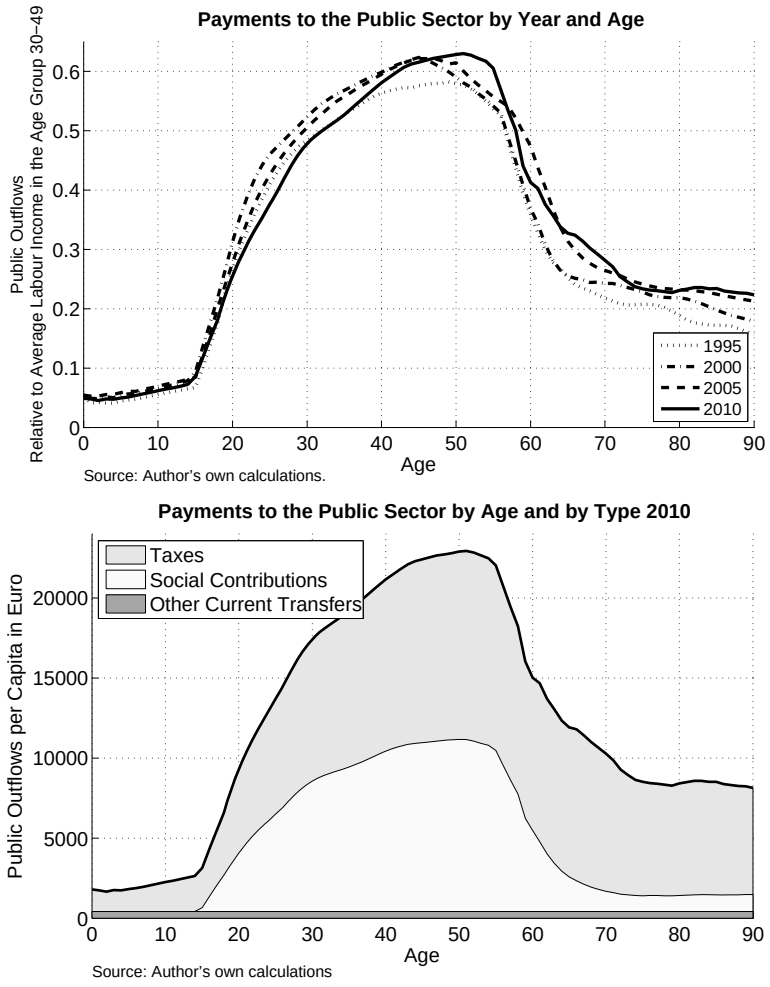


Figure 1.12: Public Outflows

NTA also estimate the age-specific contributions to each category of public transfers. The total value of outflows in each category are required to equal the total value of transfer inflows (cash and in-kind). The age profiles of these flows are estimated using the information in ESSPROS on the funding of the involved institutions. All involved institutions and consequently all transfers are funded either through payroll taxes, through the contributions to the social insurance by employees, employer, self-employed and pensioners, out of the general budget or a combination of these sources. The outflow profiles are therefore a weighted combination of the labour income and pension age profile, the age profile of social contributions and the

age profile of general taxes. General taxes consist of all taxes which are not earmarked for a certain purpose; they are basically a combination of labour income and consumption age profile because the bulk of revenues come from the wage tax and the value added tax.

Figure 1.13 shows outflows, inflows and the net flows of public transfers in total (upper left graph) and for the categories pensions, health and education. Please note that the scale of the y-axis is different in the four graphs. Pensions and health services are financed by the working age population from 15 to about 58 and directed mainly to the elderly population. The funding source for these transfers is mainly the social contributions which are paid out of labour income. Education is clearly directed to the young population. The funding age profile is rather flat, because education is financed out of general taxes which consist to a large degree of consumption taxes and income taxes which are paid also by pensioners.

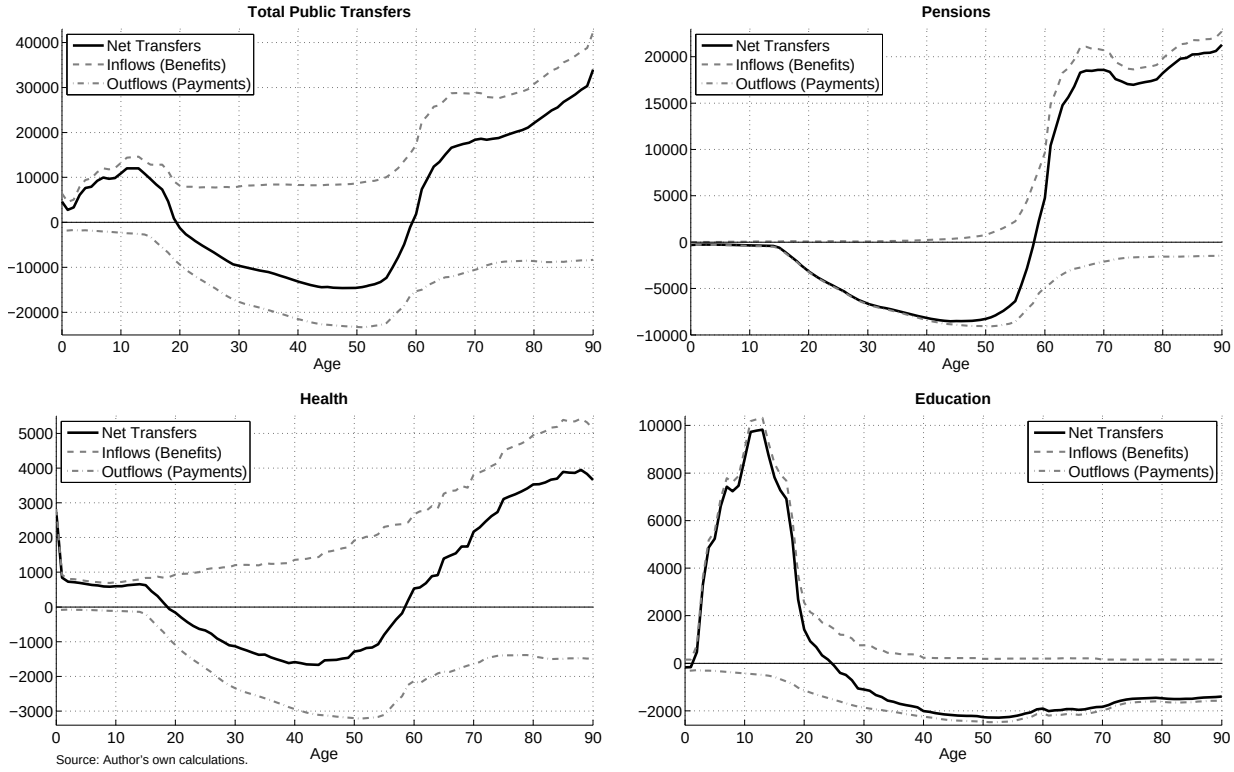


Figure 1.13: Public Transfers by Age and Purpose 2010

1.4.6 Private Asset Income

Asset income in NTA is the part of net national income which is generated through private capital input in the production processes. Its components and their relative value are listed in Table 1.7. The most important types of asset income are clearly the net operating surplus (NOS) of corporations and the capital share of mixed income. The NOS of corporations is distributed to age groups according to the age profiles of asset income. These age profiles are based on the ECHP for 1995 and 2000 and on EU-SILC for 2005 and 2010. The capital share

of mixed income is allocated to age groups according to the age profile of self-employed labour income. An important component of asset income is also the NOS of households, which consists of the housing services produced for own consumption by owner-occupiers. It is distributed according to the age profile of imputed rents (assigned to household head). Property income comprises the distribution of capital income across institutional units, for example between corporations or from corporations to households, in the form of interest, rents and dividends. In NTA it is assumed that most of the property income flows involve no age reallocation, since for the source and the receiver the same age profile is applied (e.g. flows between corporations). Of interest for the aggregate values are therefore only the net-property income flows from the public sector and the ROW. However, age reallocations through interest payments of private households are taken into account: the founding of an own household is often credit-financed; consequently there are flows from households with an head around the age of 30 and 40 to older persons who provide the funds for the credit. The age profiles of interest payments are estimated using data from the consumer expenditure surveys. Net property income as well as the taxes less subsidies on production are allocated to age groups using the survey estimates of asset income.

Table 1.7: Components of Private Asset Income

	1995	2000	2005	2010
Private asset income in Mill. Euro	26,759	36,461	46,225	51,249
Components of Private Asset Income in % of Total				
NOS of corporations	64.4	70.0	69.1	62.9
NOS of households	8.8	9.2	11.6	12.3
Capital share of mixed income	19.8	17.5	17.3	18.2
Other taxes less subs. on production	3.0	2.4	1.4	1.6
Net property income	3.9	0.9	0.6	4.9

Asset income is reported in surveys, but given only at household level. NTA assign asset income fully to the household head, it is assumed that only the household head holds assets and receives asset income. The household head is defined as the person with the highest income out of paid work and public transfers. This assumption is very central in the methodology, without it an estimation of asset income and saving age profiles would not be feasible. It has implications also for the estimation of intra-household transfers.

The smoothed age profiles of asset income are shown in Figure 1.14. There is a considerable variation in the age-specific asset income, because there is a huge variance in the size of the reported asset income and there are age groups with only few observations. The basic shape however is the same for all three years: asset income is inverse U-shaped with a peak around the age of 55. This is in line with intuition: with the decrease of income at retirement age there are fewer resources available for the accumulation of assets and a further extension of asset income. An obvious explanation for the lower asset income in older age groups is dissaving;

elderly persons use part of their assets to finance their consumption. However, this is not what we observe, income through transfers is high in old age and also retired persons have rather high saving rates. The pattern might be, at least partly, a cohort effect: older generations have been saving less because of their lower real income over the life-cycle. See Börsch-Supan (1995) for German data. The most likely explanation for the decreasing asset income in older ages is capital transfers to younger generations. It is common practice to transfer assets not in form of bequests but in form of gifts or presents. One reason is the avoidance of recourse to the assets in case the asset holder needs long-term-care in public institutions or the market; if there are no assets available (i.e. if they have been transferred early enough to the children) long term care is financed by the public sector.

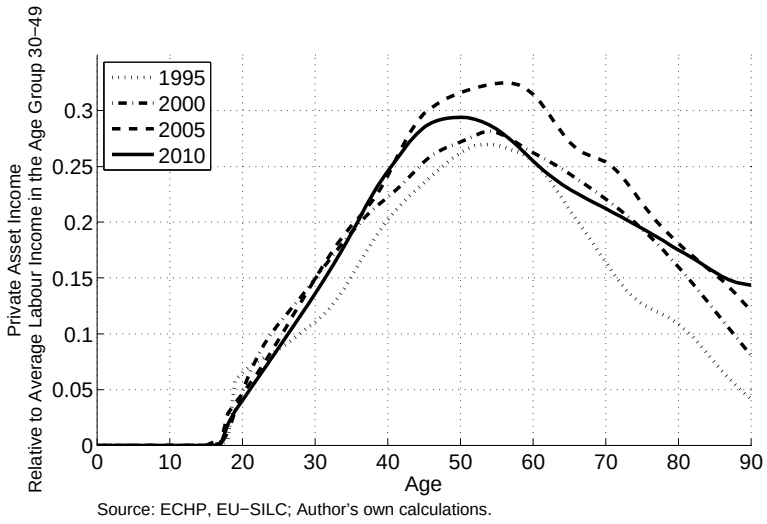


Figure 1.14: Private Asset Income by Year and Age

1.4.7 Public Asset Income and Public Savings

Public asset based reallocations are distributed to individuals according the general-tax age profile since it is the tax-payers who have to finance public savings and the (negative) asset income (interest payments on public debt).

1.4.8 Inter-Household Transfers

While NTA provides sound estimates for the other variables, the estimates of inter-household flows suffer from a lack of data and from gaps in the methodology. Table 1.8 lists the components of inter-household transfer outflows and inflows for 2010.

Although there are potential age reallocations through inter-household transfers, it is a very difficult task to estimate age reallocations through these transfer flows. So far the NTA methodology suggests a method for private transfers which are captured in surveys, namely a part of the miscellaneous current transfers. For Austria these transfers are supposed to

Table 1.8: Inter-Household Transfers 2010 in Mill. Euro

	Outflows	Inflows
Taxes/Subsidies on products to/from the ROW	635	1,198
Other current transfers	13,044	12,589
Non-life insurance premia	5,916	6,036
Non-life insurance claims	6,036	5,872
Miscellaneous current transfers	1,092	681
Social contributions	4,292	3,980
Social benefits	2,318	2,892
Consumption of NPISH	4,254	4,254
Inter-Household Transfers	**24,543**	**24,913**

be captured in EU-SILC, a closer look reveals that the values are highly unreliable. Due to the lack of data I assume that inter-household transfers do not result in a redistribution of resources over age groups, and assign outflows as well as inflows to the household head. This should not pose a problem regarding the comparability of our data with the NTA data from other countries; the estimated magnitude of net inter-household transfers according to the NTA methodology (which captures only a small part of total inter-household transfers) is extremely small.

1.4.9 Intra-Household Transfers

The most important intra-household transfer flows are clearly those from parents to children. Intra-household transfers are not directly observable, since neither income surveys nor the consumer expenditure surveys cover flows within a household. Nor are there aggregate values available, since the System of National Accounts (SNA) measures only transfers between (and not within) institutional units. In NTA these transfers are estimated using the flow identity, which states that consumption plus saving has to equal disposable income:

$$C + S^p + S^g = YL + YA + \tau^g + \tau^{inter} + \tau^{intra} \tag{1.3}$$

Recall that C denotes consumption, S saving, YL labour income, YA asset income, τ^g public transfers, τ^{inter} inter-household transfers and τ^{intra} intra-household transfers. Since we have already estimated the age-specific average values of all the terms in the equation except intra-household transfers and private savings, we choose these two quantities so, that the equality holds for each individual.

The assumption that only the household head owns assets allows the unambiguous identification of saving and intra-household transfers. Since it is only the household head who receives inter-household transfers, asset income and who saves, these terms do not show up in the flow identity for non-head members. For the individuals who are not household head the

calculation simplifies to:

$$\tau^{intra} = C - (YL + \tau^{g}) \tag{1.4}$$

If for a non-head household member the consumption is higher than labour income plus the public transfer net benefits, the gap is covered through intra-household transfer inflows. If labour income plus the net public transfer benefits is higher than consumption, intra-household transfers are negative, representing an outflow. Note that the intra-household transfers for non-head members determine also intra-household transfers for the household head, since in- and outflows have to balance within the household. With the exception of saving there are now all terms in the flow identity for the household head known, and saving can be estimated by requiring the flow identity to hold for the household head.

The estimations are based on micro-data of the consumer expenditure surveys. However, from the surveys only the information about age and the household structure is used. The information about age-specific consumption, labour income, public transfers, public asset based reallocations and inter-household transfers is taken from the estimated age profiles. In the first step intra-household transfers are estimated for the household members which are not household-head as difference between labour income, public net-transfers and consumption (Equation 1.4). If labour income and public net transfers exceed consumption, the difference is denoted as individual surplus, otherwise as individual deficit. It is clear that an individual surplus represents an outflow and a deficit an inflow of intra-household transfers for the respective age group. To identify intra-household transfer completely we have to make assumptions about the direction and source of these flows: an individual deficit of non-head household members is fully covered by transfers from other household members; each of the members with a surplus transfers a household-specific share of her/his surplus to those members with a deficit. If the surpluses are not enough to cover the deficits, thus if the total deficit of the household exceeds the total surplus, the shortfall is financed by the household head through asset based reallocations.

If non-head members have a surplus left after financing the deficits of other household members they transfer the rest to the household head for saving. This assumption does probably not resemble the mechanisms of resource-reallocation within a household; it is chosen for methodological reasons. Since the prevailing household structure is the one of nuclear households with two adult persons of similar age, the assumption does not result in huge flows across age groups. The age groups for which the assumption is most likely to bias the intra-household transfer profile are those in the 20s; they generate already an individual surplus but often still live with their parents – in reality they do not transfer their surplus to them. The estimates of these intra-household saving flows are rather small and affect the estimates of total intra-household transfers only marginally.

The individual surplus/deficit of the of the household-head is essentially computed in the same way; she/he can have additional resources through net inter-household transfers[17]. However, for the household head the individual surplus/deficit does not necessarily represent an intra-household transfer. A deficit of the household-head represents an intra-household transfer inflow only to the extent it is covered by other members through their surpluses.

Housing consumption in owner occupied dwellings is treated in a different way, since it is a part of asset income and therefore assigned to the household head. The housing consumption of non-heads is funded by an intra-household transfer from the household-head to the non-head members.

The estimates of the intra-household transfer age profiles are shown in Figure 1.15. There are large inflows to children and outflows from the age groups of their parents. The net-flows of the elderly above 60 are close to zero but turning again negative in older ages. One explanation for this pattern is long-term-care benefits: in multi-generation households with members in need of care the care-services are provided by the younger and healthy members, they receive part of the long-term-care benefits in return. We also have to be aware that we measure only current transfers which do not include capital transfers such as larger gifts and bequests.

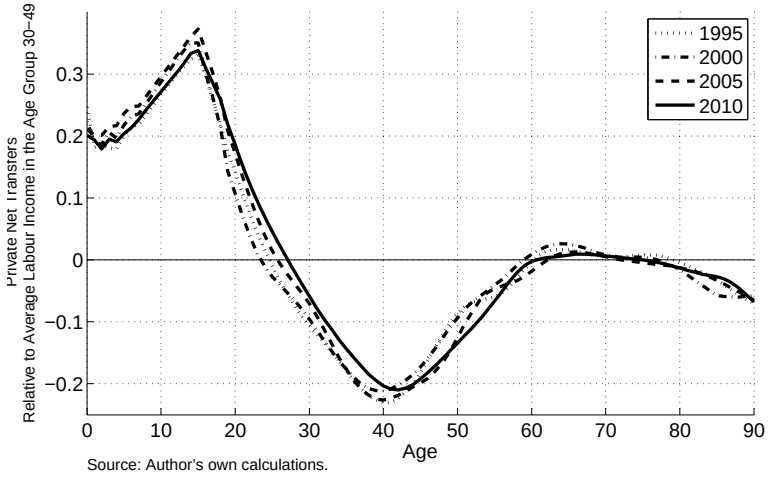


Figure 1.15: Private Net Transfers by Year and Age

1.4.10 Private Savings

Private savings is the final age profile which is estimated in NTA. It is the residual in the flow-identity of the household-head, which is also depicted for clarity once more at this place:

$$S = \underbrace{YL + YA + \tau^{g} + \tau^{inter} + \tau^{intra} - C}_{\text{disposable income of household-head minus consumption}} \tag{1.5}$$

[17]Note that there is no actual distinction between the head of households and other members in calculating the individual surplus/deficit. We use age group averages; that the age groups of household heads receive and pay more private transfers is taken already into account in the computation of these averages.

The household-head receives the household's asset income and administers the household's total surplus or deficit on behalf of the other members. If the income of the household exceeds its consumption, the surplus amount is assigned to the household head as savings. If the household runs a deficit even after taking into account asset income, the household-head has to finance the deficit through dissaving.

Saving is high in households with a head in the age group 50-70; a result which is not surprising regarding that this age group also generates the highest labour income. Also in households with a head in retirement age, savings are on average positive. There is a scarcity of resources in younger households: an average household with a head under the age of 30 does not have resources available for saving. This however is inconsistent with the asset income profile which shows, that these age groups receive asset income — impossible regarding that there are no savings, unless they receive the assets through capital transfers from the elderly. A further indicator which points in this direction is the decrease in asset income in households with an older head; these households have positive savings and should therefore increase the stock of assets and asset income.

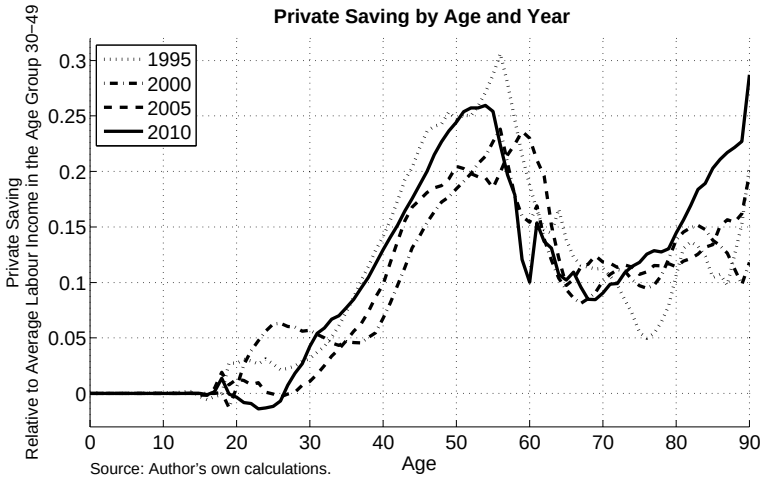


Figure 1.16: Private Saving by Year and Age

1.5 Austria in Comparison with Other European Countries

One of the most important aims of the NTA project is the generation and provision of data that is comparable across countries. In this section I want to give a short overview how the results for Austria compare to those from other European countries. Figure 1.17 illustrates the basic NTA results for the European NTA countries in a similar way as Figure 1.1 in Section 1.1: the components of the net inflows are plotted on the positive y-axis and the components of the net outflows on the negative y-axis. Labour income is represented by the white area, public net transfers by the dark-grey area, private net transfers by the light-grey area, asset

based reallocations (ABR) by the black area and consumption is represented by the black solid line.

Already this first analysis reveals some problems regarding the comparability of the data. The NTA data for Finland and the UK are obviously inconsistent. If the inflows of resources in form of labour income, net transfer inflows and asset based reallocations exceed consumption, the excess inflows should be reflected in outflows on the negative y-axis. In Figure 1.17 the excess inflows are represented by the part of the shaded bars which lie above the black line representing consumption; the outflows are represented by the shaded bars on the negative y-axis. The size of these bars should be consequently the same. This is not the case for these two countries, resulting in a violation of the accounting identity.

Certain patterns of the average economic life course are similar in the European NTA countries. A popular indicator in NTA is the age at which average labour income exceeds average consumption. In most of the European NTA countries this is from the age of 25 to about 59/60. There are some differences regarding the upper age-border: in Slovenia of 2003 average labour income fell short of consumption already at age 56, while the corresponding age in Sweden was 63. These results reflect the early retirement age in Slovenia and the late retirement in Sweden. The consumption of children is in all countries mainly financed by private transfers[18], although the public sector also plays a large role through the provision and the funding of formal education. Young persons become on average contributors to the public transfers system at the beginning of their twenties, when a large part of the population enters the labour market. Private net transfers are received until a higher age; the contributions to private net transfers become positive at the end of the twenties, an age at which many individuals set up their own family and transfer part of their income to the own children. In all of the European NTA countries is the consumption of elderly persons financed mainly by public transfers. The role of asset based reallocations differs across the countries: they play a small role in Austria, Slovenia, Hungary and Sweden; they are important in Spain, Germany and the UK. In some of the countries elderly persons are contributors to the private transfer system. However, the net transfers from these age groups seem to be small. But we have to keep in mind that NTA is dealing with current transfers; there is certainly a transfer from elderly persons to younger generations in form of capital transfers.

Some of the differences in the data are due to differences in the methodology. Hungary is the only European country where public transfers in young age are higher than the private transfers. A closer look at the age-specific contribution to the public transfer system reveals, that this is due to the application of a different methodology: the public transfer outflow age

[18]The larger importance of public transfers for children in Hungary can be explained by differences in the applied methodology.

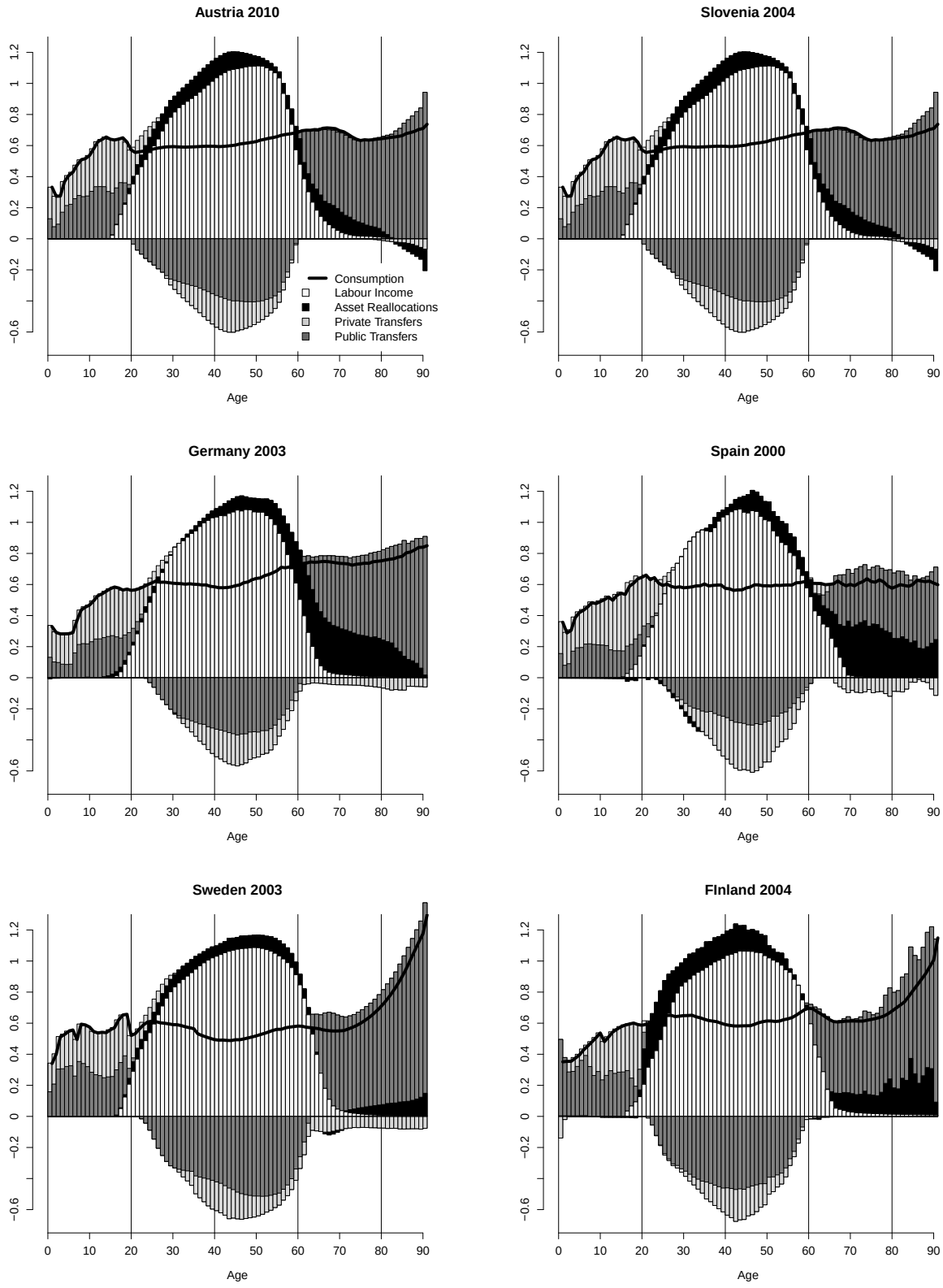


Figure 1.17: National Transfer Accounts - Results for European Countries in Relation to the Average Labour Income between 30 and 49

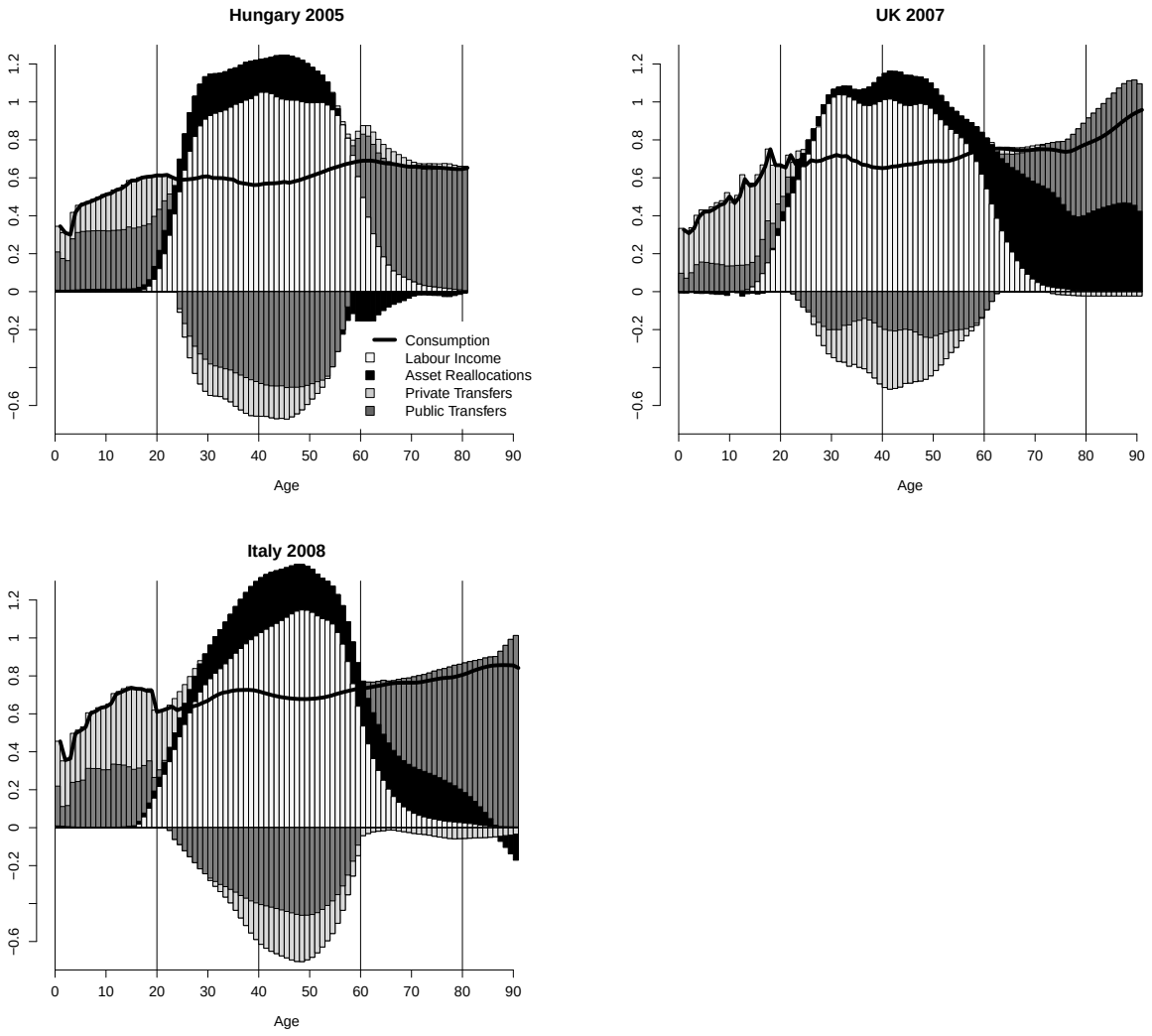


Figure 1.17: National Transfer Accounts - Results for European Countries in Relation to the Average Labour Income between 30 and 49

profile for Hungary does not account for tax payments of children and pensioners. On one hand this decreases the private transfer to the children, as the taxes which are paid by the children are not transferred to them in the first place. On the other hand it increases the public net-transfers to the children, because there are no flows from the children to the public sector. The share of public transfers is therefore higher than in other countries. The extremely low importance of asset based reallocations in Sweden might also result from differences in the methodology. I calculated NTA aggregates for all European NTA countries using European Accounts data. According to this calculation total public transfer inflows in Sweden amounted to SEK 1,163,000 Mill. in 2003. The aggregate in the NTA data however is SEK 1,427,000. Thus, the value used by the Swedish team is more than 20% higher than the value which is calculated using the same methodology as in Austria and most of other European countries. This might explain the rather low role of asset based reallocations and the outflow of private

transfer in Sweden: if the inflows in old age are higher than the true value, the excess is captured in high saving and in private transfer outflows.

Characteristic for Austria is, that young people start generating labour income rather earlier in life, visible in the labour income age profiles. About one third of the population enters the labour market already at the age of 15 through the so called dual system, which combines work and education. With the higher vocational schools there is another compact and popular educational track which prepares persons for medium and high skilled jobs and finishes already at the age of 19. Enrolment in tertiary education is rather low compared to other countries.[19] Austria is together with Slovenia, Sweden and Hungary among the countries in which consumption in old age is almost exclusively financed by public transfers and only little use is made of asset based reallocations.

1.6 Conclusions

The age reallocation of resources plays a fundamental role in shaping the economic life course of individuals, particularly by providing access to economic resources in childhood and old age. In 2010, for example, only the persons between the age of 24 and 59 were on average able to finance their consumption fully out of own labour income. The dimension of age reallocations was therefore remarkable: the consumption of children and young adults which had to be financed through age reallocations amounted to 19 percent of total labour income, the consumption of elderly persons to 23 percent. Consumption in childhood is, with the exception of publicly provided education, mainly financed by the family; the consumption of the elderly mainly by public transfers. Compared to other European countries rely elderly persons in Austria heavily on public transfers; asset based age reallocations play only a minor role. The public sector plays therefore an important role in the redistribution of resources in Austria: around 56 percent of the generated net income is redistributed through public sector transfers.

NTA provide important information for policy makers and scientists by measuring the magnitude of age reallocations, and by illustrating the channels and mechanism. Although the system relies on assumptions, sensitivity analysis indicates that the method is very robust. Nevertheless, the system has some weak points which can be attributed to a lack of data and gaps in the NTA methodology. Among these weak points is the lack of information about the population not living in private households; a lack of data and a gap in the methodology for the estimation of inter-household transfers; the ignorance of capital transfers; and problems

[19] In 2010 21% of the 25-34 year old population had attained tertiary education, compared to 26% in Germany, 42% in Sweden and 46% in the UK (OECD, 2013). `http://dx.doi.org/10.1787/888932664233` (accessed 22 November 2013).

with the cross-country comparability of NTA data.

The NTA estimates for elderly persons are potentially biased, because there is little or no information on the population living in institutions such as retirement homes. It would be already a huge advantage to have age-specific information on the size of this population. The lack of data for the institutionalized population cannot be easily solved. A full integration into the NTA system can only be achieved with an inclusion of the institutionalized population in income and consumption surveys.

Age reallocation through inter-household transfers is only to a minor degree taken into account in NTA. While the assumption of no age reallocation is reasonable for some of the inter-household transfers (e.g. insurance premiums/claims), there are certainly age reallocations through social contributions/benefits organized by firms or the activities of NPISH. An age-specific estimation of these types of transfers would require access to more detailed SNA data, as well as data from firms and NPISH. This would be an elaborate and time consuming work with a very uncertain prospect of success.

By including only current flows, NTA give an incomplete and inconsistent picture of total age reallocations. People start receiving asset income at very young ages, the saving rates cannot explain this pattern. Capital transfers certainly play an important role. Until recently there was no data on the stock of assets of households and the received asset income. With the Household Finance and Consumption Survey there is now data on assets and asset income of households available. Part of the future work of the Austrian NTA team includes certainly the compilation of NTA wealth accounts.

Another weak point is the cross-country comparability. One aim of the NTA project is the provision data which is suitable for gross-country comparisons. The set-up of the NTA project with country teams facilitates access to country-specific data sources, and ensures that the accounts are generated by researchers who familiar with country specific circumstances. However, the results cast some doubt if the same methodology is used in all the countries. Some of the cross-country differences seem to result more from differences in the applied methodology than from "real" differences. Furthermore, the NTA dataset is very complex, the generation of this data might be too demanding for research teams with small budgets. To be really useful for cross-country comparisons more efforts should be used to develop a methodology which ensures cross-country comparability, or to centralize the calculation of NTA. This is exactly what will be done in the AGENTA project, a collaborative project of the European NTA members which is financed through the FP7 programme of the European Union and which started in January 2014.

NTA are an excellent starting point for a deeper analysis of age-related economic decisions of

individuals, leading to a better understanding of the role of norms and institutions in these decisions. One step in this direction is the decomposition by gender and the inclusion of unpaid household work into the NTA framework in part 3 and 4 of this thesis. But already the NTA core accounts in this paper illustrate important aspects of the relation between age and economic activities and the importance of institutions. An application of NTA data for a comparison of Austria and Sweden is shown in the next part of the thesis.

References

Börsch-Supan, A. (1995). Age and cohort effects in saving and the german retirement system. *Ricerche Economiche*, 49(3):207–233.

Lee, R. and Mason, A., editors (2011). *Population Aging and the Generational Economy: A Global Perspective*. Edward Elgar Publishing Limited. Download from: `http://idl-bnc.idrc.ca/dspace/bitstream/10625/47092/1/133467.pdf` (accessed 9 February 2014).

OECD (2013). *Education at a Glance 2013*. OECD Publishing.

Sambt, J. and Prskawetz, A. (2011). National transfer accounts for austria: Low levels of education and the generosity of the social security system. In Lee, R. and Mason, A., editors, *Population Aging and the Generational Economy: A Global Perspective*, pages 256–268. Edward Elgar Publishing Limited. Download from: `http://idl-bnc.idrc.ca/dspace/bitstream/10625/47092/1/133467.pdf` (accessed 9 February 2014).

SNA (2009). *System of National Accounts 2008*. European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank. Download from: `http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf` (accessed 20 January 2014).

SV (2013). *Die Österreichische Sozialversicherung in Zahlen*. Hauptverband der Österreichischen Sozialversicherungsträger. Download from: `http://www.sozialversicherung.at/mediaDB/776065_Sozialversicherung_in_Zahlen.pdf` (accessed 7 November 2013).

UN (2013). *National Transfer Accounts Manual: Measuring and Analysisng the Generational Economy*. United Nations, Department of Economic and Social Affairs, Population Division. Download from: `http://www.ntaccounts.org/doc/repository/NTA%20manual%202013.pdf` (accessed 5 February 2014).

Chapter 2

The Public Reallocation of Resources across Age: A Comparison of Austria and Sweden

Authors: Bernhard Hammer, Alexia Prskawetz

This chapter consists of a paper which uses NTA data for a comparison of Austria and Sweden. The paper "The public reallocation of resources across age: a comparison of Austria and Sweden" has been published in the special issue *Economics of Ageing* of the Journal *Empirica* in August 2013 (Volume 40, Issue 3, p. 541-560). It is here reprinted with kind permission from Springer Science and Business Media. I wrote this paper together with Alexia Fürnkranz-Prskawetz, the calculations as well as substantial parts of the paper are my own work.

This work was supported by the Austrian Science Fund [Project I 347-G16 "National Transfer Accounts and intergenerational redistribution in European institutional settings"] and by the Vienna Chamber of Commerce [Wirtschaftskammerpreis 2011]. We also thank Werner Richter for the English proof reading.

2.1 Introduction

Low fertility together with increasing survival to old age will shape the future age structure of the population and in particular also the size and age structure of the labour force. These trends are in many countries reinforced by the baby boom generation which will start retiring in the next years. In addition to these demographic conditions, later entry into the labour force accompanied with early retirement ages have led to a decrease in the working-life span during the last decades. Faced with these demographic and institutional conditions that raise the ratio of retired to working people, it is important to investigate the role of the public transfer systems for the reallocation of resources across ages.

While most studies focus on the sustainability of the pension system, we are interested in the reallocation of resources across the whole age range. In particular we are interested in the in- and outflows (from the individual's point of view) of public resources at all ages and how these are shaped by the institutional settings. Public outflows consist mainly of taxes and social contributions; the inflows are in-kind services as well as cash benefits provided by the public sector, ranging from child support, education, unemployment insurance and sick leave to pension payments and elderly care.

Based on data from the National Transfer Accounts (Lee and Mason, 2011), the aim of our paper is to study age reallocation of public transfers in Austria in comparison to Sweden. We chose Austria because we are familiar with the data and the institutional environment. Sweden was chosen because it is also member of the NTA-project and because it is similar to Austria with respect to the economic output and the extent of the welfare state, but nevertheless quite different regarding the design of the age-specific allocation of public transfers and the design of the economic life cycle.

Both countries are highly developed welfare states with a similar level of production and income and with a large public sector: the purchasing-power adjusted GDP per-capita in 2010 was €30,891 in Austria and €30,433 in Sweden,[1] government expenditure amounted to 52.5 percent of GDP in Austria and 52.3 percent in Sweden.[2] However, there are remarkable differences between the two countries in the way they finance public expenditures: while in 2010 Sweden financed government expenditures by revenues amounting to 52.5 percent of GDP and has been running a small surplus, public revenues in Austria amounted to 48.1 percent of GDP and fell short of expenditures, a gap which had to be covered by a public deficit of 4.5 percent of GDP. Austria and Sweden also differ markedly regarding the shape

[1] All monetary values are given in Purchasing Power Standards (PPS): PPS are an artificial currency with the same purchasing power in each country. One PPS-Euro has the average purchasing power of one Euro in the European Union (European Communities, 2008).

[2] *Source:* Eurostat, Government finance statistics.

of the average economic life cycle, i.e. in the level and type of production and consumption at each age. Since public transfers are closely linked to the shape of the economic life cycle, the public sectors in Austria and Sweden therefore differ in the way they are redistributing resources among age groups. Combining the age-specific reallocation of resources with the projected demographic structure, we can then compare the development of the ratio of public expenditures to revenues for the future. Such a simple shift-share analysis may yield a first insight in the sustainability of the current public transfer system in Austria as compared to Sweden.

The paper is structured as follows: in the following section we give an overview of the economic life cycle in Austria and Sweden based on the most recent data from the National Transfer Account project (Lee and Mason, 2011). In Section 2.3 we review public transfers in Austria as compared to Sweden. We first present aggregate numbers and then focus on the age-specific shape of net public transfers in both countries. By plotting the cumulative distribution of public transfer benefits over the population ordered by age we investigate whether transfers are biased towards specific age groups. Based on NTA data we then provide projections of economic dependency ratios for Austria and Sweden up to 2040 in Section 2.4. In the final section we summarize our findings.

2.2 The Economic Life Cycle in Austria and Sweden

The economic life cycle describes and measures the age-specific type and intensity of economic activities. Although there is a large variation in the shape of individual economic life cycles, country-specific economic activities at each age are strongly influenced by national institutions. The age at first labour market entry, for example, is influenced by the national education system and the local conditions in the labour market. In most countries the retirement age is more or less determined by the public pension system, and the consumption of health and care services is likewise influenced by the design of the corresponding social protection systems. The age reallocation of resources through the public sector plays a particularly important role in enabling periods of economic dependency in young and in old age.

To study the differences in the economic life cycle between Austria and Sweden we compare age-specific average economic activities between both countries. Our comparison of Austria and Sweden is based on data from the National Transfer Accounts project (Lee and Mason, 2011). National Transfer Accounts (NTA) measure for a certain year how much labour- and asset income each age group generates, how income is subsequently redistributed across age groups through public and private transfers and how each age group uses the disposable resources for consumption and saving. A central equality in the NTA concept and methodology is the following: for individuals at each age as well as for the economy as whole the resources

used for consumption (C) and saving (S) equal the disposable income consisting of labour income (YL), asset income (YA) and net-transfer inflows through public transfers (τ^g) and private transfers (τ^p):

$$C + S = \underbrace{YL + YA + \tau^g + \tau^p}_{\text{disposable income}} \tag{2.1}$$

The NTA concept and data allows to examine how each age group finances consumption and saving and to answer questions of the following type: at what age can consumption and saving be fully financed out of one's own labour- and asset income? If labour- and asset income exceed consumption: how much of the generated income at each age is used for saving, how much is transferred to other age groups such as retirees and children? If labour- and asset income falls short of consumption and saving: how are the needs financed, how important are private, how important are public transfers?

A huge advantage of NTA is its consistency with the System of National Accounts: NTA introduce age into the System of National Accounts (SNA) by distributing central quantities in the SNA such as incomes, consumption, taxes/social contributions and social benefits to age groups. National Transfer Accounts additionally contain estimates for intra-household transfers, e.g. transfers from the parents to the children as these transfers are not captured by the SNA. The broad estimation strategy for age-specific economic quantities is, first, to derive the aggregate values (e.g. total income, total consumption) from the System of National Accounts and related sources. In the second step the distribution of these quantities over age groups is estimated using survey- and administrative data. All the age-profiles are then adjusted by an appropriate factor, so that the per-capita averages for each age group summed up over the total population match the aggregate values. An exception are intra-household transfers – their estimation is solely based on survey data since these flows are not captured in the SNA. It is mainly due to a lack of data that certain transfers are not, or only incompletely captured by NTA: NTA include only current transfers[3] and do not include private capital transfers such as bequests, larger (infrequent) gifts and dowries. Neither do they include all public transfers, namely those consisting of the use of public capital such as public infrastructure. And although private transfers between households are captured in NTA, their effect on the age reallocation is due to the lack of data difficult to evaluate. The estimates for these transfers have to be treated with a healthy portion of scepticism. As this paper focuses mainly on current public transfers these shortcomings should not affect our analysis.

The dataset consists of age profiles of the above-mentioned variables, which contain the average per-capita values for each age group. As base year we use 2010, so all the quantities are adjusted to the SNA values from this year. However, for Sweden there are SNA data, but no

[3]Current transfers include the flows captured by the current accounts of the SNA as well as the current (non-capital) transfers within the households.

National Transfer Accounts data available for 2010. We therefore use the NTA age-specific data from 2006 and adjust them to the aggregate values of 2010. Historical NTA data show that the shape of the age profiles changes only slowly which justifies the assumption that the age profiles in 2006 and 2010 were the same. However, we also want to point out that in the long run the relation between age and economic activity is dynamic and adjusts to changes in age-structure of the population as well as to changes in the macro-economic conditions. Our projections based on the assumption of constant age profiles serve to illustrate the importance of the design of the economic life-course for public revenues/expenditure but should not be understood as a projection of the total amount of future revenues and expenditure. For more information about Austrian NTA-data see Sambt and Prskawetz (2011). The Swedish data has been provided by the local NTA team, a more detailed description can be found in Forsell et al. (2008).

Table 2.1 gives an overview of the components of income and its use in Austria and Sweden. The NTA Net National Income at basic prices corresponds by and large to Net National Income (NNI) at basic prices as it is usually defined in National Accounts. It is derived from GDP by adding net primary income from the rest of the world and subtracting the Consumption of Fixed Capital and the Taxes on Products. The Net National Income at basic prices is a measure for the amount of resources which are available in the economy after compensating property owners and after replacing the depreciation of capital, but before transfers are implemented. NTA distinguish only between two sources of income: labour income and asset income. Labour income includes mainly the Compensation of Employees (including remuneration for work in cash and in-kind, and the employers' social contributions), while asset income comprises mainly the Net Operating Surplus. Mixed Income generated by unincorporated enterprises implicitly contains the remuneration for the work done by the owner as well as the return for the invested capital. It is therefore distributed to both sources of income – two-third to labour income, one-third to asset income. Although per-capita GDP is higher in Austria, the per-capita NNI at basic prices is higher in Sweden. One of the reasons is that Sweden receives a positive net property income from the Rest of the World (ROW); Austria is paying property income to the ROW.[4] The differences between the two countries are mainly due to the higher interest payments for the Austrian public debt. As asset income consists mainly of property income its share on total income is therefore higher in Sweden with 25 percent, as compared to Austria with 23 percent.

Part of the national income is transferred to other countries and therefore not included in the disposable income, a measure for the resources available for the purposes of consumption and

[4]Net property income received from the rest of the world is the net-income receivable by the domestic institutional unit for putting a financial asset or a tangible non- produced asset at the disposal of another non-domestic institutional unit. It consists of interest, dividends, rent ... See: OECD - Glossary of Statistical Terms

saving. These transfers are mainly in the form of social benefits paid to non-residents, taxes paid to the European Union (GNP-based fourth own resource) and international cooperation such as contributions to international organizations and foreign aid. The higher involvement of Sweden in the latter activities explains the higher value in this category.

There are considerable differences how the disposable income is used: the savings rate (Net Saving relative to Disposable Income) in 2010 was higher in Sweden with 16.1 than in Austria with 12.1 percent. This difference can be explained by the dissaving of the public sector in Austria: in 2010 the savings of the private sectors[5] amounted to 14.6 percent of the disposable income in both countries, but the public sector in Sweden managed to save 1.5 percent of the total disposable income while the public sector in Austria had to finance expenditures of about 2.6 percent of the disposable income through dissaving. Likewise, the proportions of public and private consumption are different in the two countries: while in Sweden 43 percent of total consumption expenditure is public consumption, the share of public consumption is only 30 percent in Austria.

Table 2.1: The Generation and Use of Income 2010 in Euro (PPS)

	SWE	AUT
Net National Income (NNI) at Basic Prices	**23,078**	**22,819**
Labour Income in % of NNI	75	77
Asset Income in % of NNI	25	23
Transfers from the Rest of the World	**-421**	**-223**
Disposable Income (DI) at Basic Prices	**22,657**	**22,596**
Consumption Total in % of DI	83.9	87.9
Private Consumption in % of Total Cons.	57.2	69.9
Public Consumption in % of Total Cons.	42.8	30.1
Saving Total in % of DI	16.1	12.1
Private Saving in % of Total DI	14.6	14.7
Public Saving in % of Total DI	1.5	-2.6

Sources: Eurostat, European sector accounts; Authors' own calculations.

Important economic activities that differ by age are consumption and the generation of income through a person's own labour. In most developed economies the generation of labour income is concentrated in the age groups between 20 and 65 – with large cross-country differences in the 55+ age groups. While the age variation is smaller for total consumption, the type of consumption goods varies considerably: the consumption of education goods and services is concentrated in the age groups between 6 and 25, the consumption of health and long-term-care services in the 65+ age groups. The differences between Austria and Sweden in labour income and consumption by age are analyzed in the following two sections.

[5]The private sectors consist of households, financial- ans non-finacial corporations and non-profit institutions serving households.

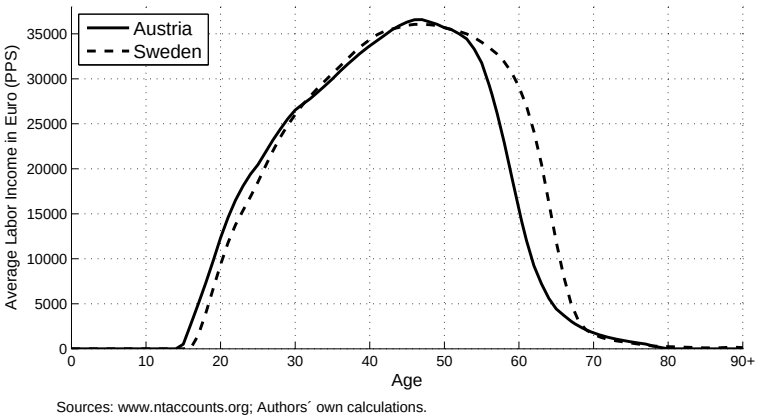


Figure 2.1: Age Group Averages of Labour Income 2010

2.2.1 Labour Income

There are pronounced differences in the average labour income by age group (Figure 2.1). Austrians start generating labour income at a younger age than Swedes do. One of the reasons is the vocational education system in Austria, in particular the apprenticeship-track which combines in-firm training and schooling. Around one-third of a cohort enters the labour market through this track of upper secondary education and starts generating labour income already at the age of 15. A similar track in Sweden is much less developed, vocational upper secondary education is mainly school-based. Another reason why Austrians enter the labour market at younger ages is the much lower youth unemployment rate: the unemployment rate for under-25-year-olds in 2010 was 8.8% in Austria but 25.2% in Sweden.[6] The most pronounced differences in the labour income age profiles however are found in the age groups from 55 to 64, reflecting the much earlier exit from the labour force in Austria. The average effective age at labour market exit for the period 2004-2009 was 58.9 for Austrian men, 66 for Swedish men, 57.5 for Austrian women and 63.6 for Swedish women (OECD, 2011).[7] These patterns of labour force entry and exit ages clearly affect total labour income: the age group 55+ generated 23 percent of the total labour income in Sweden, but only 13 percent in Austria.

The labour income age profiles are mainly shaped by the labour force participation rates, which are shown for men and women in Table 2.2. From these numbers it is evident that Austrians exit the labour market at much younger ages than Swedes. Gender differences are higher in Austria, caused by the lower participation rate of women: with the exception of the very young the participation of women is higher in Sweden than in Austria, although part-time work is more common in Austria (46.2% of all employed women vs. 35.9% in Sweden[8]) and

[6] *Source:* EUROSTAT

[7] Data available from: http://dx.doi.org/10.1787/888932370341 (accessed April 10, 2013)

[8] *Source:* EUROSTAT, Part-time work as percentage of total employment 2010

Table 2.2: Participation Rates by Age in Percent 2010

	Sweden		Austria	
Age	Women	Men	Women	Men
15-24	51.2	51.7	54.1	63.6
25-54	87.5	93.6	82.8	92.5
55-59	82.0	88.3	52.3	73.3
60-64	58.8	70.8	14.8	30.7
65+	7.7	16.7	3.6	7.7

Source: OECD

the fertility rate is lower (1.44 as compared to 1.98 in Sweden[9]).

2.2.2 Consumption

Consumption age profiles of developed economies indicate some unique pattern: public consumption expenditure is high for children and for young adults due to publicly provided education and for the elderly due to the use of public health and long-term-care services. The age groups between 20 and 60 profit mainly from collective consumption of public goods that are provided independent of age, such as administration and defence. Overall, private consumption is a substitute to public consumption; it is low in childhood and for the elderly and peaks around the age of 30 and between ages 55 and 65. Though the average per-capita income increases in the age group from 30 to 50, consumption expenditure stays constant or even decreases in these ages since the presence of children implies that available resources have to be distributed over a larger number of persons.

There are, however, also evident differences between Austria and Sweden. These are the higher consumption relative to disposable income in Austria and the higher share of public consumption on total consumption in Sweden (Table 2.3). Part of the higher share of public consumption in Sweden can be attributed to the higher expenditure on child-care and preschool-education. But in Sweden the share of public consumption is also higher for all other age groups. This can be explained by the slightly larger public sector in Sweden and by the type of transfers: public transfers in Sweden are mostly in-kind transfers and as such part of public consumption. Austria applies much more cash benefits which enable the beneficiary to buy the services on the market (long-term-care allowance) or with the purpose of compensating people for the provision of services which are important for the community (childcare allowance). The use of cash transfers is discretionary; a part might be used for saving or for private transfers, for the most part, however, they are finally used for private consumption.

[9] *Source:* EUROSTAT, Fertility 2010

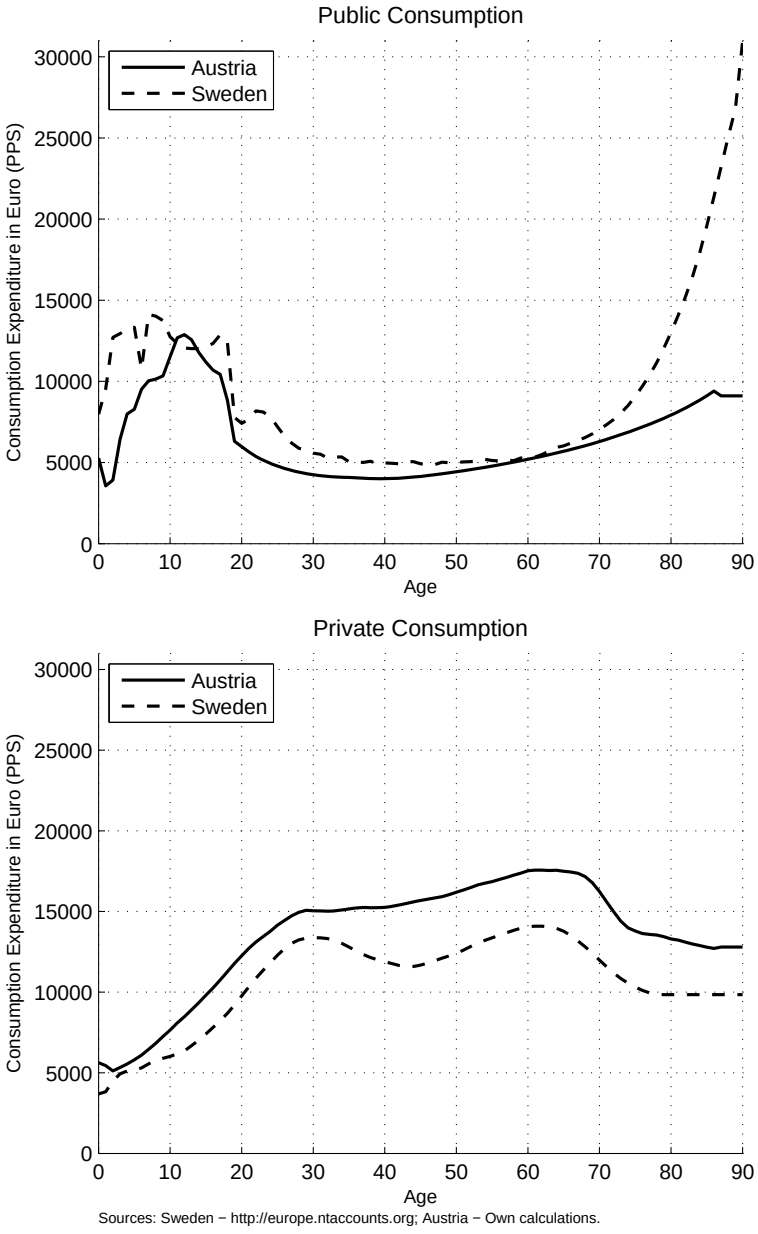


Figure 2.2: Age Group Averages of Public and Private Consumption 2010

Table 2.3: Public Consumption 2010

	Sweden		Austria	
	Euro (PPS)	% of Total Cons.	Euro (PPS)	% of Total Cons.
Public Consumption	**8,138**	**42.8**	**5,977**	**30.1**
Health	2,039	10.7	1,681	8.5
Education	1,934	10.2	1,536	7.7
Pre-Primary and Primary	1,195	6.3	399	2.0
Secondary Education	419	2.2	775	3.9
Tertiary Education	258	1.4	160	0.8
Education Other	62	0.3	202	1.0
Social Protection (incl. old age)	1,773	9.3	416	2.1
Other Cons.	2,391	12.6	2,344	11.8

Source: Eurostat, General government expenditure by function (COFOG)

2.2.3 The Life Cycle Deficit

Figure 2.3 shows the aggregate labour income and aggregate consumption for each age group. These numbers are obtained by multiplying the per-capita values of income and consumption (Figure 2.1 and Figure 2.2) with age-specific population numbers in 2010. What is most remarkable is the concentration of labour income in Austria: more than one-third of total labour income (33.8%) is generated by the age group from 40 until 49, i.e. by the baby-boom generation born in 1960-1969. The corresponding value for Sweden is 28.1%, labour income in Sweden is distributed over a larger number of age-groups. This can be explained by two facts: first, in Sweden the baby-boom was less pronounced and second, people remain much longer in the labour force in Sweden as compared to Austrians.

The age groups of children/young adults and those of elderly persons consume on average more than they generate on labour income. These age groups have to finance at least part of their consumption through age reallocations, i.e. through public and private transfers from other age groups or through asset-based reallocations such as asset income and dissaving. Of particular interest is a composite indicator of consumption and labour income: the life cycle deficit – defined as consumption minus labour income. We want to point out that the term life cycle does not refer to the life cycle of an individual, but to the cross-section age-pattern of consumption and labour income. The life cycle deficit measures the consumption which cannot be covered by a persons's own labour income and can be derived by rearranging the terms in Equation (2.1).

$$\underbrace{C - YL}_{\text{life cycle deficit}} = \underbrace{YA - S}_{\text{ABR}} + \underbrace{\tau^g + \tau^p}_{\text{transfers}} \tag{2.2}$$

If the life cycle deficit is positive (in childhood and retirement), i.e. if consumption exceeds labour income the difference has to be financed by asset-based reallocations such as asset income (YA), (dis-)saving (S) or through public (τ^g) or private transfers (τ^p). If the life cycle

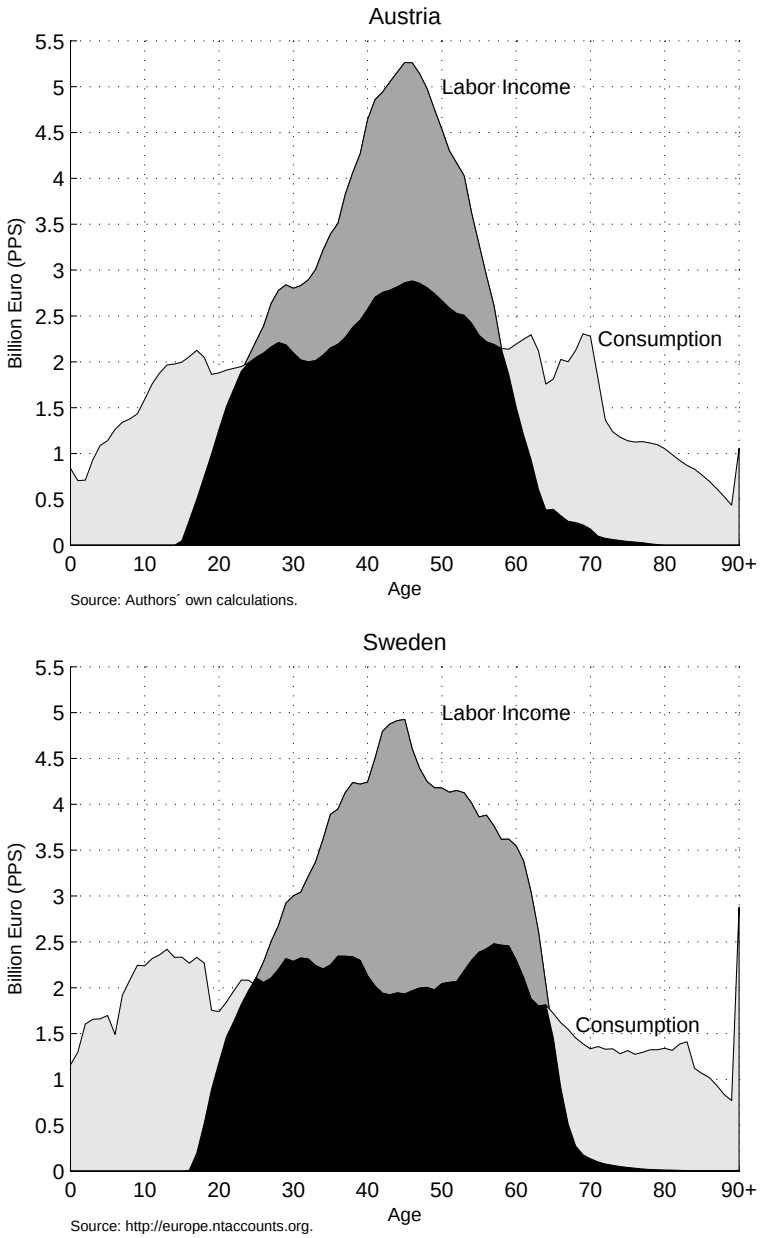


Figure 2.3: Aggregate Labour Income and Consumption 2010

deficit is negative (at working age), i.e. if labour income exceeds consumption, part of the excess labour income can be used for saving and for transfers to other age groups.

The size of the life cycle deficit at young and old age, and consequently the amount of resources which has to be reallocated over age, is substantial: the total life cycle deficit of young people amounts to 19.5 percent of the total labour income in Austria and 24 percent in Sweden. The higher value for Sweden can be explained by (a) the higher number of children, (b) the higher per-capita expenditure for education and (c) young people's later entrance into the labour market in Sweden. For elderly persons, the aggregate life cycle deficit amounts to 19 percent of the total labour income in Sweden and almost 25 percent in Austria. The difference is due to (a) the higher consumption of the age groups 60-75 and (b) the much earlier exit from the labour force in Austria.

2.3 Public Transfers

Large parts of transfers related to social protection in old age are based on what is commonly described as a generational contract – the active population invests in children who in turn finance their care in old age. In comprehensive welfare states such as Austria and Sweden there is no direct relation between the investment in children and social protection in old age for an individual, but for whole generations this relation holds. At present, the transfer system is somewhat unbalanced in most welfare states: decreasing shares of workers and contributors are confronted with growing numbers of beneficiaries. The public sector plays an important role in these transfers. Elderly people finance part of their needs through asset income and an important share of the necessary care is provided privately, mostly through family members. Most of the resources required by elderly persons, however, are provided by the public sector through the pension system and the public provision of health care and long-term care services. The public sector plays also an important role regarding transfers to children and the working-age population, e.g. to families: most importantly because formal education is provided or at least financed to a great extent by the public sector; moreover the public sector provides incentives and support for families, thereby also influencing how much families invest in children. Adequate and well-designed transfers to the younger population can therefore enhance the sustainability of the welfare system in the long run.

Table 2.4 provides an overview of revenues and expenditures of the public sector in 2010. The total revenues as well as total expenditures as a share of the net national income (NNI) were higher in Sweden than in Austria: revenues amounted to 58.1 percent of NNI in Sweden and 55.3 percent in Austria; total expenditures on transfers amounted to 58.7 percent in Sweden and 56.3 percent in Austria. In both countries the transfer revenues through taxes, social contributions and other transfers fell short of transfer expenditure. The public sector in

Sweden however received asset income to cover the gap and finance public saving; in Austria the government had to additionally finance a negative asset income (interest on public debt) requiring additional borrowing and dissaving. Social contributions play a much larger role in Austria than in Sweden, where public transfers are to a larger degree financed by taxes. The share of in-kind transfers (public consumption) is much higher in Sweden than in Austria, corresponding to 60 percent of total public expenditure. In Austria public expenditure consists to 53.4 percent of cash transfers.

Table 2.4: Public Revenues and Expenditure 2010 in Euro per-Capita

	Sweden		**Austria**	
	Euro (PPS)	%	Euro (PPS)	%
Public Asset Income	**499**		**-370**	
Public Transfer Revenues in % of NNI		58.1		55.3
Public Transfer Revenues	**13,407**	**100**	**12,624**	**100**
Taxes	10,542	78.6	7,219	57.2
Social Contributions	2,652	19.8	5,021	39.8
Other Revenues	214	1.6	384	3.0
Public Transfer Expenditure in % of NNI		58.7		56.3
Public Transfer Expenditure	**13,540**	**100**	**12,848**	**100**
Public Consumption (transfers in-kind)	8,144	60.1	5,984	46.6
Social Benefits (cash transfers)	4,488	33.1	6,077	47.3
Other Transfers	909	6.7	787	6.1
Public Net Saving	**366**		**-594**	

Source: Eurostat - European Sector Accounts

The analysis of public transfers usually puts more weight on expenditures than on revenues. But the tax structure determines what age groups carry the burden of financing the public transfers system. Taxes and social contributions on labour are paid by the population at working ages while taxes on capital affect the older age groups more. In particular the high taxation of labour together with early retirement is problematic as it shifts the burden of financing the public sector to the age groups in the "rush hour" of life, thus to those age groups which at the same time have to invest resources into building up their homes and families. As indicated in Table 2.5, taxes on employment in Austria constitute, at 50.8 percent of revenues, a higher share than in Sweden at 48.8 percent. Sweden in turn accrues higher tax revenues from consumption taxes, labour taxes of non-employed (e.g. retirees) and on the stock of capital. The share of capital taxes is higher in Austria, mainly because of the higher share from self-employed persons.

Table 2.5: Tax Revenues by Function in Percent of Total Tax Revenues 2010

	Sweden	Austria
Labour Taxes on Employment	48.8	50.8
Labour Taxes Non-Employed (e.g. Retirees)	7.6	5.9
Consumption Taxes	29.0	28.1
Capital Taxes, on Capital and Business Income	11.5	13.0
Capital Taxes on Stock of Capital	3.1	2.3

Source: EUROSTAT, Structure of Taxes by Economic Function

In Figure 2.4 we plot age-specific public net transfers for Austria and Sweden in 2010. The Swedish public sector provides more resources to younger generations than the Austrian. The higher net benefits for children in Sweden reflect the comprehensive provision of childcare facilities and the higher public consumption expenditure for education. The higher net benefits (lower net contributions) of Swedes as compared to Austrians in the age groups 20-50 reflect the slightly higher taxation of labour income and the lower share of transfers directed to these age groups in Austria (e.g. care and health services). Around the age of 50 this age pattern reverses: Swedes in the age groups 50-64 provide a fundamental share of public transfers while Austrians already start to leave the labour force at those ages. Net contributions decline very quickly in Austria: Austrians become net-receivers of public transfers already at the age of 59, Swedes at the age of 64.

The more compressed period of labour force participation in Austria therefore influences the age distribution of contributions to public transfers, and also the distribution of the benefits. The longer retirement time requires a much higher share of total transfers to be directed to pensioners in Austria. Therefore, public transfers in Austria are, to a much larger degree than in Sweden, a reallocation to elderly persons.

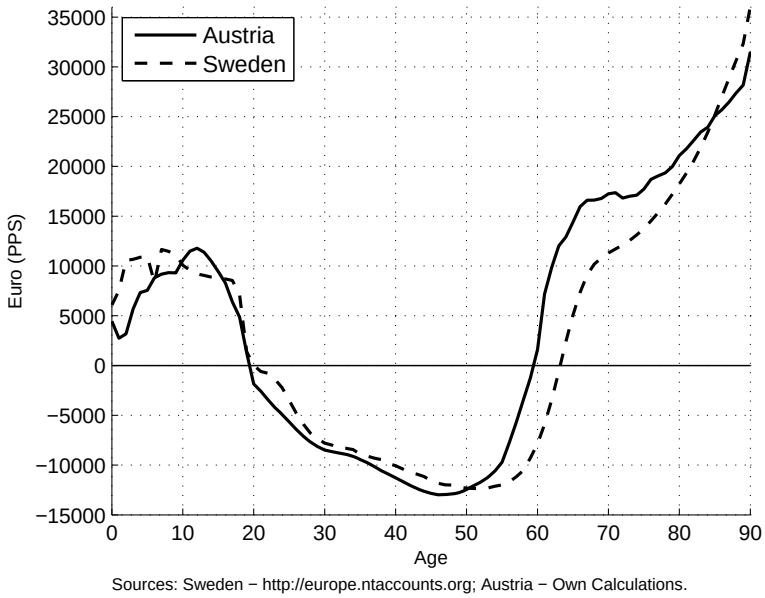


Figure 2.4: Public Net Transfers 2010

To investigate whether public transfers are biased towards the younger or elderly segment of the population we plot the population percentiles ordered by age against the cumulative distribution of public transfer benefits (Figure 2.5). Since both curves (for Austria and Sweden) are below the 45 degree line, public transfer benefits are not evenly distributed across the age structure. However, the reallocation of public benefits is more even for Sweden. The youngest 30 percent of the population receive 27% of total public transfers in Sweden, but only 22% in Austria. On the contrary, the oldest 30 percent receive 45% of total public transfers in Sweden, but around 55% in Austria. Consequently we find a bias towards old-age transfers in both countries though this is more pronounced in Austria as compared to Sweden.

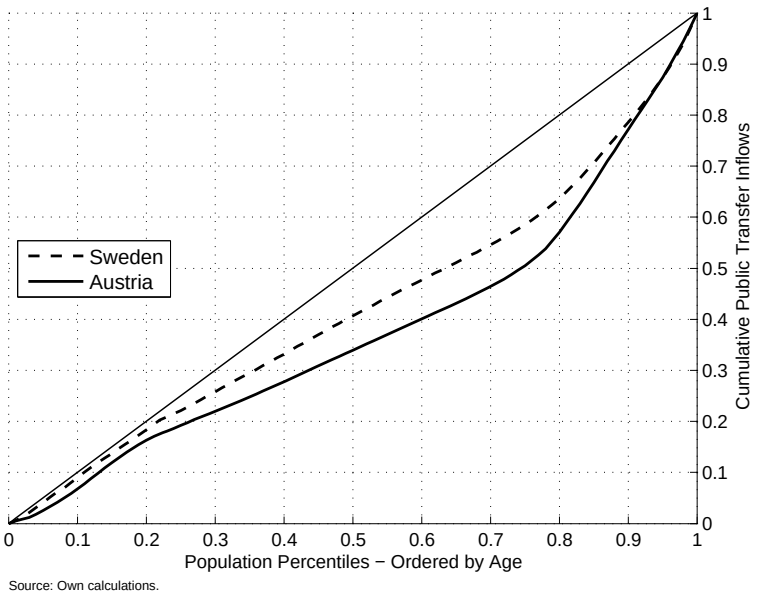


Figure 2.5: Cumulative Distribution of Public Transfer Benefits

2.4 Dependency Ratios

The demographic structure constitutes one of the most important factors influencing public revenues and expenditure: the age-structure of the Austrian population is shaped by the persistent low fertility during the last 20-30 years and the baby boom cohorts born in the 1960s. The age-structure of the Swedish population is generally more balanced with a high share of people over the age of 60, a more equally distributed population in working age and a much higher share of children and young adults (Figure 2.6).

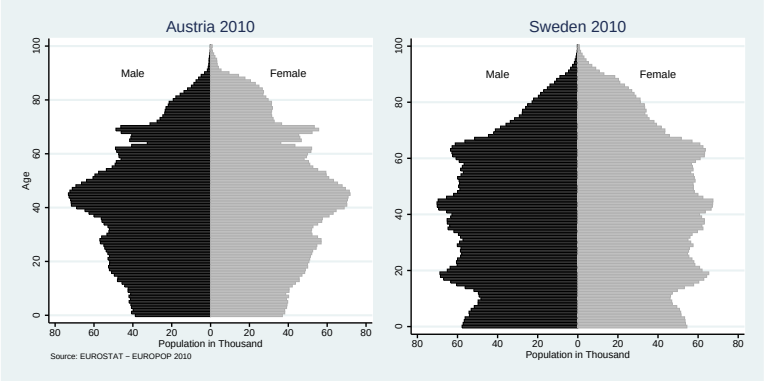


Figure 2.6: Population Pyramide

Dependency ratios are often used to describe the age structure of the population and its projected change. The old-age dependency ratio measures the ratio of the population older than 60 to the working-age population from age 20 to 59. Based on the EUROSTAT population projections (European Commission, 2011) Figure 2.7 shows how this indicator has developed

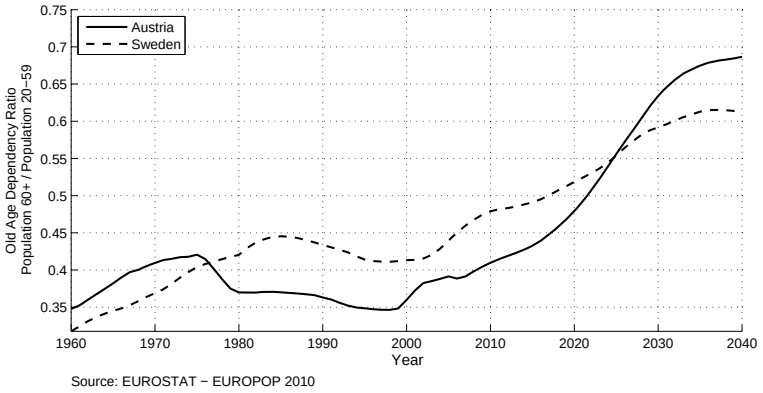


Figure 2.7: Dependency Ratio 1960-2040

since 1960 and how it is predicted to change until 2040. Population projection become uncertain as the projection horizon increases, because they depend on developments which are difficult to predict such as fertility and migration. But because most of the people which constitute the working-age population in 2040 are born already, the development of the demographic dependency ratio is not expected to deviate far from the projections. For Austria there has been a decline in this ratio after 1975 as the baby boomers entered the age group 20-59. However, with baby boomers leaving the labour force and entering the age groups of retirement the dependency ratio in Austria has been increasing since 2000 and will further increase because smaller birth cohorts enter the prime working age from 20 to age 59. In 2040 the ratio is expected to reach 70 percent and will therefore be almost twice as high as in 2000. The old-age dependency ratio is rising in Sweden as well but at a much lower pace. On the one hand, there is currently already a larger share of the population in the age group 60+, implying a higher dependency ratio, and secondly, the baby boom was as pronounced as in Austria.

2.4.1 Economic Dependency Ratio

The change of the demographic dependency ratio is often used to illustrate the strain on transfer systems that is induced by the demographic structure. However, the extent to which the ageing of the population also implies an increase in the demand of intergenerational public transfers depends on the distribution of contributions and benefits over age. While in Sweden the labour force participation at ages 60-64 is still high, many persons in the same age group in Austria are already retired and economically dependent. Indicators which are better suited to evaluate the economic impact of population ageing are economic dependency ratios, i.e. age dependency ratios that take into account age-specific weights of consumption and labour income (Cutler et al., 1990). One example for such an indicator has been given already: the life cycle deficit (LCD) of elderly people divided by total labour income. This ratio measures the consumption of elderly persons (or alternatively children) which is not covered by their

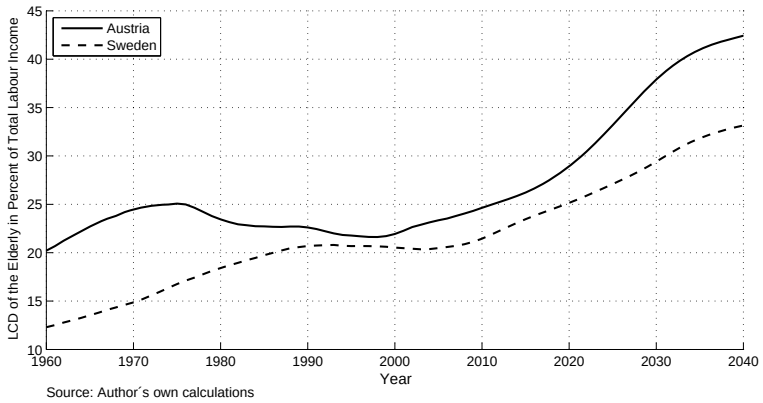


Figure 2.8: Economic Old-Age Dependency Ratio: LCD of the Elderly 1960-2040

own labour income as a share to total labour income.

In the following we assume that the per-capita age profiles of consumption and labour income are the same as in the base year (Austria 2010, Sweden 2006) and apply these profiles to population projections. We therefore present a simulation of the LCD in old age given the base-year design of the economic life cycle. The development of this indicator between 1960 and 2040 is plotted in Figure 2.8. Under the assumption of the 2010 economic life cycle the LCD in Austria would have decreased between 1975 and 2000 as a result of the baby boomers entering the labour market. However, we actually overestimated its value in those years as the economic life cycle in the 1960s was quite different: first, the per-capita LCD for elderly persons was smaller as retirement ages were higher and public benefits less generous, and second, the total LCD for elderly persons was smaller as life expectancy was lower then. In Austria the demographic dividend resulting from the entry of the baby boomers into the labour market has been used to expand the per-capita life cycle deficit by increasing the benefit level and decreasing the retirement age – resulting in an aggregate LCD of elderly persons of around 25 percent today. From 2020 onwards the demographic dividend will turn into a demographic burden as the baby boomers retire – the LCD of the elderly persons will increase sharply. For Sweden we observe a similar development but with a more moderate increase than fin Austria. Figure 2.8 indicates that in Sweden the economic dependency ratio is lower than in Austria, despite the fact that the demographic dependency ratio (Figure 2.7) is higher in Sweden. This illustrates the importance of including the shape of the economic life cycle to correctly measure economic dependency.

2.4.2 Economic Dependency Ratio for The Public Sector

Economic dependency ratios provide a compact measure of the economic dependency of the older and the young generations. Their use for evaluating the demographic pressure on the public transfer system is not entirely valid, however, as the resources for the dependent popu-

lation are also provided through private transfers and asset based reallocations. To correctly illustrate the demographic pressure on the public transfer system we build up an alternative indicator that applies age-specific weights of net benefits from public sector transfers to the population structure. The net benefits are positive for children and elderly persons and negative for the active age groups which contribute more to public transfers than they get out of them. In case the total transfer benefits exceed the revenues, this indicator will be larger than unity, indicating that the public sector relies on asset income or incurs debt. A value below unity would be optimal since part of the revenues could be used for investments and saving. The economic dependency ratio for the public sector is plotted in Figure 2.9. The public dependency ratio is higher in Austria than in Sweden, reflecting the larger gap between tax revenues and transfer expenditure in that country. The pronounced increase of the indicator for Austria reflects the combination of a higher demographic burden in Austria combined with high expenditures for elderly people.

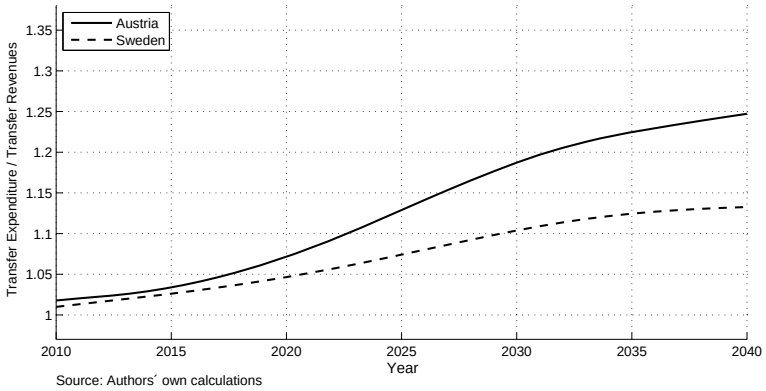


Figure 2.9: Public Dependency Ratio

We next evaluate the effect of the demographic structure on the development of the public dependency ratio. For this purpose we run two counterfactual simulations. First we choose the Swedish economic life cycle profiles of public net transfers and apply them to the projected Austrian age structure and alternatively we take the Austrian economic life cycle profiles of public net transfers in combination with the projected Swedish age structure. The results of these simulations – together with the Austrian baseline indicators of Figure 2.9 – are plotted in Figure 2.10. Obviously the shape of the economic life cycle as well as the development of the demographic structure will influence the sustainability of the public transfer system: if the Swedish age profiles are applied to the Austrian population (dashed line), the public old-age dependency ratio decreases from a value above unity in 2010 to 0.94, i.e. the public expenditures would be much lower than the revenues. Moreover, the public old-age dependency ratio would stay below the Austrian benchmark indicator over the whole projection period. These results are mainly explained by the higher retirement age in Sweden as compared to Austria. If alternatively we apply the population weights of Sweden to the Austrian economic

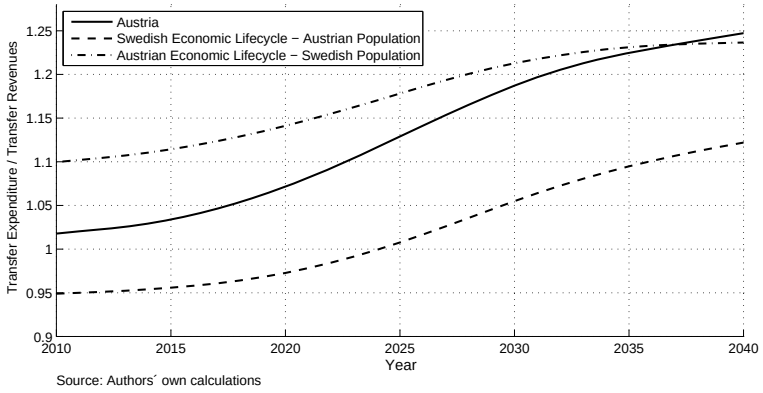


Figure 2.10: Ratio of Expenditure to Revenues - Exchange Population Age Profiles

life cycle (the dash-dotted line), the public old age dependency ratio would worsen because of the older age structure in Sweden in 2010. However, as the pace of population ageing is lower in Sweden, the increase of the indicator would be dampened as compared to the benchmark simulations. In the long run, the Austrian life cycle together with the Austrian population development is the least favourable combination.

2.4.3 An Economic Dependency Ratio Including Asset Income

So far we have only concentrated on public reallocation of resources over age. To take into account asset income, saving and interest payments as well, we need to pose assumptions on future economic growth rates and interest rates. For the following simulations we assume productivity growth to be 1.5% a year, a growth rate of revenues and expenditure that equals productivity growth and a real interest rate on assets/debt of 1%. Real interest rates on 10-year government bonds have been around 2 percent in the years before 2007 and are currently negative; the 1% percent is a compromise and certainly suited to illustrate the importance of including public asset-based reallocations in the indicators. Asset income (interest) in each year will of course be affected by government expenditures. If the government runs a debt, asset incomes will decline in the next period taking into account the rate of interest that has to be paid on government debts. Similar to the public dependency ratio in the previous section, we construct an indicator of the ratio of expenditure to revenues; but now also including asset income and interest payments. The development of this indicator – together with the indicator from Figure 2.9 – is plotted in Figure 2.11. For Austria, the inclusion of asset income results in an increase of the public dependency indicator from slightly above one in 2010 to 1.05. This means that around 5% of the expenditure could not be covered out of revenues. Since the Austrian government has to run a public debt to cover public expenditures, interest payments will steadily grow leading to an increasing wedge between the public dependency ratio without and, alternatively, with asset income. In Sweden the opposite development can be observed. Since the public sector runs a surplus, the inclusion of the positive asset income

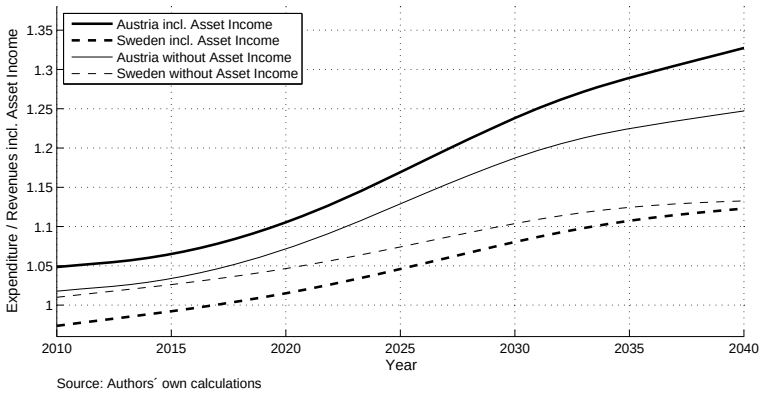


Figure 2.11: Ratio of Expenditure to Revenues - Including Asset Income

implies a reduction of the public dependency ratio once asset incomes are included.

2.5 Conclusions

Based on data from the National Transfer Accounts project we studied the economic life cycle and the public age reallocation of resources in Austria and Sweden. The most important difference between the two countries is the much higher labour force participation of older age groups in Sweden as compared to Austria. The early retirement in Austria leads to a compressed period of active labour force participation and consequently to a high tax burden for the active population. Compared to Sweden the funding of public transfers in Austria is based on fewer age groups and a larger part of public transfers is provided to elderly persons. In Sweden more resources are used to finance education and public investments are higher than in Austria. With the baby boom generation reaching retirement age Austria faces a huge challenge to adjust its public transfer system to the pronounced changes in the age-structure of its population.

Using economic dependency measures based on age-specific labour income and consumption as well as on the age-specific public contributions and benefits, we studied the development of the public transfer system in both countries. Although in Sweden the demographic dependency ratio is higher – there is a larger share of the population in the age group 60-plus – economic dependency ratios are lower than in Austria. This illustrates that beside the demographic development the design of social transfer systems is an important determinant of the degree of economic dependency. Economic dependency ratios should complement purely demographic measures, in particular when these measures are used to evaluate the sustainability of public sector funding.

References

Cutler, D., Poterba, J., Sheiner, L., Summers, L., and Akerlof, G. (1990). An aging society: opportunity or challenge? *Brookings papers on economic activity*, 1990(1):1–73.

European Commission (2011). The 2012 Ageing Report: Underlying Assumptions and Projection Methodologies. *European Economy*, 4.

European Communities (2008). *European Price Statistics: An Overview*.

Forsell, C., Hallberg, D., Lindh, T., and Öberg, G. (2008). Intergenerational public and private sector redistribution in Sweden 2003. *Institute for Futures Studies*.

Lee, R. and Mason, A., editors (2011). *Population Aging and the Generational Economy: A Global Perspective*. Edward Elgar Publishing Limited. Download from: `http://idl-bnc.idrc.ca/dspace/bitstream/10625/47092/1/133467.pdf` (accessed 9 February 2014).

OECD (2011). *Pensions at a Glance 2011: Retirement-Income Systems in OECD and G20 Countries*. OECD Publishing.

Sambt, J. and Prskawetz, A. (2011). National transfer accounts for austria: Low levels of education and the generosity of the social security system. In Lee, R. and Mason, A., editors, *Population Aging and the Generational Economy: A Global Perspective*, pages 256–268. Edward Elgar Publishing Limited. Download from: `http://idl-bnc.idrc.ca/dspace/bitstream/10625/47092/1/133467.pdf` (accessed 9 February 2014).

Chapter 3

A National Transfer Household Account: The Role of the Family in the Age Reallocation System

3.1 Introduction

The production measure in the SNA excludes most of the goods and services which are produced by households for their own final use (e.g. housework, childcare) or which are provided free of charge to other households (e.g. voluntary work). The importance of accounting for this type of production in the SNA framework has been widely recognized. An important argument for the inclusion of own account household production in the SNA is, that a simple shift from household production to the market should not lead to changes in the measure for total production (GDP), when the amount of the produced goods and services remains the same. The production of households for their own consumption, as well as unpaid production for other households, is of particular importance in the NTA framework. A large share of these goods and services are provided to other persons, they constitute therefore important transfers. In particular the consumption of children consists to a large degree of services provided by other household members. Ignoring own account household production gives therefore an incomplete and biased picture of the role of the family in the transfer system and in particular of women's contribution to total production.

3.1.1 Household Satellite Accounts

Information about household production is usually introduced into the SNA through so called household satellite accounts (HHSA). Satellite accounts allow the introduction of additional information into the SNA framework, as well as changes in concepts and definitions, without affecting the information captured in the central accounts. HHSA extended the SNA production boundary and cover also production activities of households which are not captured in the SNA central accounts. They provide information on the total value of these goods and services, as well as information about the type and amount of goods and services which are used as inputs in the production process. There are numerous open issues regarding the measurement and valuation of household production. However, a lot of thought and effort has been spent already to develop a methodology for the introduction of such accounts, e.g. Holloway et al. (2002); European Communities (2003); Abraham and Mackie (2005). These efforts have been successful and for many countries HHSA have been generated. See e.g. Landefeld et al. (2009) for the US or Ruger and Varjonen (2008) for Germany and Finland.

A household satellite account for Austria has been developed on the basis of the time use survey from the year 1992 (Franz, 1996). According to this account the value of non-SNA production activities was equivalent to 50-140 percent of GDP in 1992; the exact value depends on the valuation of unpaid work. While women generated only one third of total income from employment and self-employment in 1992, their contribution to total production amounted to 45-55 percent. The share of non-SNA production in the Austrian HHSA from 1992 is

high compared to other developed countries. The estimated value of non-SNA production lies usually between 20% and 50% percent of GDP (see e.g. OECD, 2011, p. 25). In Austria there were considerable changes in the time use between 1992 and 2008, among them a reduction of the time devoted to housework and an increase in the time devoted to childcare (Hammer, 2012). In this chapter I develop a household satellite account based on the Austrian time use survey from 2008/09, taking into account also recent developments in the HHSA methodology. The satellite account which is compiled in this chapter does not only provide estimates for the total value of non-SNA production and consumption. It includes information about non-SNA production by age and gender, as well as information on transfers between age groups and the age- and gender-specific consumption of these goods and services. The age-specific household account and the NTA core accounts together provide a comprehensive picture of production activities at each age, of the redistribution of resources between age groups, and of the age-specific use of the disposable resources for consumption and saving.

3.1.2 National Time Transfer Accounts

This work is very closely related to the development of so called National Time Transfer Accounts (NTTA) within the NTA project: NTTA estimate the age-specific use of time for unpaid work, transfers across age and gender in form of unpaid work, as well as age- and gender-specific consumption. Time transfer accounts have been generated already for several countries, see e.g. Phananiramai (2011) for Thailand or Zagheni and Zannella (2013) for Italy, Spain, Germany and France. The methodology for generating NTTA has been developed by Donehower (2013). The aim of these efforts is not only the age-specific measurement of unpaid work activities, but the provision of a gender- and age-specific measure for total production (i.e. SNA and non-SNA production), total transfers and total consumption through the combination of NTTA with NTA. The approach which is so far applied to get such measures is to add the NTTA results to the results from the NTA core accounts. However, the approach for generating NTTA is not fully consistent with the method which is used to generate NTA. One inconsistency lies in the different methods which are applied to estimate the age-specific consumption of goods and services which are bought on the market, and the age-specific consumption of goods and services produced by household work; another is the ignorance of the consumption of fixed capital of households in the calculation of net production. Furthermore, while NTTA provide information on the labour input in household production, they do not contain information on the inputs in household work in form of goods and services bought on the market.

Two main changes are introduced in the in the age-specific household account in this chapter as compared to the NTTA methodology: the methodology for calculating age-specific production and consumption is consistent with accounting principles and methods which were used to

generate the NTA core accounts; and estimates for the input of market goods and services in the household production process are provided. As there are numerous difficulties regarding the methodology and data availability for the estimation of the households' capital stock, I do not fully account for the households' consumption of fixed capital; but the consumption of fixed capital regarding owner occupied dwellings is taken into account. To emphasise the difference to NTTA and the relation to the HHSA methodology the term National Transfer Household Account (NTHA) is used for the age-specific household satellite account.

The next part of this chapter describes the HHSA methodology, in particular the HHSA production boundary and the method for valuing unpaid household work. Age- and gender-specific estimates of time use for non-SNA production as well its monetary value are provided in Section 3.3. The method for estimating the age-specific consumption of goods and services produced through unpaid household work and the results are described in Section 3.4. Finally, to get for each age group a measure for total production and total consumption, the results from the NTA core accounts and the household accounts are combined in Section 3.5. Section 3.6 summarizes and concludes.

3.2 The Household Satellite Accounts Methodology

The main function of a HHSA is the provision of information about production that is not captured in the SNA. In a first step I outline the border between SNA and non-SNA production, and draw a border between household production activities and non-production activities such as personal care and leisure.

3.2.1 The Production Boundary in the System of National Accounts

The general definition of production in the SNA is as follows: *Production is an activity, carried out under the responsibility, control and management of an institutional unit, that uses inputs of labour, capital, and goods and services to produce outputs of goods and services. All goods and services produced as outputs must be such that they can be sold on markets or at least be capable of being provided by one unit to another, with or without charge (SNA, 2009).* This definition includes physical goods, services which are sold on the market, as well as services provided free of charge to other persons. However, not all of the production is actually included in the SNA. There are several reasons why the SNA production boundary is further restricted and excludes services produced by the households for own consumption, and services which are provided free of charge to other households or non-profit institutions serving households (e.g. charities). One of these reasons is the absence of price information from market transactions, another reason the analytical purpose of SNA data.

The System of National Accounts records most of the production and consumption of goods

and services by their price in market transactions. Problematic is the valuation of the goods and services which are not traded on markets. An important group of such goods and services are those which could have been supplied to others on the market, but are actually retained by the producers for their own use. Among them is the production of agricultural goods for own consumption, the own-account construction of dwellings, and the production of domestic and personal services for consumption within the own household. For some of these products and services the value of the output is imputed and they are included in the SNA production boundary, e.g. the production of agricultural goods and the construction of dwellings. Other production activities, such as the production of services for other household members, are not included in the SNA production measure.

The problem of estimating monetary values for the output is not the only reason for restricting the production activities which are recorded in the SNA. The choice of the production boundary has to take into account the analytical purpose of the SNA. It is argued in SNA (2009), that the inclusion of large non-monetary flows, such as services provided to other household members (where income is automatically tied to the consumption of these goods), together with monetary flows can obscure what is happening on markets and reduce the analytic usefulness of the data. The argumentation is somewhat inconsistent, because the same argument can be applied to government production. Government services are, contrary to the services produced in the households, included in the production boundary. But it is clear that the inclusion of all type of household production would be too broad for some analytical purposes. An example stated in SNA (2009) are labour force statistics: economically active persons are defined as those engaged in productive activities within the SNA production boundary (see e.g. ILO, 2010). If the production boundary were extended to include the production of personal and domestic services for own consumption, unemployment would be almost impossible by definition.

The rule which is used as guideline in the SNA is to include production for the household's own consumption within its production boundary, if the decision whether the goods or services are to be sold or retained for own use can be made even after they have been produced. Household production which is measured in the SNA clearly includes market production, the production of physical goods for own use and the construction and maintenance of dwellings which is carried out by their owners. However, in the European System of Accounts (ESA), which is the source of Austrian SNA data, the households' own-account production of goods is only recorded if this type of production is significant, i.e. if it is believed to be quantitatively important in relation to the total supply of that good in a country. The ESA includes own account construction of dwellings, as well as the production, storage and processing of agricultural products. Not included are other kinds of processing, like weaving cloth, the production of pottery and making furniture (European Communities, 1996, chapter 3.08). Not within the

SNA production boundary is the production of services for own final consumption within households, because the decision to consume them within the household is made before the service is provided. This includes the cleaning, decoration and maintenance of the dwelling; the cleaning, servicing and repair of household durables; preparation and serving of meals; care, training and instruction of children; care of sick, infirm or old people and the transportation of members of the household or their goods (European Communities, 1996, chapter 3.08).

3.2.2 The Production Boundary in Household Satellite Accounts

HHSA extend the production boundary compared to the central accounts in the SNA. However, also the shape of the extended production boundary depends on the analytical purpose of the analysis. We clearly want the household production activities to fall within the general definition of production in the SNA. A crucial criterion in this definition is, that *all goods and services produced as outputs must be such that they can be sold on markets or at least be capable of being provided by one unit to another.* This criterion is fulfilled by the activities which fall into the definition which is used by Reid (1934), who defines unpaid household production as the *unpaid activities which are carried on, by and for the members, which activities might be replaced by market goods, or paid services, if circumstances such as income, market conditions, and personal inclinations permit the service being delegated to someone outside the household group.* Most researchers use this or a similar criterion to identify household production activities. Thus, activities are counted as unpaid household production if it is possible to replace these activities through paid goods and services from the market. An example for unpaid household production are cleaning activities in the own household; it is usually done by the household members themselves, but many households buy these services on the market. Activities which cannot be delegated, because utility is derived through carrying out the activity, are not treated as production. Eating, sleeping and reading a book cannot be delegated to somebody else without transferring also the utility derived from these activities.

However, the criterion that an activity counts as production if it can be replaced through market goods and services is too broad. It would include a broad range of personal care activities which are usually not perceived as production, such as getting dressed, washing the hair, manicure or medical treatment for oneself. Roy (2012) argues that today's social norms what constitutes work and a productive activity are rather straightforward. Personal care activities are usually not regarded as work; healthy adults replace few of them by market goods and services, and if, only once in a while (e.g. manicure, washing the hair). I follow this line of argumentation and do not include personal care activities into the measure of production. However, if these activities are delegated to somebody else because the person is not able to carry them out by herself/himself (children, handicapped persons), they are treated as care and included into production.

There is also a fuzzy border between production and leisure activities. An activity is classified as leisure if the utility is mainly derived from performing the activity, and not from the product of the activity. Most of the leisure activities are clearly performed for the activity itself, e.g. sport, socializing or cultural activities. But what about gardening or do-it-yourself activities such as knitting? There is certainly an output which classifies as production, but people enjoy these activities and the input in form of time stands often in no relation to the output. As HHSA usually measure the output of household production by the value of the inputs (in particular time), we have to be careful with activities for which the output compared to the time input is small. I use a tight production measure and do not include the activities of productive leisure such as gardening and handicrafts into the HHSA production boundary. Because many researchers include these activities in their production measure, I additionally present an estimate for the value of these activities.

Although in the classification of activities there is some grey area, for most of the activities it is clear if they classify as production or not. The most time consuming unpaid household production activities include food preparation, cleaning and maintenance activities in and around the dwelling, the care of textiles (e.g. doing the laundry) as well as shopping and household management including administrative work. Activities which require less time on average, but which are unambiguously treated as production activities, include the care for adults and voluntary work. What I do not count as production are pet care activities such as walking the dog. Although they can be replaced by services bought on the market, these activities are usually carried out for pleasure and are one of the main reasons why people have pets in the first place. They fit better into the category leisure.

I use the term *SNA production* for the production which is included in the SNA. It includes the production of corporations and the government, as well as the SNA production of households. SNA production of households include their market production, the own account construction of dwellings and processing of agricultural products. The term *non-SNA production* captures the production activities which are not included in the SNA, but which lie within the extended production boundary and are regarded as work by the current social norms. The terms *unpaid household work* and *unpaid household production* are used as synonyms for non-SNA production activities.

3.2.3 Measuring and Valuing Household Production

Most of the output in the SNA is valued using the market price. In absence of market transactions the valuation is made either by an output- or by an input approach. The output approach values the produced goods and services by a reference to the market price of analogous goods and services. An example for the use of the output approach in the SNA is the valuation of housing in owner occupied dwellings. The input approach values goods and

services according to the costs incurred in the production process. In the SNA this approach is applied to non-market services produced by the government, such as administration and defence. For a discussion of these two approaches see also European Communities (2003).

The Output Approach

A large part of the output of unpaid household production can, theoretically, be measured in physical terms. For example: by the number of meals prepared; the size of the flat which has been cleaned; or by the number of children which is cared for. However, in Austria there are no or little data which actually measure or allow the estimation of this type of output. The lack of information on the physical output of household production is the reason why most of the household accounts are generated using the input approach. One of the exceptions is the household account for the UK (Holloway et al., 2002), which is generated using an output approach. There are also difficulties regarding the valuation of the output. For some type of household production there are hardly comparable products available on the market. This is especially true when taking into account time, space and the exact type of the services (e.g. a coffee delivered at six in the morning to the bed or breastfeeding a child).

The Input Approach

The input approach uses as value of non-SNA production the costs of the inputs. These inputs consist of labour, of intermediate consumption goods and services, as well as of capital goods which are used in household production. A particular problem in the application of the input approach in HHSA arises because labour, as the most important input to household production, is not bought on the market; the market price is therefore unknown. To get a monetary value for the labour input in non-SNA production the time which used for unpaid household work is usually valued with the market wage for similar activities. The huge advantage of the input approach is, that with time use surveys there is information on age- and gender-specific labour input in household production. I use therefore an input approach for valuing non-SNA production in the Austrian NTHA. The following section analyses the age- and gender-specific input of time in household production and provides estimates for its monetary value.

3.3 Non-SNA Production

3.3.1 Labour Input

The information how much time the Austrian population uses for production is based on the time use survey (TUS) from 2008/09.[1] The TUS 2008/09 has been conducted as special programme of the Austrian microcensus from March 2008 to April 2009. All members aged

[1] *Source:* Statistik Austria, Zeitverwendungserhebung 2008/09

10 and older of selected households were asked to fill in time diaries. These diaries have slots of fifteen minutes for the time from 5:00 to 23:00 and half an hour slots from 23:00 to 5:00. In each time slot the respondents had to fill in a range of information: the main activity she/he was carrying out; the secondary activity in case there were several activities carried out parallel; if the activity was carried out at home or outside the home; who else was present; and if the activity was carried out also for another household. The activities could be described in own words and were later coded into more than 300 categories of activities. The participation in the TUS was voluntary, around 38 percent of the originally sampled households took part (Statistik Austria, 2011). The TUS 2008/09 contains data for 8,234 individuals from 4,757 households.

Weights in the Austrian Time Use Survey 2008/09

There is a problem with the weights which are provided with the time use survey. These weights adjust the distribution of certain characteristics in the TUS sample population to their distribution in the much larger labour force survey. They take into account federal state, age group, sex, labour force status and day of the survey. The weights additionally adjust for the distribution of persons according to the level of urbanisation and the country of origin (Statistik Austria, 2011, p.9f). However, one of the most important characteristics determining the amount of household work is the household structure. By using the weights provided in the TUS the results are not representative for the Austrian population; the share of persons with young children is too high. The characteristics of households in the time use sample suggest, that people with a lower time burden through paid work (e.g persons on parental leave) have been more likely to participate in the survey. I decided to construct own weights which better reflect the household structure of the population and use these weights in the analysis of time use data. The construction of weights is described in detail in the Appendix.

Time Use by Gender and Age

I first give an overview over the average time use of adult men and women in two age groups. The production activities are then analysed in more detail and the estimates are presented in single year age groups. Table 3.1 shows the average amount of time which is used by adult men and women for different categories of activities in minutes per day. Two age groups are distinguished: working age (20-59) and old age (60+). In 2008/09 a person in working age devoted around 645 minutes (men 637, women 654) to personal care activities such as sleeping, eating, personal hygiene, to relax and having a rest. The population aged 60+ used on average about 745 minutes (men 750, women 744) for these activities. The participation in personal care activities is 100%; virtually all survey participants carried out personal activities

on the survey day. Also almost all survey participants devoted time to leisure activities such as hobbies, sports, media consumption or social activities (97% of adult men, 98% of adult women). Working age men used on average around 298 minutes for leisure activities, women around 276 minutes. Elderly persons have a much smaller time pressure as few of them carry out paid work, and they usually do not have care responsibilities for own children. The population aged 60+ uses consequently more time for leisure activities: in 2008/09 men used around 430 minutes for leisure and women around 370 minutes. Activities of productive leisure such as gardening and handicrafts are popular mainly in the elderly population. While the working age population used on average a bit more than 10 minutes for these activities (men 11, women 16) in 2008/09, the average was around 40 minutes in the population 60+. Education is an activity which is concentrated at the beginning of the twenties, the average over the total working age population was around 13 minutes. Around 4 minutes of the daily time could not be assigned to an activity-category.

Table 3.1: Time Use of the Adult Population by Gender in Minutes per Day

	Men				**Women**			
Age	**20-59**	**60+**	**Total**	**Part. in %**	**20-59**	**60+**	**Total**	**Part. in %**
Non-Production Activities								
Personal care	637	750	**665**	100	654	744	**682**	100
Leisure	298	432	**332**	97	276	371	**305**	98
Productive leisure	11	39	**18**	19	16	43	**24**	31
Education	18	2	**14**	3	18	2	**13**	4
Unknown	4	5	**5**	9	4	3	**4**	9
Non-production total	**968**	**1228**	**1034**	**100**	**968**	**1163**	**1028**	**100**
Non-SNA Production								
Housework	85	150	**101**	73	190	244	**207**	95
Childcare	19	5	**16**	18	49	9	**37**	27
Voluntary work	7	11	**8**	7	6	7	**6**	5
Adult care (HH Member)	1	2	**2**	3	3	3	**3**	5
Non-SNA total	**113**	**168**	**127**	**79**	**248**	**263**	**252**	**96**
SNA Production								
Paid work	354	40	**275**	52	223	14	**159**	39
Construction own dwelling	5	4	**5**	2	1	0	**1**	1
SNA total	**359**	**44**	**280**	**53**	**224**	**14**	**160**	**39**
Production total	**472**	**212**	**406**	**94**	**472**	**277**	**412**	**98**
Total	**1440**	**1440**	**1440**	**100**	**1440**	**1440**	**1440**	**100**

Part. in % is the share of men/women who devoted time to the activity on the survey day.

The time use for paid work and unpaid household work reflects the gendered distribution of production activities within the households. Men in working age devoted in 2008/09 with an average of 354 minutes much more time to paid work than to unpaid household work with 113

minutes. Working age women on the contrary used with 248 minutes more time for unpaid household work than for paid work with 223 minutes. However, the average amount of time which has been devoted to production activities by the working age population in 2008/09 was about the same for men and women; both used on average around 470 minutes for production. In the 60+ population women used more time for production than men. While in 2008/09 men above the age of 60 used on average 212 minutes per day for production activities, this number is 277 minutes for women. Both sexes increase the amount of unpaid work with retirement, but men do not fully compensate the reduction of time used for paid work with an increase in unpaid household work.

The time use for the care of adult household members has been rather small at all ages and for both, men and women. Only few people were enrolled in such activities (men 3%; women 5%). The low involvement in adult care activities makes a reliable age-specific estimation of these activities infeasible. For the further age-specific analysis of production I include adult care into the category housework. One of the reasons why little time is devoted to adult care activities is, that these activities cannot be unambiguously identified as such. Activities such as preparing food for an ill person or going for a walk with the handicapped partner are likely to be classified as preparing food and leisure rather than as care activities. The construction of dwellings is an activity which is unpaid, but whose output is included in the SNA. Men used on average 5 minutes and women 1 minute for this activity. Voluntary work accounts for 6-11 minutes of average daily time use.

Production Activities by Single-Year Age Groups

The results in the previous section illustrate the strong relationship between time use and age. There are large differences not only between the population in working age and the population in retirement, but also within these age groups. For an illustration of these differences the averages for the production activities (housework, childcare, voluntary work) are plotted in the following graphs by single year age groups. A large part of unpaid household production is carried out for other persons and constitutes a transfer. Like in the NTA core accounts I distinguish between intra- and inter-household production. Intra-household production captures the unpaid household work for the own household, inter-household production the unpaid household work which is carried out for other households. While housework is carried out mainly for the own household, childcare activities of elderly persons (grandparents) constitute mainly inter-household transfers.

Housework

Housework activities are certainly the most important type of unpaid work. The involvement in these activities is increasing with age until about 70 and declines strongly thereafter (Figure

3.1). In 2008/09 women aged 70 devoted around 260 minutes to housework activities and men more than 150 minutes. Time devoted to housework activities is classified as inter-household production if the respondent stated explicitly that the activity is carried out for another household. When it is indicated that the housework activity is carried out also for another household, I assume that half of the production is for the own household and half for the other household. Housework for other households plays only a minor role, almost all of the goods and services produced by housework are consumed within the household: out of the 152 minutes which adults devote on average to housework, around 4 minutes of housework per day constitute inter-household production (and consequently an inter-household transfer).

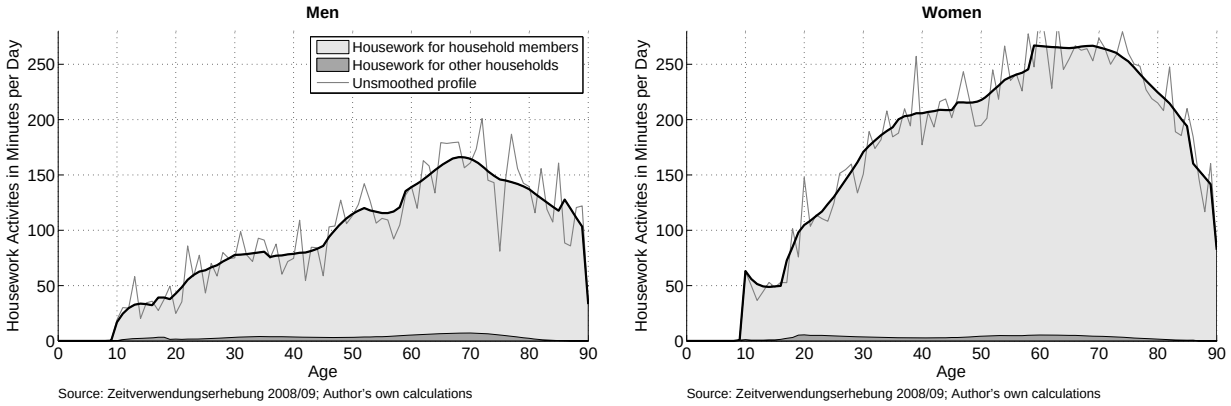


Figure 3.1: Housework Production by Gender and Age in Minutes per Day

Housework consists of a wide range of different activities, Table 3.2 shows the time use by subcategories of housework. For women the preparation of food is the most time consuming activity, an average adult woman used 77 minutes per day for this activity in 2008/09. Cleaning activities demanded around 47 minutes, shopping[2] 42 minutes and doing the laundry 28 minutes on average. The most time consuming housework activity for men is shopping, for which on average 31 minutes per day have been used in 2008/09. For the preparation of food, cleaning and maintenance (e.g. repairs of the dwelling or of household equipment) they used around 20 minutes on average. While men aged 60+ devoted considerably more time to all of housework activities, the higher amount of time which women aged 60+ devoted to housework is to a large degree due to the higher amount of time used for food preparation. The average in this category was 67 minutes in working age and 98 minutes in the age group 60+. Between 5 and 9 minutes a day were in 2008/09 devoted to activities in the category *other*, which contains unspecified housework activities as well as travel related to household work (excluding ways related to shopping).

[2]The category shopping includes shopping as well as household administration tasks such as the use of banking and postal services or the organisation of repairs.

Table 3.2: Time Use of the Adult Population by Type of Housework and Gender in Minutes per Day

	Men				Women			
Age	**20-59**	**60+**	**Total**	**Part: in %**	**20-59**	**60+**	**Total**	**Part in %**
Food preparation	20	30	**23**	42	67	98	**77**	85
Cleaning	15	24	**17**	29	44	55	**47**	73
Shopping	25	48	**31**	40	40	47	**42**	56
Laundry	3	5	**4**	7	27	31	**28**	49
Maintenance	17	35	**21**	20	4	5	**5**	9
Other	5	9	**6**	16	7	8	**8**	21
Total	**85**	**150**	**101**		**190**	**244**	**207**	

Part. in % is the share of men/women who devoted time to the activity on the survey day.

Childcare

One of the most important activities of households and families is the upbringing and the education of children. Child care includes activities such as feeding the child, personal hygiene, looking after the child, learning with the child, spare time with the child (playing with the child) or accompanying the child to school or to the doctor. Also for childcare activities I try to distinguish if they were carried out for household members or for other households. If not indicated otherwise I assume that childcare activities were carried out for household members. The time devoted to childcare is treated as inter-household production if there are no children in the household, or if it is explicitly stated that the activity is carried out for another household (e.g. an older couple taking care of their grandchildren). If the activity is carried out also for another household (e.g. taking care of the own children and of the children of friends), half of the time is treated as intra-household production and the other half as inter-household production.

Sometimes childcare is carried out by both parents together. Since the gender- and age-specific estimates are used for deriving the monetary value of childcare activities, I want to avoid double counting and take into account only the time of one parent when they take care of the child together. This adjustment is necessary, because childcare is valued with the price of a professional child minder who would replace the care of both, father and mother. In the case that both parents take care of the child together half of the childcare time is assigned to the mother and half to the father. This adjustment is quite important: mothers of young children spend around 90 percent of the childcare time without their partner. However, 30 percent of the time when fathers devote time to their children, they do it together with the mother.

As most of childcare is carried out by parents of small children, the care activities are strongly concentrated in the age from 25 to 45 with a peak around the age of 35. In 2008/09 men around the age of 35 devoted on average more than 30 minutes per day to childcare and

women more than 90 minutes (Figure 3.2). For women there is another smaller peak from age 55 to 65. Childcare activities in older age groups are almost exclusively carried out for other households. The childcare activities of elderly persons represent most likely the time which they spend with their grandchildren.

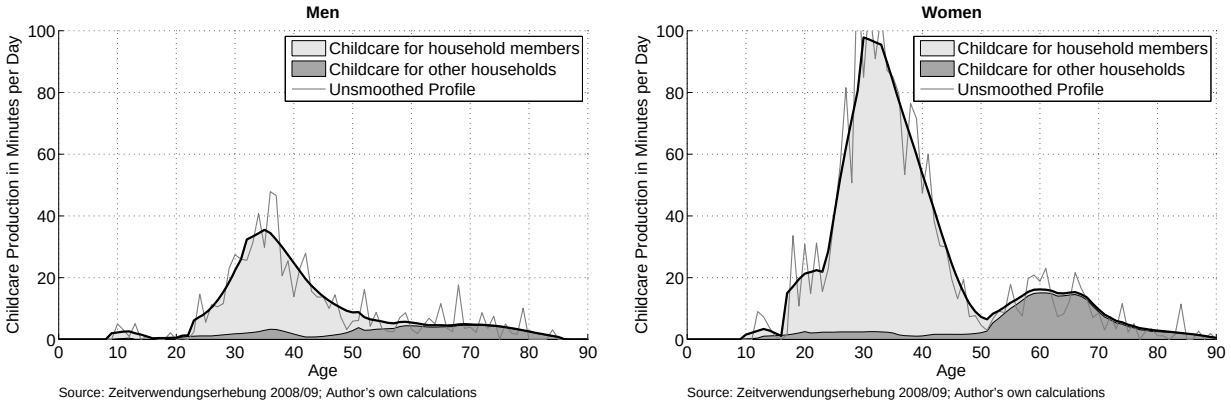


Figure 3.2: Childcare Production by Gender and Age in Minutes per Day

Voluntary Work

Figure 3.3 shows the age profiles of time use for voluntary work. Men from the age of 65 to 75 devoted with around 12 minutes somewhat more time to voluntary work activities than the other age groups with about 7 minutes. For women there is no clear age pattern with regard to voluntary work. The average for women was around 5 minutes at all ages between 20 and 80.

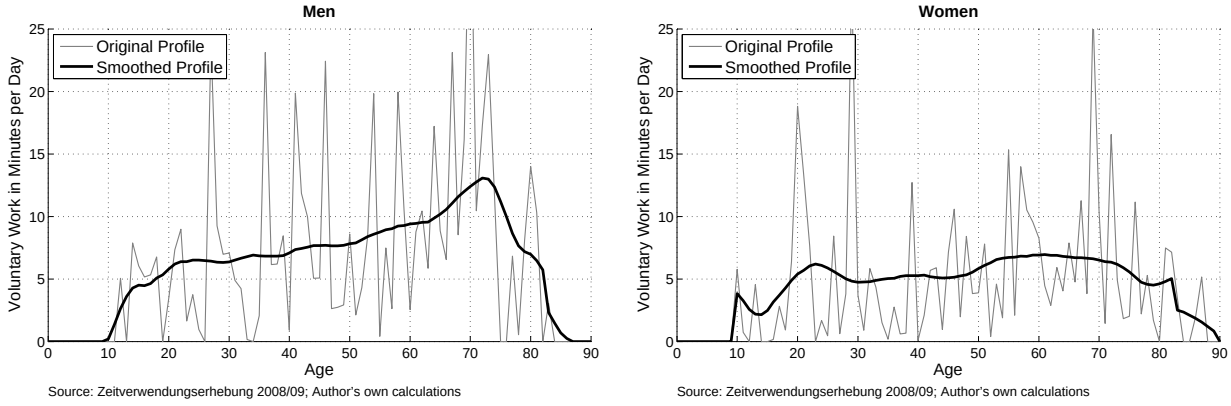
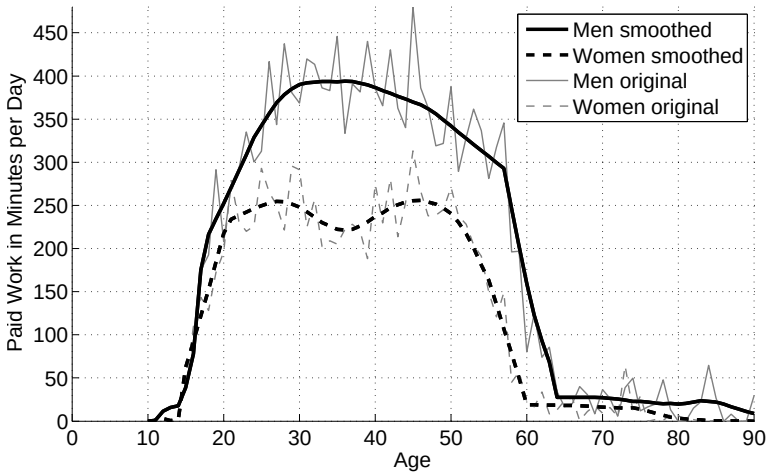


Figure 3.3: Voluntary Work by Gender and Age in Minutes per Day

Paid Work and Productive Leisure

For comparison I also provide the age- and gender-specific estimates of average daily time use for paid work and productive leisure. The age profile for paid work increases strongly from the

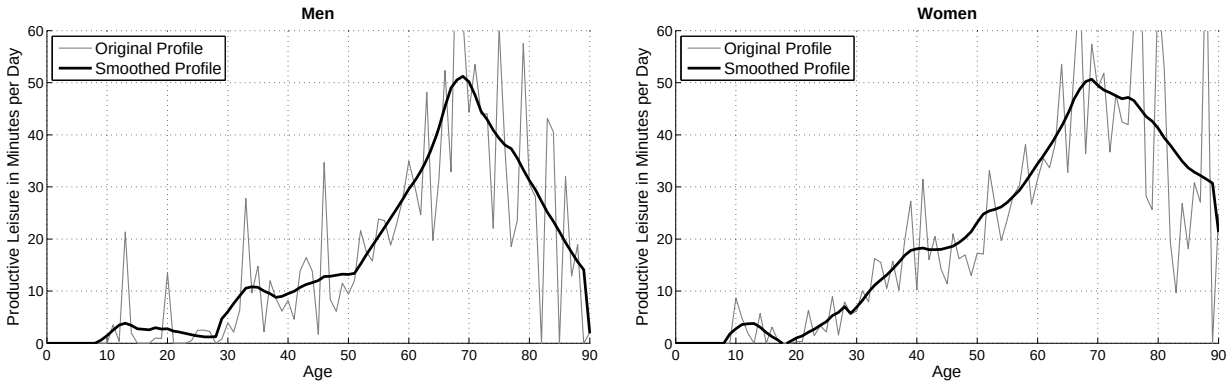
age 15 until age 20 for women, and from age 15 to age 30 for men. In 2008/09 the averages for women were rather constant around 250 minutes between the age of 20 and 50 with a reduction around the age of 35, when a large share of women has care responsibilities for small children. Visible is the earlier retirement of women, they leave the labour force between the age of 50 and the age of 60. Men around the age of 30 devoted with an average of about 400 minutes the highest amount of time to paid work. The averages decline slowly with age until about 57. At this age men start to exit the labour force and the averages drop sharply.



Source: Zeitverwendungserhebung 2008/09; Author's own calculations

Figure 3.4: Paid Work by Gender and Age in Minutes per Day

Productive leisure activities are strongly concentrated in old age. In 2008/09 only slightly more than 10 minutes per day were devoted to these activities in the age group 30-50. The population aged 65-75 used on average well above 40 minutes for these activities. This pattern can be interpreted as an indicator for the leisure character of gardening and handicrafts, as these activities are carried out mainly at an age when there is no time pressure through paid work and childcare responsibilities.



Source: Zeitverwendungserhebung 2008/09; Author's own calculations

Figure 3.5: Gardening and Handicraft Activities by Gender and Age in Minutes per Day

The Monetary Valuation of Unpaid Labour

The value of non-SNA production that is estimated using the input approach depends crucially on the valuation of labour, i.e the wage rate which is used to value the time which is spent on non-SNA production activities. There is an intensive discussion about the wage rate which should be used: the wage that the producer gets for his/her market work (opportunity cost), an average wage or the wage of a specialist, gross or net wage, etc. The choice depends on the analytical purpose of the account, but is to a large degree arbitrary. I try to choose the wage rates so, that a shift of production from households to the market or vice versa does not affect the total value and the age profiles of consumption and production. The total and the age-specific value for the consumption of a meal, for example, should not depend on whether it was prepared by unpaid household work or bought in a restaurant. A shift of production between unpaid household work and the market will always affect transfers. Market production requires public transfer payments in form of labour and consumption taxes; these flows do not emerge when goods and services are produced by unpaid household work.

In NTA consumption is measured at basic prices.[3] Shifts between the market and household production have no effect on the measures of production and consumption when the goods and services produced by unpaid household work are valued with the basic price of their market equivalent. Under the assumption that there are no profits or losses the basic market price of a good or service reflects the wages and non-wage labour costs, the costs of intermediate consumption and capital goods, as well as the taxes which are paid during the production process (other taxes on production). The total costs of the labour input consist of the gross wage, the employers' social contributions and payroll based taxes.[4] Therefore I decided to value the time used for unpaid household production with the labour costs of a professional who is hired to carry out these production activities. It is assumed that the professional uses the same amount of time as the individual who carries out the unpaid production activities. The assumption that the professional produces the same goods in the same amount of time is certainly problematic: household production is distributed over the whole day with large breaks in between, paying somebody to provide exactly the same services at exactly the same time (e.g. 10 minutes preparing breakfast at 7:00, one hour preparing lunch at 12:00, 45 minutes preparing dinner at 20:00) would in any case require a servant available the whole day. The valuation used for the Austrian NTHA takes therefore into account the amount of time which is used for household production, but ignores the distribution of production activities over the day.

[3]The basic price in NTA includes taxes which are paid in the production process (other taxes on production) but excludes taxes on products such as the value added tax.

[4]In Austria payroll based taxes include the contribution to the family burden equalization fund (Familienlastenausgleichsfond) and community taxes.

Housework activities (cooking, cleaning, shopping etc.) are valued by the labour costs for a general housekeeper; childcare by the labour costs for a child minder; and for voluntary work I use the labour costs for a social worker. It is assumed that these workers are paid according to the collective contract and have around 6 years of experience but no vocation-specific education. The reason for using contractual minimum wages, rather than average wages, is the lack of a reliable data source for wages of domestic workers. EU-SILC contains also occupation, but it measures yearly income and not hourly wages. Furthermore, the number of observations being household personal is low. Official sources are problematic because a large part of household work is carried out in the black market. Because the wages for domestic work are rather low, the minimum wages are probably close to the actual wages for this type of work. For voluntary work I use the wage of a social worker, because it includes a wide range of different activities. Many of these activities are comparable to what social workers or related professions carry out, such as the involvement in non-profit associations (e.g. rescue services, voluntary fire brigade) and leisure clubs (organizing different types of events). The wage of social workers are higher than for unskilled workers but lower than for management and should therefore be representative for the different type of voluntary work activities. Table 3.3 shows the minimum gross wages, the non-wage labour costs, and the total labour costs for housekeepers, nannies[5] and social workers[6]. To the hourly gross wage I add the cost for the mandatory special payments (1/6 of hourly gross wage) as well as the non-wage costs in form of employers' social contributions and taxes.[7] Table 3.3 also shows the average wage for paid work. It is derived by dividing NTA aggregate labour income with the estimate for the total number of hours which were devoted to paid work in 2010.

[5] i.) *Source:* Mindestlohntarif für im Haushalt Beschäftigte. `http://www.wgkk.at/mediaDB/495373_mindestlohntarif_ooe_im_haushalt_besch%202009.pdf` (Access 27 November 2013)

ii.) There are small differences in these agreements across federal states. I use the value for Upper Austria (Oberösterreich) because these correspond to the values used in the majority other federal states.

iii.) Nannies taking care of children younger than 3 years get a supplement of 80 cents per hour. The estimates for childcare consumption suggest that around 38 percent of childcare activities is provided for children aged 0-2 and 62 percent for children older than 2. For calculating the gross wage of nannies I add therefore 38 percent of the supplement to the basic gross wage.

[6] *Source:* Kollektivvertrag für Arbeitnehmerinnen, die bei Mitgliedern der Berufsvereinigung von Artbeitgebern für Gesundheits und Sozialberufe beschäftigt sind. The hourly wages are calculated by dividing the monthly wage through 4.33*40 (weeks per month*hours per week) and adjusting them for 5 weeks of paid holidays (times 52/47).

[7] The employers' social contributions amount to 21.7% of the gross wage, the contribution to the family burden equalization fund to 4.5%, community taxes to 3% and the contribution to the employee provision fund to 1.53% of the gross wage.

Table 3.3: Hourly Wage Rates in Euro

	Minimum Gross Wage	Special Payments/ Social Contributions/ Indirect taxes	Total Labour Costs
Housekeeper	7.9	2.8	10.7
Nanny	8.0	2.9	10.9
Social Worker	10.4	3.7	14.1
Average for SNA production*			18.2

* This estimate is derived by dividing total labour income through the estimate for total hours worked.

The Monetary Value of Non-SNA Production

Our goal is the combination of NTHA with NTA. Since the most recent NTA data is from the year 2010 also the estimates for household production should refer to 2010. It is assumed that the gender- and age-specific averages of daily time use for non-SNA production did not change between 2008/09 and 2010. To derive estimates of the total amount of time which has been used for non-SNA production in Austria 2010, these averages are multiplied with the corresponding population numbers from 2010. Table 3.4 shows the estimates for the total number of hours of unpaid household work carried out in Austria 2010 as well as estimates for their monetary value. In 2010 about 7,850 million hours with a value of about €85,000 Mill. or 40.3 percent of net national income (NNI)[8] (29.8 percent of GDP) were devoted to non-SNA production. The biggest part of non-SNA production were housework activities with a value of 33.1 percent of NNI, followed by childcare with a value of 4.7 percent, and voluntary work with a value of 1.9 percent of NNI. More than two thirds of the work for non-SNA production was carried out by women.

Table 3.4: Unpaid Work 2010 in Mill. Hours and Mill. Euro

Activity	**Mill. Hours**	**Value in Mill. Euro**	**% of NNI (% of GDP)**	**Shares in % Women**	**Men**
Childcare	912	9,952	4.7 (3.5)	73	27
Housework	6,652	71,120	33.6 (24.9)	68	32
Voluntary Work	289	4,072	1.9 (1.4)	43	57
Total Non-SNA	**7,853**	**85,144**	**40.3 (29.8)**	**68**	**32**

For comparison also information on paid work and productive leisure is provided (Table 3.5). Paid work accounted with around 9,000 Mill. hours for around 53 percent of the total time which was devoted to production in 2010. Women carried out about 39 percent of total work hours in paid work.[9] With these production activities they generated about 34 percent of total

[8] With net national income I refer to the sum of labour income and asset income in the NTA core accounts. It corresponds by and large to net national income at basic prices as it is usually measured in the SNA. Details on the NTA income measures can be found in Chapter 1.

[9] *Sources:* Zeitverwendungserhebung 2008/09 for time use; EUROSTAT for population data.

labour income.[10] The difference between the share of work hours and the share on total income can be explained by the lower wages of women. By using the input approach, gardening and handicraft activities amounted to 4.3 percent of NNI or 3 percent of GDP in 2010.

Table 3.5: Paid Work and Productive Leisure in Euro

Activity	Mill. Hours	Value in Mill. Euro	% of NNI (% of GDP)	Shares in % Women	Men
Paid work in hours	8,971			39	61
Labour income in Euro		163,606	77.4 (57.2)	34	66
Gardening, Handicrafts	845	9,035	4.3 (3)	59	41

Secondary Activities

There are concerns that housework and childcare activities are underestimated because they are carried out sometimes parallel with other activities. The time diary provides the opportunity to analyse secondary activities as well. The left column in Table 3.6 shows the recorded secondary activities while housework activities were carried out as main activity; the right column shows the main activities when housework activities were recorded as secondary activities. Unsurprisingly the most frequent activity which is carried out as secondary activity is listening to the radio/listening to music. Secondary activities other than listening to radio and other housework activities were recorded during 13.1 out of the 142 minutes of housework. Housework in turn was reported as secondary activity for 4.0 minutes when other activities than housework were carried out as main activity. Out of the 23.7 minutes of childcare as main activity, for 2.8 minutes secondary activities other than listening to radio and childcare were reported. Childcare activities in turn were carried out 4.5 minutes as secondary activities. It has been discussed in the NTA project to include secondary activities in the form of 1/3 of the time, and the primary activity for 2/3 of the time. Using this rule would decrease housework by 3 minutes, and increase childcare by less than a minute. Since the assumption is rather arbitrary and the magnitude of secondary activities is small, I decided not to account for secondary activities and stick to the main activities.

[10] *Source:* EU-SILC 2011

Table 3.6: Secondary Activities - Housework

	Housework as Main Activity Secondary Activities in Min. per Day	Housework as Sec. Activity Main Activities in Min. per Day
Housework	1.9	1.9
Childcare	1.6	0.4
Personal activities	0.9	1.2
Leisure	7.3	1.0
Watching TV	3.1	0.7
Listening Radio	15	0.0
Other	0.3	0.7
No Secondary Activity	112.1	
Sec. other than housework/radio	13.1	
Main activities other than housework		4.0
Total	**142**	**5.9**

Table 3.7: Secondary Activities - Childcare

	Childcare as Main Activity Secondary Activities in Min. per Day	Childcare as Sec. Activity Main Activities in Min. per Day
Housework	0.4	1.6
Childcare	1.2	1.2
Personal Activities	0.2	1.2
Leisure	1.8	1.2
Watching TV	0.3	0.3
Listening Radio	0.8	0.0
Other	0.1	0.3
No Secondary Activity	18.9	
Sec. other than childcare/radio	2.8	
Main activities other than childcare		4.5
Total	**23.7**	**5.8**

3.3.2 Intermediate Consumption and Capital in Non-SNA Production

Most of the resources which are used up by households are in the central SNA accounts, and consequently in NTA, classified as final consumption.[11] However, a large part of these resources are not directly consumed by households, but used as inputs in non-SNA production. The inputs are either in form of intermediate consumption (goods which are transformed or used up in the production process) or in form of capital goods required in the household production process. An important example is the preparation of a meal: raw food (intermediate consumption) is transformed into a delicious meal through the use of labour and capital goods (kitchen and kitchen equipment). The difference between intermediate consumption and capital formation is as follows: *the distinction between intermediate consumption and gross capital formation depends on whether the goods and services involved are completely used up in the accounting period or not. If they are, the use of them is a current transaction recorded as intermediate consumption; if not it is an accumulation transaction recorded in the capital account (SNA, 2009).* In this section I try to decompose SNA final consumption into the part which is indeed final consumption, and the part which is used as input in household production in form of intermediate consumption and capital. With the costs for commuting a part of SNA final consumption is identified as input in SNA production. This breakdown of consumption into subcategories is necessary to enable the application of NTA accounting principles in the household account. It has further the advantage that we gain information on the non-labour inputs in household production.

Capital in Non-SNA Production

Part of the goods which are purchased by households clearly classifies as capital formation, because these goods are repeatedly or continuously used in household production over several accounting periods (more than one year). This includes of course the building, but also household appliances such as kitchen equipment, hoover and vehicles if they are used for household production (e.g. shopping). For Austria there exists so far no NTA capital account. The capital stock is not of primary interest in the NTA core accounts, which measure only the current flows. However, NTA record the flows related to capital accumulation, i.e. saving, asset income and the consumption of fixed capital. Of particular importance is the consumption of fixed capital, because income is measured in NTA by its net value, thus less the consumption of fixed capital. The estimation of these quantities is difficult. The approach which is recommended and often used to estimate the capital stock and the related flows is a perpetual inventory model (for a description of this model see Meinen et al., 1998). This model requires knowledge about the investments over some time period as well as estimates (assumptions) of service life and discard pattern. Because for Austria there exist neither data on service life or

[11] An exception are the resources used for the construction and reconstruction of owner occupied dwellings.

discard patterns nor data on investments at a detailed enough level. I chose the approach to treat the goods used in household production as intermediate consumption, even when they are used longer than a year. The only good which is treated as asset are owner occupied dwellings, the flows from this asset (imputed rents) are recorded in the SNA. The expenditure for the maintenance of owner occupied dwellings is treated as consumption of fixed capital.

Intermediate Consumption Goods in Non-SNA Production

The goods and services used as intermediate consumption for household production have to be identified and reclassified from final consumption in the SNA central accounts to intermediate consumption in the HHSA. I classify the expenditure in the categories[12] alcoholic beverages, narcotics and tobacco, clothing and footwear, health, recreation and culture, education, restaurants and hotels as final consumption expenditure. Goods and services in these categories are usually enjoyed immediately and not further transformed by household production activities. Expenditure in the category communications is also classified as final consumption expenditure, because most of these goods and services are used for leisure activities, although undoubtedly some of them serve as input in household production, e.g. the communication necessary for household administration. The goods and services in the other categories require a more detailed analysis of their use, as they are used in household production and for final consumption. The allocation rules are described below for each category.

Food and non-alcoholic beverages

The processing of food is one of the most time consuming housework activities. Food is therefore a particularly important input in the household production process. I classify food which requires further processing (e.g meat, wheat) as intermediate consumption. Food which is bought in a state ready for immediate consumption (e.g. bread, fruits), or almost immediate consumption (e.g. frozen pizza) is classified as final consumption. By using this rule around 35 percent of total expenditure for food and non-alcoholic beverages are classified as intermediate consumption in the CES 2009/10, the rest as final consumption.

Housing, water, electricity, gas and other fuels

The expenditure for housing (e.g. rents) as well as running costs (e.g. water, energy) are divided into a part which is final consumption and a part which is used for household production and therefore classifies as intermediate consumption. As allocation key I use the amount of time which is spent in the household for household work and other activities. Of the 1440 daily minutes around 1000 are on average spent at home; of these 1000 minutes are around 100 minutes used for household production. That is, about 10 percent of the housing and running costs for housing are classified as intermediate consumption. The expenditure in the

[12] I use the classification of private consumption according to the Classification of Individual Consumption by Purpose (COICOP).

subcategory maintenance and repair is classified as consumption of fixed capital if the dwelling belongs to the household.

Furnishings, household equipment and routine maintenance of the house
Furnishings, household textiles and household utensils are treated as final consumption. Smaller household equipment (tools), household appliances which are used in the household production process, and goods used for routine maintenance of the household are treated as intermediate consumption. Intermediate consumption makes up around one third of total expenditure in this category.

Transport
The costs and the time used for travelling are assigned to the activity which is the aim of the travel/transport activity. The costs of travel related to leisure activities are treated as final consumption, those related to household work as intermediate consumption and the costs which arise through commuting are classified as intermediate consumption for the generation of income from paid work.

The information about the purpose of the travel activity is taken from the time use survey (Table 3.8): around 30 percent of the time spent in the car is for commuting, 30 percent for housework activities (e.g. shopping) and 40 percent for leisure. Of the time in public transport 46 percent are used for getting to work, 17 percent for household work and 37 percent for other (leisure) activities. Education related travel in public transport services is not included, because it is usually financed by the public sector. The total consumption expenditure for travel and transport is distributed according to these shares.

Table 3.8: Purpose of Travel Activities

Purpose	Minutes per day	%
Car: commuting	9.8	30
Car: household work	9.8	30
Car: leisure activities	12.9	40
Public transport: commuting	3.7	46
Public transport: HH work	1.4	17
Public transport: leisure	3	37

Insurance

I interpret the costs for property insurance as the costs which arise to replace the goods in case of loss or damage. If the insurance would not exist, this expenditure would show up in the consumption category to which the insured good belongs to. The consumption expenditure for the housing insurance of owner occupied dwellings is therefore treated as consumption of fixed capital; the expenditure for housing insurance in rented dwellings is allocated to final consumption and intermediate consumption according to the key used for the direct housing costs; for vehicle and transport insurance I use the same allocation key as for the direct expenditure on vehicles.

Table 3.9 shows how private consumption is divided into final consumption, intermediate consumption in household production, intermediate consumption for generating income from paid work and consumption of fixed capital. With 81.5 percent the by far largest share of SNA consumption is treated as final consumption. Around 13.9 percent of SNA consumption serve as inputs in the household production process: 12.1 percent in form of intermediate consumption and 1.8 percent in form of capital. Quite a large share of SNA final consumption is used for commuting (4.6 percent) and treated as intermediate consumption in SNA production.

Table 3.9: Decomposition of SNA Final Consumption

	Final Consumption	Intermediate Consumption	Consumption of Fixed Capital	Intermediate Consumption Paid Work
Food	8,531	4,606		
Rent, operation costs	23,078	3,002	1,636	
Household equipment	5,697	2,779		
Transport:				
Purchase and operation of vehicles	5,544	4,206		4,198
Transport services	1,077	481		1312
Insurance	2,198	464	693	445
Other	58,620			
Total	**104,744**	**15,538**	**2,329**	**5,955**
In % of private consumption	**81.5**	**12.1**	**1.8**	**4.6**

3.3.3 Non-SNA Production by Age: Monetary Value

Figure 3.6 plots the age-specific contribution to non-SNA production in Euro. As women carry out much more housework and childcare than men, they contributed with around €20,000 around the age of 30 (childcare) and the age of 70 much more to non-SNA production than men. The monetary value of men's non-SNA production activities is around €12,000 between the age of 30 and the age of 70. We assume that those consumption goods which serve as input in household production are financed out of asset- and labour income. As their labour income is higher, the share of intermediate consumption goods which is financed by men is higher than the share for women.

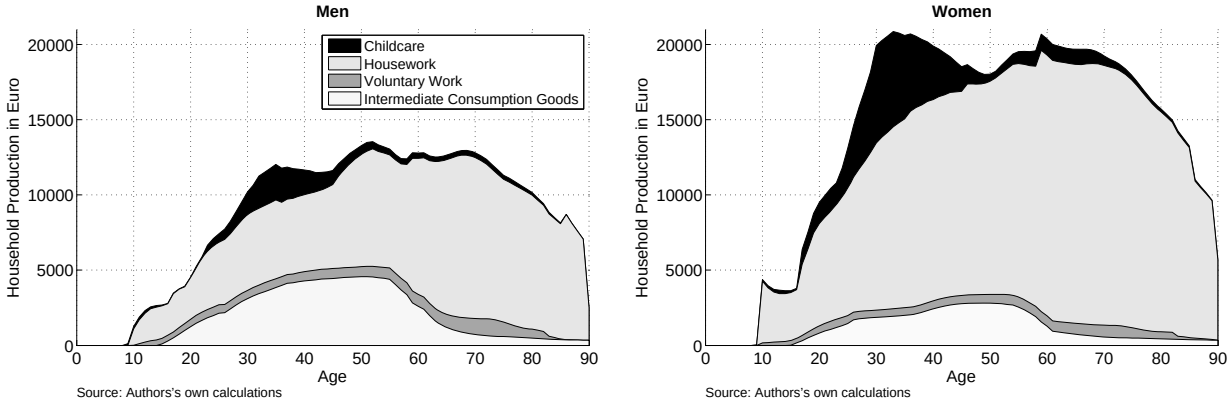


Figure 3.6: Household Production by Gender and Age in Euro

3.4 Non-SNA Consumption

In the previous section we estimated the monetary value of the goods and services which are produced by non-SNA production activities at each age. In this section we derive estimates for the age- and gender-specific consumption of these goods and services. It is assumed that there is no investment or saving through unpaid household work; total production equals therefore total consumption. A large part of unpaid household work is not consumed by the producer himself/herself but by other persons. This is obvious for care activities and voluntary work, but applies also to housework, which is in most cases carried out for all household members. The consumption of goods and services emerging from household work is not directly observed. The estimation of age- and gender-specific consumption requires therefore assumptions about the distribution of the produced goods and services within the household, and assumptions about the age-specific consumption of the goods and services which are provided to other households. The method for estimating consumption is based on the suggestions by Donehower (2013) and is described below for the different categories of non-SNA production activities.

3.4.1 Consumption of Unpaid Household Work

Housework

It is assumed that the goods and services emerging from intra-household production in form of housework are shared among all household members. To derive the age-specific estimates for consumption, the total time which is spent to produce these goods and services is summed up within the household and distributed among all household members according to the NTA consumption equivalence scale. This equivalence scale consists of age-specific weights[13], ac-

[13]The weights are expressed in adult- or household head equivalents, therefore the term *equivalence scale*. In the NTA consumption equivalence scale it is for example assumed, that a four year old child is in terms of consumption equivalent to 0.4 adults (consumes 40% of an adult).

cording to which the total intra-household production of the household is distributed. The NTA equivalence scale accounts for the lower consumption of children as compared to adults, and is also applied in the NTA core accounts for private consumption other than health and education. It is assumed that adults aged 20 and older consume the same amount, children until the age of four 40 percent of an adult and there is a linear increase between age four and age twenty. The use of this equivalence scale ensures that a shift from market- to household production or vice versa does not change the consumption age profiles. Since there is no information on the beneficiaries from inter-household production, the total production in the economy is distributed to the total population according to the NTA consumption equivalence scale. After allocating household production to individuals, average age-specific consumption is estimated by taking the mean in each age group.

There has been an intensive discussion within the NTA project how much children consume as compared to adults. The NTA equivalence scale has been accepted by the NTA members as reflecting the consumption of children compared to adults for products bought on the market. Its application for household work is criticized for underestimating the consumption of children regarding the goods and services produced by unpaid household production. However, many market goods and services are quite comparable to household production. E.g. a meal which is bought in a restaurant and a meal produced at home; cleaning services which are bought on the market and the cleaning activities carried out by the household members; professional laundry services and doing the laundry by home production; professional maintenance of the dwelling (plumber, electrician) and do-it-yourself maintenance. It would be inconsistent to use different allocation rules for similar products and services. The allocation rule should not depend on whether the good or service was produced in- or outside the market.

The age-specific averages for the consumption of housework are adjusted so, that aggregate consumption (age averages multiplied by population numbers and added up over all ages) equals aggregate production. The age- and gender-specific averages of inter-household and intra-household consumption are plotted in Figure 3.7. The increase of consumption between age zero and age 20 can be explained by our assumption about the lower consumption of children. It is rather constant during working age until about 50 and increases thereafter until the peak around the age of 70. We observe a similar effect as for SNA consumption in NTA: household production at age 30-50 is often shared with the own children who live in the same household. The averages are increasing in old age because older people produce more and the housework which is done is shared among fewer people. The average household size decreases in old age because the own children leave the common household. There are little differences in consumption between men and women because we do not assume gender differences in the equivalence scale. Average housework consumption is slightly higher for women, because women living alone produce, and consequently consume, more housework

than men.

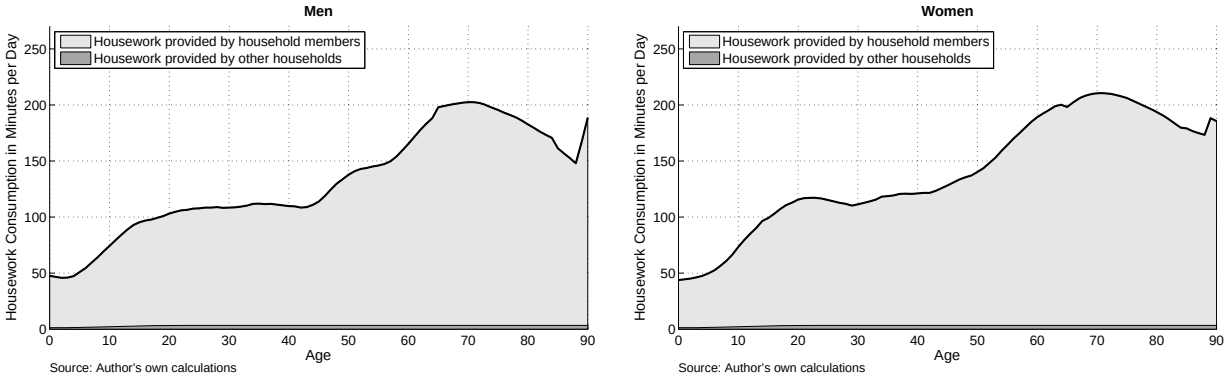


Figure 3.7: Housework Consumption by Gender and Age in Minutes per Day

Adult care consumption is calculated separately from housework because it shows a strong age-pattern (Figure 3.8). To allocate the time which is devoted to adult care to household members, I assume that the care is distributed among all adult household members (15+) and that somebody who gives care does not receive care. With this rule a large part of care consumption is assigned to the age group 89 and 90+. The high averages for the age group 90+ are not surprising. Surprising is the strong increase at age 89; this might be a random-effect as the survey population in these older age groups is already rather small.

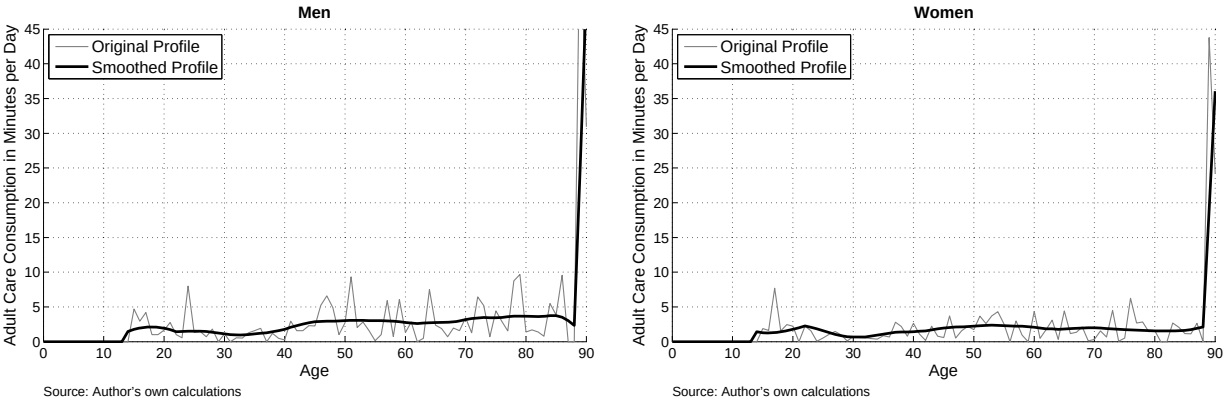


Figure 3.8: Adult Care Consumption by Gender and Age in Minutes per Day

Childcare

The amount of childcare consumption (i.e. the amount of time which is devoted to a child in form of care) is strongly dependent on the age of the child. The bulk of childcare is enjoyed by the children in the first years of their life. Figure 3.9 shows the amount of time that parents use for childcare activities by age of the child. To avoid complications with the assignment of childcare activities when several children are present, I included for this analysis only parents with a single child below the age of 16. This age-border is chosen because that is how children

are defined in the Austrian time use survey. In the first 1-2 years after birth mothers use around 250 minutes of their daily time for childcare activities. This is decreasing fast as the child gets older: for children aged 2-4 years mothers use on average 140 minutes, for children aged 5-9 around 100 minutes and for those aged 10-15 around 20 minutes. Fathers use for their newly born offspring on average 80 minutes until the age of 2, around 60 minutes for the children aged 3-9 and about 15 minutes for those aged 10-15.

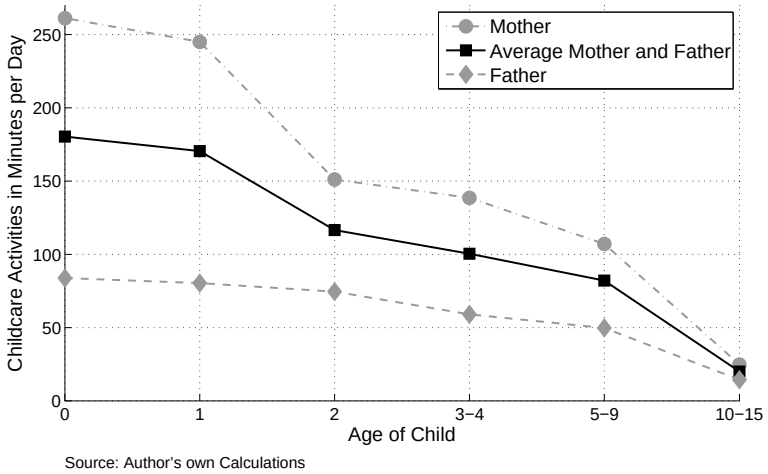


Figure 3.9: Childcare Activities of Parents in One-Child Families by Age of Child

When several children are cared for the time used for childcare has to be distributed to all of the children. Since younger children usually require more attention I distribute the childcare activity according to age-specific weights. These weights are generated using the information on the amount of time which is used for childcare by parents with only one child. Because the time use of mothers for childcare is much different from those of the other household members (e.g. breastfeeding), a different equivalence scale for mothers and for other household members (based on the results of fathers) is used. These childcare weights are normalized so that newborn (below one year) get a weight of one (Table 3.10). After distributing the time which is used for childcare activities to the children the age averages are calculated.

Table 3.10: Childcare Consumption Equivalence Scale

Age of Child	**Mother**	**Other Household Members**
Below 1	1	1
1	0.94	0.96
2	0.58	0.89
2-4	0.53	0.70
5-9	0.41	0.59
10-14	0.09	0.17

The age of the children is not known if a person takes care of the child from another household. For the estimation of the age-specific consumption of childcare services which are provided by

other households, data from EU-SILC 2011 are used. EU-SILC contains variables for the use of different care-arrangements in weekly hours. Total inter-household childcare production is distributed according to the age-specific use of unpaid childcare services through other persons than parents[14]. Figure 3.10 shows the consumption of childcare services, distinguishing intra- and inter-household transfers.

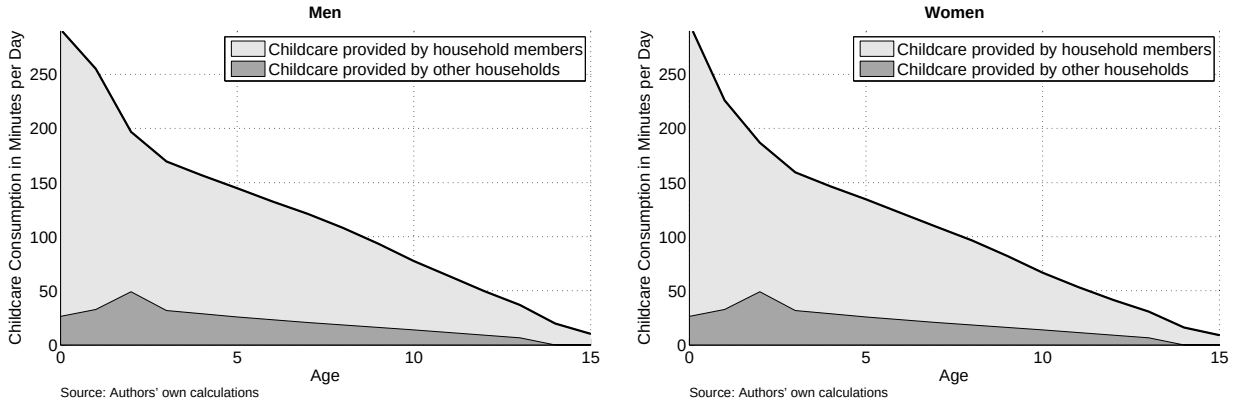


Figure 3.10: Childcare Consumption by Gender and Age in Minutes per Day

Voluntary Work

The consumption of voluntary work is assumed to be independent of age and gender. Average daily consumption of voluntary work is 5.5 minutes.

3.4.2 Intermediate Consumption

Household production requires not only input in form of work, but also in form of goods and services bought on the market. The value of goods and services produced by household production consists therefore of the value of labour input and the value of the input in form of intermediate consumption goods and services. The estimation of age-specific consumption of intermediate consumption goods for household production is based on the consumer expenditure survey 2009/10.

3.4.3 Non-SNA Consumption by Age: Monetary Value

Figure 3.11 plots the estimates of non-SNA consumption by age and gender. In 2010 total non-SNA consumption was with an average value of more than €23,000 clearly highest at the beginning of life. The most important consumption component at this age is childcare. Non-SNA consumption decreases with the amount of received childcare until the age 15, and is rather constant around €10,000 between the age of 15 and age 50. It increases in the age groups from about 50 to 70 because at this age people devote more time to household

[14]Variable K001080 in EU-SILC

production. Since there is a low share of more-generation households with adult children (consequently there are no transfers to younger age groups), the higher production translates directly into higher consumption. Non-SNA consumption decreases after the age of 70 but increases again at the age of 90+, because adult care is strongly directed to these age groups.

Figure 3.11: Household Consumption by Gender and Age in Euro

3.5 Total Production: Combining the Accounts for SNA Production and Unpaid Household Production

The measures for total production/income and consumption include the values of the products and services which are captured in the central system of the SNA and in NTA, as well as the value of goods and services which are produced by unpaid household work. Total income consist of labour income (YL), asset income (YA) and the value of the labour input in non-SNA production (YH). Total consumption consists of public consumption (CG), private SNA consumption (CF), and the value of the consumed goods and services which are produced by unpaid household work (CH). The extended SNA accounting identity states, that the total disposable income consisting of total income plus public transfers (TG), private SNA transfers (TF) and private non-SNA transfers (TH) equals total consumption plus savings.

$$\underbrace{YL + YA + YH}_{\text{total income}} + \underbrace{\tau^g + \tau^p + \tau^h}_{\text{net transfers}} = \underbrace{C^p + C^g + C^h}_{\text{total consumption}} + \underbrace{S}_{\text{savings}} \tag{3.1}$$

The extended production measure corresponds largely to SNA production plus the labour costs for non-SNA production. However, it is not correct to simply add the quantities of the household account and the central accounts; likewise it is not correct to simply add NTTA (considering only unpaid household labour) and NTA age profiles. The introduction of a HHSA requires some adaptations in the SNA central accounts and consequently also in the NTA core accounts.

In the time use analysis travel activities are assigned to the activity the journey is related to; commuting is treated as part of paid work. The costs arising through commuting constitute therefore intermediate consumption for generating income from paid work. Since the output is captured in SNA (and NTA) in form of labour income, these costs have to be subtracted from total income. In 2010 the estimated costs for commuting were €5,955 Mill. (Table 3.9). Taking into account the costs for commuting decreases NTA labour income by about 3.6 percent. This adjustment consequently affects also consumption: as the expenditure for commuting is neither part of final consumption nor of HHSA intermediate consumption also total consumption decreases by this value, equivalent to 4.6 percent of private SNA-consumption.

Income in the NTA core accounts corresponds to net national income at basic prices, thus it does not include the income which is used to maintain the capital stock. To be consistent we have to decrease total income by the value of resources which are used to maintain the households' capital stock. In our case this is the expenditure for the maintenance and repair of owner occupied dwellings which amounted to €2,329 Mill. in 2010 and decreases total asset income by about 4.5 percent and private SNA-consumption (in form of imputed rents) by about 1.8 percent.

Since the age profiles in NTA are interdependent, it is necessary to recalculate the whole NTA dataset. Total production and total consumption by age and gender is plotted in Figure 3.12. Production is highest in the age groups around the age of 50. These age groups do not devote the highest amount of time to production, but they have the highest average income from paid work and the highest average asset income. Women contribute less to total production than men, because the average monetary value of an hour unpaid household work is lower than the average monetary value of an hour of paid work. There is a peak in total consumption at the beginning of life when children need a large amount of care from their parents. Consumption is also quite high from the age of 6 until the age of 15 because of public expenditure for education. The age groups around the age of 60 have the highest level of consumption. Because of high average labour income and few dependent children the expenditure for private SNA consumption is high. The age groups from 60 to 70 consume additionally the highest average amount of goods produced by unpaid household work. There is another peak at the end of life when people require a high amount of public and private long-term-care as well as public health services.

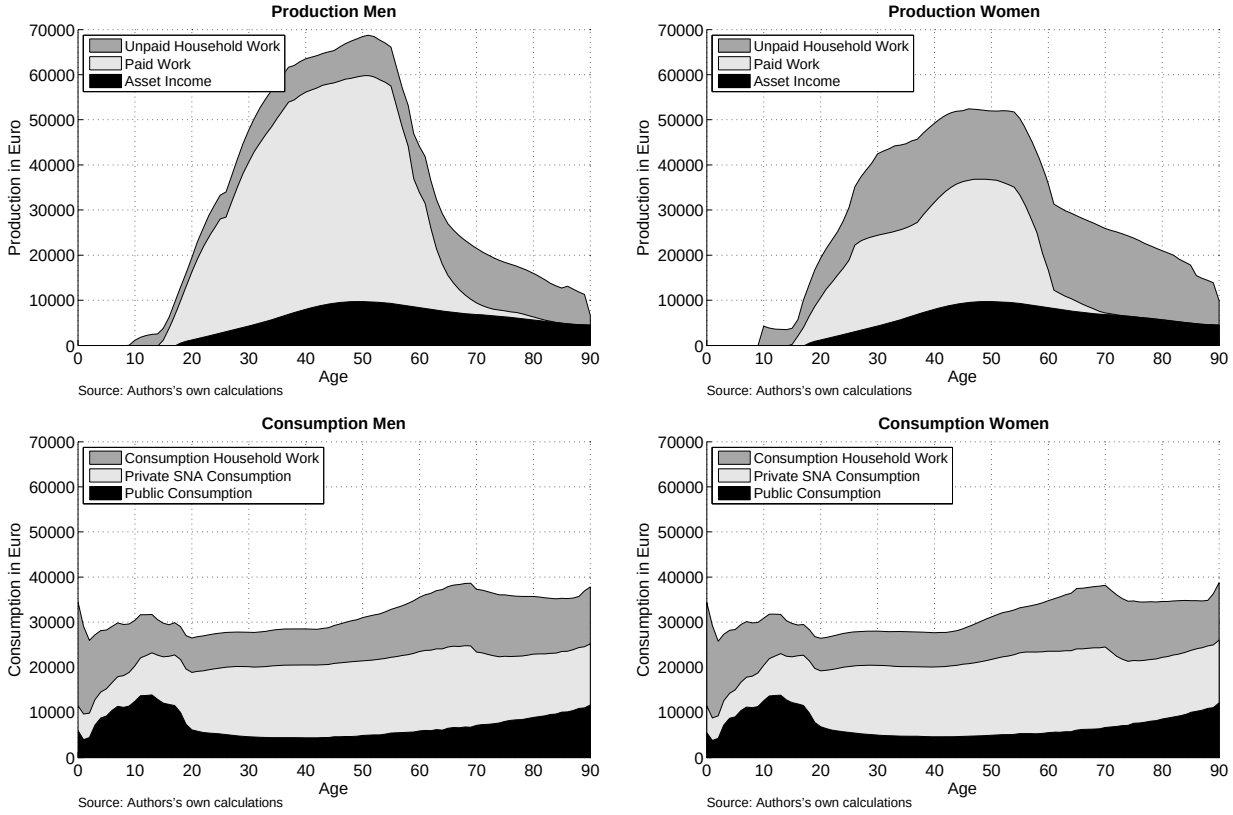


Figure 3.12: Total Production and Consumption by Gender and Age in Euro

By rearranging the terms in Equation 3.1 we can derive a measure for the total net transfer inflows at each age. It is calculated as the difference between production (less saving) and consumption:

$$\tau^g + \underbrace{\tau^p + \tau^h}_{\text{private transfers}} = \underbrace{C^p + C^h + C^g}_{\text{total consumption}} - \underbrace{YL + YH}_{\text{labour income}} + YA - S \tag{3.2}$$

The total net transfers which are received at each age are plotted in Figure 3.13. Transfers are high in childhood and old age because of the care which is received by these age groups. In 2010 the average value of total net transfer inflows was around €30,000 for children until the age of 15. The value of the net transfers which have been received by the elderly population was between €15,000 around the age of 60 and €40,000 in the age group 90+. In 2010 men between the age of 22 and 61 were on average net contributors to the transfer system; the average value of their contribution to the transfer system was more than €30,000 between age 35 and age 50. Women were on average net-contributors between the age of 24 and 59 in 2010. Because of the lower monetary valuation of unpaid household work they contributed with around €15,000 between age 35 and 50 less to the transfer system than men. The most frequent household in older ages is an elderly couple living together. Since women do more

housework, there are net transfers from women to men. This is reflected in the lower net transfers which are received by elderly women as compared to men.

Figure 3.13: Total Net Transfers by Gender and Age in Euro

Figure 3.14 provides an overview over the age specific type of production and the age-specific type of transfers. For this graph labour income from SNA production and the value of the labour input in unpaid household production have been merged into a single measure of total labour income. Similarly, the private transfers in form of market goods and in form of unpaid household work have been merged into a single measure of total private transfers. Total income is represented by the white (total labour income) and the black area (asset income less savings). The black line represents total consumption. Private net transfers are presented by the light grey area and public net transfers by the dark grey area. Net-inflows are plotted on the positive y-axis, net-outflows on the negative y-axis. It shows that the transfers to children consist mainly of private transfers, while the difference between consumption and production in old age is covered mainly through public transfers. The total private net transfers to children[15] in 2010 had an value of about €33,000 Mill. (15.6% of NNI, 11.5% of GDP), the public net transfers to children an value of about €13,100 Mill. (6.2% of NNI, 4.6% of GDP). The value of the public net transfers to the elderly population was in 2010 €34,200 Mill. (16.2% of NTA income, 11.9 % of GDP). There was a small outflow of private transfers from the elderly population in form of unpaid household work with a value of €2,400 Mill. (1.1% of NTA income, 0.8% of GDP).

[15]We define children as the young population until the age of 24; until this age average production falls short of average consumption. Likewise is the elderly population is defined as the population above the age of 60; average consumption exceeds average production in older age groups.

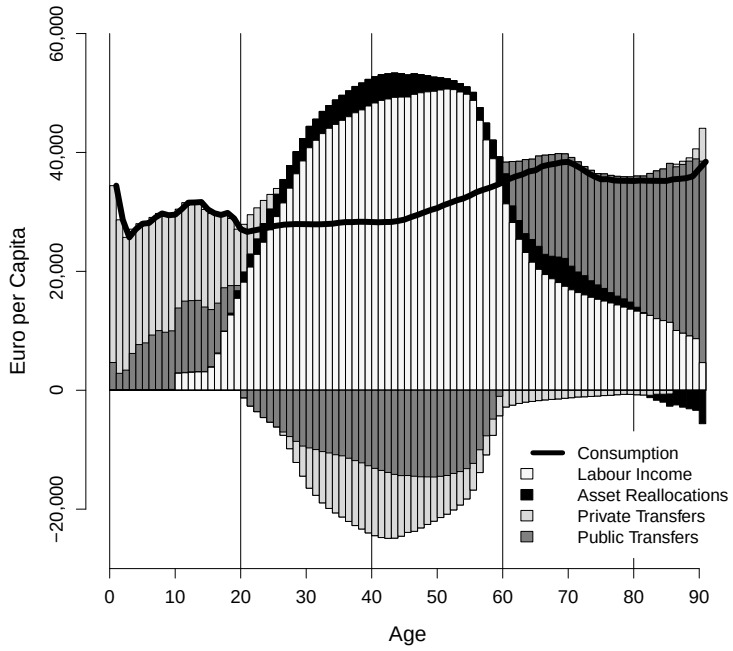


Figure 3.14: Overview Total NTA

3.6 Summary and Conclusions

The NTHA for Austria 2010 provides valuable information about the non-SNA production activities of households and the role of the family in the age reallocation system. Non-SNA household production accounts for a considerable part of total production: according to the estimation method which has been used in this chapter the total value of unpaid household work in Austria amounted to 29.8 percent of GDP in 2010. There is an asymmetry in the public and private transfer system regarding the direction of transfers. While the private transfers are mainly from the working age population to the children, the public welfare system consists mainly of transfers from the working age population to the elderly population (pensions, health and long-term-care). Transfers within households, in particular transfers in form of unpaid household work, are an extremely important part of the age reallocation system. With 11.4 percent of GDP the private net transfers to children were in 2010 almost as high as the public net transfers to the elderly population with a value of 11.9% of GDP. But the private flows are less visible because until the development of NTA and NTTA there were only few attempts to measure these flows. Discussions about welfare reforms focus therefore often only on public transfers and ignore the private flows in the age reallocation system. The NTHA recognizes and illustrates the important role of the family in the welfare system.

Both, the results for the HHSA as well as the results for the NTHA are in some sense experimental. There are, despite intensive efforts to develop a consistent and comparable method-

ology, numerous open methodological questions. Important open questions in HHSA and in the NTHA are the valuation of unpaid household work, the exact shape of the production boundary and the estimation of the households' capital stock. An important issue which is relevant only in age specific household accounts (NTHA, NTTA) is the estimation of age-specific non-SNA consumption.

Most of the researchers working on NTTA use net-wages for valuing unpaid household work and there is an ongoing discussion about the appropriate wage rate. But the choice of the wage rate is not necessarily a completely arbitrary decision. Clearly stated assumptions and desired properties of the valuation method can provide a guideline for the choice of the wage rate. In the Austrian NTHA unpaid household work is valued with the total labour costs of a professional who is hired to carry out these activities. This choice is suggested by the desired property, that replacing the work of household members with a professional worker should not change the aggregate and age-specific values for consumption and production.

The classification as production or non-production is for most of the activities unambiguous. But productive leisure activities like gardening and handicrafts lie somehow on the production boundary; some researchers include these activities in their account, others do not. This choice affects not only the value of total production but also the age profiles, because these activities are carried out mainly in older ages. Their treatment as production additionally increases the amount of time which is used for unpaid household production in old age, the actual output however might be quite low. In the NTHA for Austria these activities are not treated as production, because I regard the input approach as not appropriate to estimate the value of this type of production. The input in form of time is likely to be high compared to the actual output. An elegant way to solve this problem for gardening and handicrafts would be an output based valuation of these activities.

Further development is required regarding the estimation of the households' capital stock. This is especially in the NTA framework important, as income is measured in form of net production, thus less the consumption of fixed capital. The approach which is usually used to estimate the capital stock in HHSA is a perpetual inventory model. For Austria I did not find appropriate and detailed enough data to use this approach. There is currently a lot of research to generate NTTA in the NTA project. With the experience and data from other countries the use of this methodology might become feasible.

The distribution of household production within the household is one of the most controversial issues in the NTA project. In the Austrian NTHA these goods and services are according to the NTA consumption equivalence scale for market goods, which assumes a lower consumption of children as compared to adults. This approach is criticised of not reflecting the true share of children's consumption relative to the consumption of adults. The feedback indicates that it is

regarded as inappropriate to use the same rules for market goods as for household production. I nevertheless chose this approach because I regard it as inconsistent to base the choice of the allocation rule on the way how the good or service was produced. The allocation rule for the consumption of non-SNA products and services requires more discussions within the NTA project. One possible solution would be to use different rules for different type of goods and services.

We will see in the next chapter that the decomposition of NTA by gender and the introduction of household production into the NTA framework provide not only important information about the age reallocation system, but also leads to a better understanding of cross-country differences in the results from the NTA core accounts.

References

Abraham, K. G. and Mackie, C. D. (2005). *Beyond the Market: Designing Nonmarket Accounts for the United States*. National Academies Press, Washington,D.C.

Donehower, G. (2013). *Incorporating Gender and Time Use into NTA: National Time Transfer Accounts Methodology*. Available on: `http://www.ntaccounts.org/doc/repository/Incorporating%20Gender%20and%20Time%20Use%20into%20NTA,%20Version%203.docx` (accessed 30 November 2013).

European Communities (1996). Council Regulation (EC) No 2223/96 of 25 June 1996 on the European system of national and regional accounts in the Community. *Official Journal L 310*, pages 0001 – 0469. Available on: `http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=CELEX:31996R2223:EN:HTML` (accessed 31 October 2013).

European Communities (2003). *Household Production and Consumption: Proposal for a Methodology of Household Satellite Accounts*. European Communities. Office for Official Publications of the European Communities, Luxembourg.

Franz, A., editor (1996). *Familienarbeit und Frauen-BIP*. Österreichische Studien zur amtlichen Statistik; Österreichisches Statistisches Zentralamt.

Hammer, B. (2012). Statistical Models for Time Use Data: An Application to Housework and Childcare Activities using the Austrian Time Use Surveys from 2008 and 1992. Master's thesis, University of Vienna.

Holloway, S., Short, S., and Tamplin, S. (2002). *Household Satellite Account (Experimental) Methodology*. Office for National Statistics, London.

ILO (2010). *Measuring the Economically Active in Population Censuses: A Handbook*. United Nations, International Labour Office. United Nations Publication, International Labour Office Publication.

Landefeld, J. S., Fraumeni, B. M., and Vojtech, C. M. (2009). Accounting for Household Production: A Prototype Satellite Account Using the American Time Use Survey. *Review of Income and Wealth*, 55(2):205–225. Download from: `http://www.bea.gov/about/pdf/`

RIOW_Householdproduction.pdf (accessed 06 December 2013).

Meinen, G., Verbiest, P., and de Wolf, P.-P. (1998). *Perpetual Inventory Method*. Available on: http://www.oecd.org/std/na/2552337.pdf (accessed 10 December 2013).

OECD (2011). *Society at a Glance 2011: OECD Social Indicators*. OECD Publishing. Download from: http://dx.doi.org/10.1787/888932381665 (accessed 20 January 2014).

Phananiramai, M. (2011). Incorporating time into the National Transfer Accounts: the case of Thailand. In Lee, R. and Mason, A., editors, *Population Aging and the Generational Economy: A Global Perspective*, pages 528–541. Edward Elgar Publishing Limited. Download from: http://idl-bnc.idrc.ca/dspace/bitstream/10625/47092/1/133467.pdf (accessed 9 February 2014).

Reid, M. G. (1934). *The Economics of Household Production*. John Wiley & Sons, Inc., New York. Download from: https://archive.org/download/economicsofhouse00reid/economicsofhouse00reid.pdf (accessed 28 October 2013).

Roy, D. (2012). *Measuring the contribution of unpaid domestic work to the well-being of households using Time Use Surveys*. Download from: https://www.ciret.org/conferences/vienna_2012/papers/upload/p_211-804780.pdf (accessed 28 October 2013).

Ruger, Y. and Varjonen, J. (2008). Value of Household Production in Finland and Germany. Technical report, Working Paper 112, National Consumer Research Centre, Finland.

SNA (2009). *System of National Accounts 2008*. European Communities, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank. Download from: http://unstats.un.org/unsd/nationalaccount/docs/SNA2008.pdf (accessed 20 January 2014).

Statistik Austria (2011). *Standard-Dokumentation, Metadaten: Zeitverwendungserhebung 2008/09*. Statistik Austria. Download from: http://www.statistik.at/wcmsprod/groups/gd/documents/stddok/060010.pdf (accessed 22 August 2013).

Zagheni, E. and Zannella, M. (2013). The life cycle dimension of time transfers in Europe. *Demographic Research*, 29:937 – 948. http://www.demographic-research.org/volumes/vol29/35/29-35.pdf (accessed 30 November 2013).

Chapter 4

Production Activities by Age and Gender in Europe: A Cross-Country Comparison

Authors: Bernhard Hammer, Alexia Prskawetz, Inga Freund

The last chapter of the thesis consists of paper which is a contribution to the project Welfare, Wealth and Work for Europe (WWWforEurope). This project is organized by the Institute of Economic Research (WIFO) and funded through the Seventh Framework Programme of the European Union. A working paper version of this paper has been published in the working paper series of the project.[1] The version of the paper which is included here has been submitted for publication in the *Journal of Economics of Ageing* and is currently (February 2014) under review. It is a work together with Alexia Prskawetz and Inga Freund. The calculations as well as substantial parts of the paper and the final version are my own work.

We acknowledge the funding through the European Commission's Seventh Framework Programme FP7/2007-2013 under grant agreement no. 290647. Our research has also been supported by the Austrian Science Fund [Project I 347-G16 "National Transfer Accounts and intergenerational redistribution in European institutional settings"].
The authors thank Jože Sambt and Robert Gál for valuable comments as well as Michael Freiberger for his research assistance.

[1] Download from: `http://www.foreurope.eu/fileadmin/documents/pdf/Workingpapers/WWWforEurope_WPS_no013_MS12.pdf` (accessed 16 January 2014)

4.1 Introduction

Persistent low fertility and increasing survival to older ages are the key determinants of population ageing in many European countries. The consequences of the changing age structure for the overall economic development depend on the design of the economic life cycle, i.e. the age pattern of economic activities such as consumption, the generation of labour income and saving. A typical characteristic of the life cycle in modern societies are phases of economic dependency at the beginning and end of life, in which consumption exceeds the income generated through one's own labour input. In childhood and retirement at least part of consumption has to be covered through the reallocation of resources in form of transfers and asset accumulation. A shift in the age structure of the population - as a consequence of the ageing process - requires an adjustment of the age reallocation system. The current system will be under pressure as an increasing share of elderly people has to be sustained by an ageing and shrinking population in working age.

In this paper we analyse the cross-country differences in the age- and gender-specific involvement in production activities. These differences are influenced by country-specific institutional settings, practices and norms as well as the current demographic structure. With the comparative analysis we aim to identify challenges, but also possible strategies and best practice examples regarding the organisation of production and the reallocation of resources across age. We argue that a better understanding of the reallocation of resources across age is necessary to guide any welfare reform in the face of population ageing. In particular it needs to consider gender differences in the type and the intensity of production activities at each age as well as private transfers in combination with public transfers. The involvement of women in paid work might facilitate financing public transfers to children and dependent elderly persons. However, an increase of paid work might only be feasible with a reduction of unpaid work. Unpaid work activities have therefore to be taken into account in reform considerations.

The analysis is based on the methodology and data from the National Transfer Accounts (NTA) project, as well as on income data from the European Survey of Income and Living Conditions (EU-SILC) and data from the Multinational Time Use Study (MTUS), complemented by Austrian time use data. From these data sources we obtain information on the age-specific levels of production and consumption. The difference between consumption and labour income is termed the *life cycle deficit* (LCD) (Mason et al., 2006) and represents a measure for the age specific level of economic dependency. For children as well as for elderly persons the life cycle deficit is positive, i.e. average consumption in these ages exceeds average labour income, while it is negative during the working years when labour income is higher than consumption. By multiplying the age-specific per capita LCD with the corresponding population numbers and summing up over all age groups with a positive LCD, we obtain a

measure for the total economic dependency of children, respectively elderly persons. The total economic surplus of the working age population (the sum over the age groups with a negative LCD) gives us a measure for a society's ability to support the population with a (positive) life cycle deficit. Different to the commonly used demographic measures, like the standard demographic young and old age dependency ratios[2], that are based on fixed age limits and consider only the demographic structure, the aggregate life cycle deficit allows for flexible age limits and age-specific levels of economic dependency. NTA data therefore allow to endogenously define the stages of the life cycle (see also Sanderson and Scherbov, 2010).

In Section 4.2 we give an overview of the NTA methodology and present the LCD as a measure of economic dependency for selected European countries. In Section 4.3 the LCD and LCS are presented for men and women separately. Since we are interested in the effect of the design of the economic life cycle on the total dependency of children and the elderly, we control for cross-country differences in the population structure. I.e. we apply a standardized population for all countries. With this analysis we gain further insights into the cross-country differences regarding the gender-specific shape of the economic life cycle. By only considering paid work the estimates for production activities by gender are biased since they ignore unpaid household labour that is on average higher for females as compared to males. We therefore further extend our analysis by unpaid household work in Section 4.4 and build up an indicator that measures the difference between the production and consumption of goods and services which are produced by unpaid household work in a specific age group. In Section 4.5 we combine paid work as well as unpaid household work into a measure for total production and consumption at each age and by gender. Section 4.6 concludes.

4.2 The Life Cycle Deficit for Paid Work

4.2.1 National Transfer Accounts

The concept of the life cycle deficit and the data on age-specific consumption are taken from the National Transfer Accounts (NTA) project. At the centre of this project is the development of an accounting system which extends the System of National Accounts (SNA) by information on age - the so-called National Transfer Accounts. NTA measure how much labour- and asset income each age group generates, how income is subsequently redistributed across age groups through public and private transfers and how each age group uses the disposable resources for consumption and saving. The NTA data set consists of an extensive number of age pro-

[2]The young age dependency ratio relates the number of people below the age of 20 to those in working age, assumed to be the age group from 20 to 64. Similarly the elderly dependency ratio records the number of the population above age 65 relative to those in working age. Also the age borders 0-14 for children, 15-64 for the working age population and 65+ for the elderly are often used.

files containing per capita averages of labour income, asset income, public transfers, private transfers, consumption and saving. The broad estimation strategy for age-specific averages of economic quantities is, first, to derive the aggregate values (e.g. total income, total consumption) from the System of National Accounts and related sources. In the second step the distribution of these quantities over age groups is measured or estimated by using administrative and survey data. A detailed introduction to the methodology is given in UN (2013) and in Lee and Mason (2011). The NTA project is a collaborative work of international research teams from 41 countries.[3] Among these countries are the following 12 European countries: Austria, Finland, France, Germany, Hungary, Italy, Poland, Slovenia, Spain, Sweden, Turkey and the UK. Due to data availability we focus on 10 European countries excluding Poland and Turkey.[4] NTA measure the economic activities of individuals in a given year. It is important to note that the age patterns represent a cross-sectional snapshot of the economic activities of each age group and do not represent the actual life course pattern of an average individual.

4.2.2 The Life Cycle Deficit

NTA are based on an accounting identity which states that for each individual, and consequently for each age group, the resources used for consumption (C) and saving (S) equal the disposable income composed of labour income (YL), asset income (YA) and net transfer inflows (τ)[5]:

$$C + S = \underbrace{YL + YA + \tau}_{\text{disposable income}} \tag{4.1}$$

The difference between consumption and labour income in NTA offers a measure for the average economic dependency (if positive) or the economic ability to support others (if negative) at each age. It can also be derived by an rearrangement of the terms in the NTA accounting identity (4.1):

$$\underbrace{C - YL}_{\text{life cycle deficit}} = \underbrace{\tau + (YA - S)}_{\text{age reallocations}} \tag{4.2}$$

The life cycle deficit is positive in childhood as well as for elderly persons and negative for the population in working age. For a negative life cycle deficit we will also use the term *life cycle surplus* (LCS). In childhood and in old age, when the life cycle deficit is positive, at

[3] http://www.ntaccounts.org/web/nta/show/NTA%20Countries

[4] For data from Austria, Finland, Germany, Hungary, Slovenia, Spain and Sweden see Lee and Mason (2011). For the Italian data see Zannella (2013). Turkey and Poland joined the NTA project in 2012 and 2013, respectively. For these two countries no NTA dataset is available yet.

[5] Transfer inflows and outflows are recorded from the individuals point of view: inflows constitute the benefits, outflows the contributions to the transfer systems. Public transfer inflows consist for example of benefits such as pensions, health services or child benefits while the public transfer outflows consist mainly of taxes and social contributions.

least a part of consumption has to be financed through *age reallocations*, i.e. through public and private transfers from other age groups or through asset based reallocations such as asset income and dissaving. The age groups can therefore be split up into three "life-stages" depending on whether the consumption of an age group can be financed by own labour income or not. In childhood labour income falls short of consumption. Since children have not yet accumulated assets and have very restricted access to credit, they finance their consumption almost exclusively through transfers: mainly through private transfers (from the parents to the child), but to a considerable extent also through public transfers, e.g. in form of publicly financed education. On the other hand, an average person in working age generates more income than needed for his/her own consumption and is able to support other age groups with this surplus income. In higher ages the pattern turns again: retirees are economically dependent in the sense that the consumption of these age groups is not covered by their own labour income. As they have accumulated assets during their working life, elderly persons finance a part of their consumption through asset based reallocations. However, in most of the countries the bulk of the consumption of the elderly persons is financed through public transfers such as pensions and publicly provided health- and long-term care services.

The qualitative shape of the economic life cycle is similar in all countries (see also Lee and Mason, 2011): economic needs of children and elderly persons are financed through asset based reallocations and through the transfer of the surplus income from the working age population. However, the type and intensity of economic activities at each age, and therefore also the shape of the age profiles, differ across countries depending on country-specific characteristics of individuals (such as the level and type of education, labour market entry and exit ages, etc.), institutional arrangements (family policies, labour market regulations, etc.) as well as the overall macroeconomic situation of a country.

As indicated in the previous section, in order to obtain a measure for the dependency of the total population in childhood and old age, the life-cycle deficit at each age is multiplied with the corresponding population size and added up over those age-groups with a positive LCD. A dependency ratio is then calculated by relating the total life cycle deficit of the children and the elderly to total labour income. The *aggregate life cycle deficit* measures the consumption of children and the elderly which cannot be financed out of their own labour income as a share of total labour income. This measure reflects both, the population structure as well as the design of the economic life course, i.e. the involvement in production and consumption activities. Likewise we can derive a support ratio by relating the total life cycle surplus (the negative life cycle deficit) of those in working age to total labour income in order to receive the *aggregate life cycle surplus*. It represents the share of labour income which is not consumed by the working age population and available for transfers to other age groups.

4.2.3 Data

The aggregate quantities are derived from the SNA. The basic components of labour income are the compensation of employees (incl. gross wages as well as the employers' social contributions) and self-employment labour income, i.e. the part of mixed income which is assumed to be generated by labour input.[6] Consumption consists of public consumption as well as private consumption at basic prices (i.e. without taxes on products such as the VAT). The information on the distribution of labour income by age and sex is taken from the European Survey of Income and Living Conditions (EU-SILC) 2011.[7] This survey is carried out yearly and includes representative and comparable income data for private households for all EU member countries. The components of income which are of interest for us are the gross remuneration of employees, the employers' social contributions and gross income from self-employment. These income components are reported as the annual income generated during the income reference period.[8]

A limitation of our data is the fact, that we do not have data on age-specific consumption by gender and that the information on consumption is not available for the same year as on labour income. The estimation of age averages for consumption is highly complex as both, public consumption as well as private consumption, consist of many different components for which often only limited age-specific information is available. Consumption age profiles have been estimated by the country teams within the NTA project. The use of consumption age profiles from different years should not affect our results: historical NTA data show that the shape of the age profiles changes only slowly with time. Furthermore, consumption of adults is rather constant over the whole adult age range. Although there is intensive work on gender-specific NTA, consumption age profiles by sex are not available for all of the countries so far. Data from those countries for which gender-specific consumption profiles are available show, that there are only small gender differences for private consumption. Some differences between men and women are found for public consumption expenditure in the categories health and long term care (see e.g. Zannella, 2013), but compared to cross-country differences the gender differences are small. We therefore assume that consumption does not differ between men and

[6] Mixed income is the surplus (or deficit) accruing from production by unincorporated enterprises; it implicitly consists of the remuneration for work done by the owner and the return for the input of the owner's capital. Mixed income is divided into a labour share and asset share by assuming that two thirds of mixed income is labour income and one third is capital income.

[7] We use the cross-sectional EU-SILC UDB - version from August 01, 2013. We herewith acknowledge data provision by EUROSTAT and the European Commission respectively. Presented results and drawn conclusions are those of the authors and not those of EUROSTAT, the European Commission or any of the national authorities whose data have been used.

[8] With the exception of the UK the income reference period in the 2011 survey was the calendar year 2010. In the UK yearly income is extrapolated from smaller and flexible reference periods referring to the current year.

women and use the age averages provided by the NTA project for both, men and women. The consumption and labour income age profiles are adjusted so that the aggregate value of consumption and labour income corresponds to the one derived from the SNA for 2010. Not the aggregates, but the corresponding per capita averages are shown in Table 4.1.

Table 4.1: The Generation and Use of Income in 2010 by Country in Euro per Capita*

	Austria	Finland	France	Germany	Italy
Net National Income p.c. in Euro	**22,654**	**20,509**	**19,827**	**22,294**	**17,259**
Labour Income in %	76.6	75.7	76.8	73.7	73.7
Asset Income in %	23.4	24.3	23.2	26.3	26.3
+ Transfers from ROW p.c. in Euro	-216.2	-259.5	-381.7	-418.8	-257.0
Disposable Income	**22,438**	**20,249**	**19,445**	**21,875**	**17,002**
Consumption in % of DI	87.5	94.6	95.3	88.8	100.5
Saving in % of DI	12.5	5.4	4.7	11.2	-0.5
Public Saving in % of DI	-2.3	-3.5	-8.2	-3.2	-5.1
Private Saving in & of DI	14.8	9.3	12.9	14.4	4.6
Consumption as Share of Labour Income	1.13	1.23	1.22	1.18	1.34

	Slovenia	Spain	Sweden	UK	Hungary
Net National Income p.c. in Euro	**14,594**	**17,905**	**22,264**	**21,289**	**9,905**
Labour Income in %	85.7	79.7	75.5	75.0	81
Asset Income in %	14.3	20.3	24.5	25.0	19
+ Transfers from ROW p.c. in Euro	69.6	-136.7	-423.5	-382.0	52
Disposable Income	**14,663**	**17,768**	**21,841**	**20,907**	**9,957**
Consumption in % of DI	93.9	96.8	83.2	98.2	95
Saving in % of DI	6.1	3.2	16.8	1.8	5
Public Saving in % of DI	-3.8	-8.8	1.8	-9.9	-9
Private Saving in & of DI	9.9	12.1	14.9	11.7	15
Consumption as Share of Labour Income	1.10	1.21	1.08	1.29	1.17

**Note:* Euro values are adjusted for differences in purchasing power.

The life cycle deficit in young and old age as well as the life cycle surplus for the European NTA countries are shown in Table 4.2. The table also shows the commonly used demographic dependency ratios that are based on fixed age limits and ignore the heterogeneity of economic activities over age: the demographic young age dependency ratio is calculated as the share of the population younger than 20 to those aged 20-64 years, and the old age dependency ratio as the share of the population aged 65+ to those aged 20-64 years. Obviously this indicator gives only a limited and biased estimate of the economic dependency. It neither takes into account the degree of economic dependency nor the degree of the ability to support others. The life cycle deficit in turn reflects the age structure of the population as well as age-specific labour income and consumption. A major advantage of the life cycle deficit is, that the age borders between the life cycle stages of dependency and support are not fixed but endogenously determined by the age profiles of consumption and labour income. According to this measure an average young person stays economically dependent for around 5 years longer (up to age 23-26 as indicated by the lower age borders in Table 4.2) than assumed in the demographic dependency ratios where the life cycle stage of young dependent people has been assumed

to be delimited by age 20 (often the even lower age-border at the age of 15 is used). In old age individuals become economically dependent again about 6 years earlier (in most countries around age 59 as indicated by the upper age borders in Table 4.2) as compared to the assumed age limit of 65 years for the demographic dependency ratio.

Table 4.2: The Life Cycle Deficit in European Countries

	Aggregate Life Cycle Deficit/Surplus in % of Labour Income			Age Borders LCD		Standard Demographic Dependency Ratio	
Country	**Young**	**Working Age**	**Old**	**pos. until**	**pos. from**	**Young**	**Old**
Austria	20	32	25	24	59	34	29
Finland	26	28	25	26	60	38	28
France	29	31	24	23	59	42	28
Germany	18	31	30	26	60	31	34
Hungary	22	32	27	24	58	33	27
Italy	26	24	32	27	60	31	33
Slovenia	24	39	24	25	58	30	26
Spain	25	27	23	26	60	31	27
Sweden	25	39	23	26	64	40	31
UK	27	23	25	26	59	40	28
Average*	**24**	**31**	**26**	**25**	**59**	**35**	**29**

*The average is calculated giving each country the same weight, i.e. the values are not weighted by the population numbers.

Obviously, the life cycle deficit/surplus is strongly influenced by the age structure: France as the country with the highest demographic young age dependency ratio (42%) is also the country with the highest LCD in young age (29%). Italy and Germany are the countries with the highest demographic old age dependency rates (33% resp. 34%). These are also the countries with the highest LCD in old age, corresponding to 32 and 30 percent of total labour income, respectively. But the values for Sweden make clear that the population structure is not the only determinant of economic dependency (see also Hammer and Prskawetz, 2013): with a demographic old age dependency ratio of 31% Sweden has a rather old population. However, the LCD in old age is with 25% not particularly high. The demographic structure is compensated by a higher labour force participation and the higher labour income of elderly persons: in Sweden the average labour income exceeds the average age-specific consumption until the age of 63 years, which is 4 to 6 years longer than in the other countries. There are marked differences in the LCS across the analysed countries: while the working age population in Slovenia and Sweden uses 39% of its labour income for saving or transfers to other age groups the corresponding value is only 23% in the UK. In the following section we will investigate these differences across European countries in more depth by considering gender specific life cycle deficits and surpluses.

4.3 The Life Cycle Deficit by Gender

The aggregate life cycle deficit constitutes certainly an improvement for measuring economic dependency as compared to standard demographic dependency ratios that ignore the cross-country heterogeneity of economic characteristics by age. We gain further insight into the structure of economic activities at each age by calculating the life cycle deficit for men and women separately. Since our focus in this paper is the comparison of the shape of the economic life cycle across European countries, we use a standardized population for all of the countries.[9] With the use of a standardized population we control for differences in the population structure across countries. The differences in the gender-specific life cycle deficit/surplus across countries can therefore be attributed to the differences in the shape and level of the consumption and labour income age profiles.

An important determinant of the LCD/LCS is the amount of total consumption relative to total labour income. Total consumption exceeds total labour income in all of the analysed countries, as part of consumption is financed through asset income and dissaving. The ratio of consumption to labour income is influenced by the share of asset income relative to total income and by the saving rate. It is rather low in Sweden and Austria as these are countries with high saving rates (Table 4.1). Thus, a large part of asset income is saved/reinvested and only a small part used for consumption. The rather low level of consumption relative to labour income in Slovenia is a result of a low share of asset income (relative to total income) and a moderately high saving rate. The high values of consumption relative to labour income for the other countries can be explained through a combination of a low/moderate saving rate of the private sector and large dissaving of the public sector (in particular in the UK, Spain, France and Hungary). Italy is an extreme case with a negative saving rate - consumption exceeds labour and asset income altogether. The result is a very high ratio of consumption to labour income and consequently a comparatively large life cycle deficit and low life cycle surplus.

The shape of the consumption age profiles is rather similar across countries, with the consumption of adults being rather constant over the age range (Figure 4.1)[10]. An exception is Sweden with a strong increase of consumption from age 70 onwards, which can be attributed to Sweden's comprehensive but expensive system of long-term care (see Bengtsson, 2010). Two further specific consumption patterns are the fairly high average consumption of children in Italy, Slovenia and France as well as the high consumption of persons 56+ in Germany and

[9] The standardized population age structure is calculated as the average age structure of the included countries, giving each country the same weight.

[10] To facilitate the comparison of the age patterns across countries we measure the age group averages relative to the average income in the respective country sample, which is representative for the population aged 16+ living in private households.

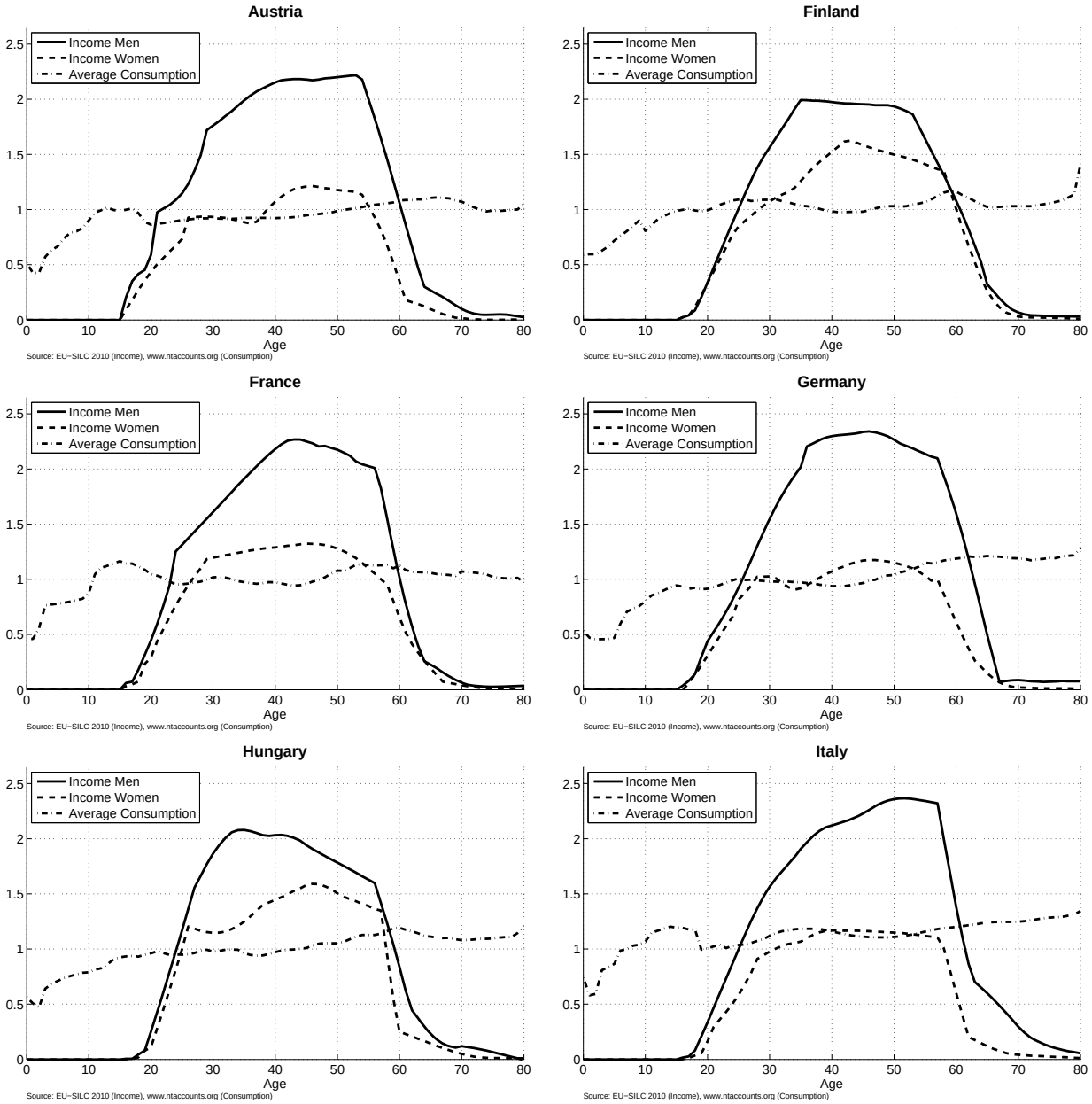


Figure 4.1: Labour Income and Consumption by Age and Sex
in Relation to the EU-SILC Sample Average of Labour Income

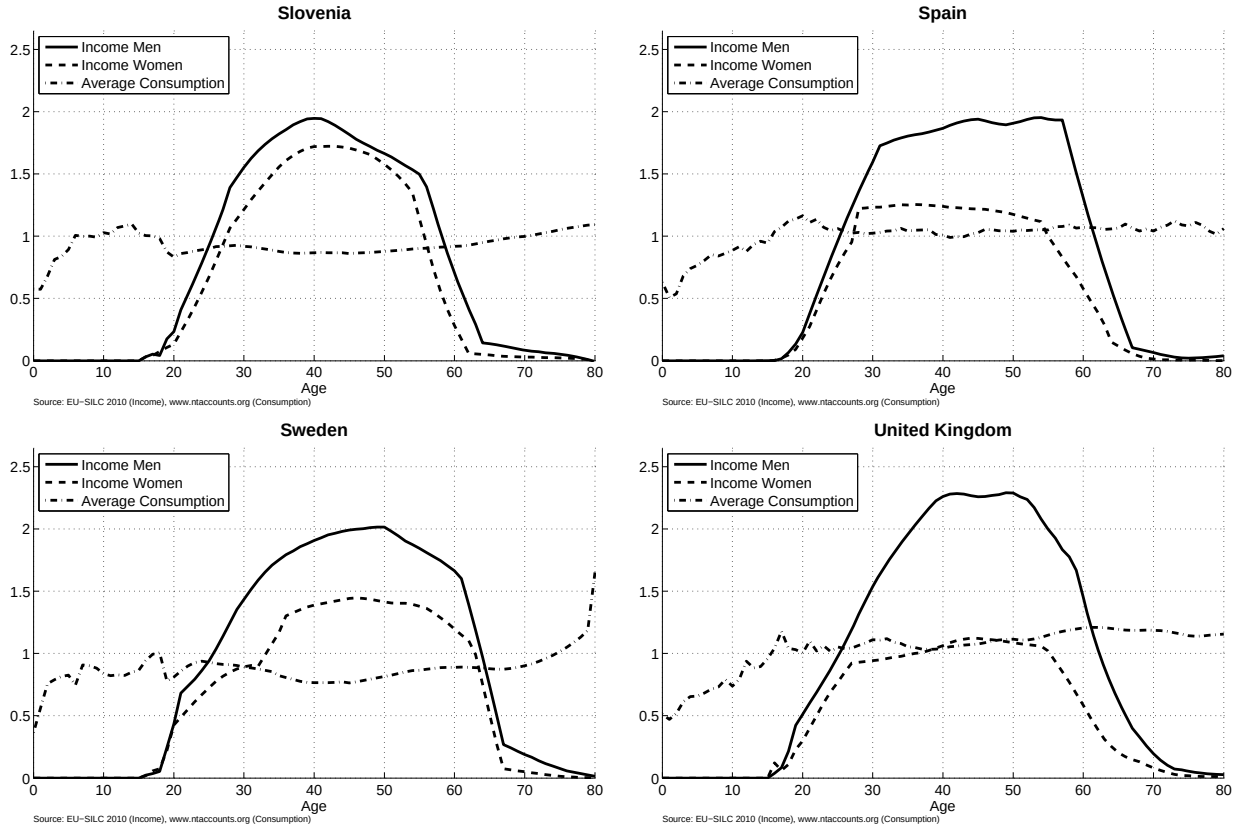


Figure 4.1: Labour Income and Consumption by Age and Sex in Relation to the EU-SILC Sample Average of Labour Income

Hungary.

The age-specific levels of labour income are clearly among the main determinants of the LCD/LCS. Particularly important are the ages at entry and exit from the labour force. In Austria young males start generating income at a younger age than in the other countries, but otherwise the income age profiles for men in young age are quite similar across countries. For young women the differences are larger, reflecting cross-country differences in female enrolment rates in higher education as well as cross-country differences in the age at which they give birth to children and their economic behaviour after giving birth. In Italy and the UK average labour income of women hardly reaches the consumption level even in the age between 40 and 50, when participation rates are high. In Hungary, Slovenia and France on the contrary average labour income of women exceeds their average consumption level already around the age of 25. For both, men and women, there are considerable cross country differences in the age group from 55 to 64 (see also the age borders in Table 4.2). In Slovenia, Hungary and Austria most people leave the labour market between the age of 56 and 60, reflected in the strong decline of the labour income age-profiles in these age groups. In Sweden on the other hand most of the 60 year old persons are still in the labour force, with the effect that the labour income age profiles declines at a much higher age than in other countries. Sweden is an extreme example, but also in the UK people between 60 and 70 generate a considerable amount of labour income. The most pronounced differences across countries are in the share of the labour income generated by women as compared to the labour income of men. As it is visible in Figure 4.1, in all of the countries the average labour income of women is lower than that of men. But while the gender difference in Slovenia is rather low, there are large differences in Austria, Germany, Italy and the UK: the labour income of women amounts to only about one third of total income in the latter countries but is about 42 percent in Sweden and Hungary, 44 percent in Finland and 45 percent in Slovenia.[11]

With this overview of the level and the distribution of income and consumption by age and sex we can next investigate the aggregate life cycle deficit/surplus by gender shown in Table 4.3. Differences to the results shown in Table 4.2 can be ascribed to the population structure. When using the standard population Sweden is the country with the lowest LCD in old age, amounting to 21% of labour income. This indicates that the economic life cycle in Sweden has been adjusted to the comparably old population (the demographic old age dependency ratio is with 31% the third highest among the analysed countries - see Table 4.2). Italy on the contrary also has a high demographic old age dependency ratio (with 33% the second highest after Germany), but is also among the countries with the highest LCD in old age (29%) after controlling for the age structure effect. Furthermore, Italy is also the country with the highest

[11] These estimates are based on data from EU-SILC 2011

Table 4.3: The Aggregate Life Cycle Deficit and -Surplus by Gender

		Aggregate Life Cycle Deficit/Surplus in % of Labour Income		
Country	**Sex**	**Young**	**Working Age**	**Old**
Austria	Women	11	3	17
	Men	10	30	10
	Total	**20**	**32**	**27**
Finland	Women	12	9	15
	Men	12	20	10
	Total	**24**	**29**	**25**
France	Women	12	6	15
	Men	12	27	10
	Total	**24**	**32**	**24**
Germany	Women	11	2	18
	Men	10	30	10
	Total	**20**	**30**	**27**
Hungary	Women	11	10	18
	Men	11	23	11
	Total	**23**	**33**	**29**
Italy	Women	16	0	19
	Men	14	25	10
	Total	**30**	**24**	**29**
Slovenia	Women	14	16	17
	Men	14	23	11
	Total	**28**	**39**	**28**
Spain	Women	14	4	17
	Men	14	23	10
	Total	**28**	**26**	**26**
Sweden	Women	11	13	13
	Men	11	28	8
	Total	**22**	**40**	**21**
UK	Women	12	0	18
	Men	11	26	9
	Total	**23**	**23**	**26**

To facilitate the comparison across countries
a standard population is applied.
Source: Authors' own calculations based on EU-SILC
(income) and data from the NTA project (consumption).

LCD in young age (30%). These results reflect the high level of consumption in Italy that will be unsustainable in the long run. Austria and Germany are the countries with the lowest LCD in young age (20% of total labour income). These results are driven by the rather low average consumption of children and by the early entrance into the labour market. There are huge gender differences across countries in the generation of the life cycle surplus: the aggregate LCS ranges from 23% in the UK and 24% in Italy to 39% in Slovenia and 40% in Sweden. These differences can be attributed to the differences in the contribution of women to total labour income. While the aggregate LCS of women is virtually zero in Italy and the UK, it amounts to 13% of total labour income in Sweden and 16% in Slovenia.

4.4 Unpaid Work

By accounting only for paid work the life cycle deficit ignores a large part of production activities. In particular it gives a biased picture of the contribution of women to total production as in virtually all countries women do more unpaid work than men, mainly in form of unpaid household work such as childcare, cooking and cleaning (see e.g. Miranda, 2011). The output of unpaid production activities is difficult to measure and assess in physical as well as monetary terms. The physical output (e.g. number of meals prepared, kilograms of laundry washed) is usually not recorded. Furthermore, most of the goods and services which are produced through unpaid work are not traded on the market and therefore do not have a market price. For this reason unpaid work is usually valued by an "input approach", i.e. by measuring the value of the inputs into production (see e.g. European Communities, 2003; Abraham and Mackie, 2005). Working time constitutes certainly the most important input in household production. Measures of production through unpaid work are therefore mostly based on time use surveys (for an exception see Holloway et al., 2002, who use an output approach). We also choose an input approach in our analysis and measure production through unpaid work by the amount of time which is devoted to unpaid production activities.

There are pronounced cross-country differences in the share and level of unpaid work carried out by women. These differences have been documented and analysed in a large number of comparative studies on the gendered distribution of production activities (see e.g. Gimenez-Nadal and Sevilla, 2012, for an analysis of changes over time). Some of these differences can be explained by the different institutional settings. Welfare state arrangements shape the distribution of unpaid household work by providing or denying access to resources and opportunities such as parental leave, child benefits, childcare facilities or survivor benefits. Hook (2010) for example finds that long parental leaves are positively related to gender specialization and lower contributions of men to household work. She suggests that paternity leave not only boosts the involvement in housework and childcare in the short, but also in

the long run as fathers acquire skills as caretaker and the paternity leave fosters the relation between the father and children. The national context influences the level and distribution of household work also by shaping social norms and attitudes. Based on the data from the International Social Survey Program, Geist (2005) shows that in conservative welfare state regimes (Austria, Germany, Mediterranean Countries) it is more rare for couples to share housework equally than in social-democratic regimes (Scandinavian countries), which explicitly promote gender equity. Our analysis provides information on the cross-country differences in the age- and gender-specific level of unpaid work. Additionally we provide estimates of the age-specific consumption level of goods and services produced by unpaid work.

4.4.1 Data: The Multinational and Austrian Time Use Survey

Our analysis of unpaid work is based on data from the Multinational Time Use Survey (MTUS)[12] (Gershuny et al., 2012) and the Austrian time use survey from 2008[13]. The MTUS contains data from about 60 diary based time use surveys in 20 countries. We use the surveys from the following countries: Germany (2001), Finland (1999), France (1998), Italy (2002), United Kingdom (2000)[14], Slovenia (2000) and Spain (2002)[15]. Furthermore, we make use of the Austrian time use data from 2008, which is not yet included in the MTUS database. Participants of time use surveys fill out diaries with predefined time slots (between 5 and 30 minutes) for which the respondent reports the activity he/she is carrying out during that period. The single activities were later grouped into categories of activities. As the design and the grouping of activities is different across surveys these data are harmonised within the MTUS to enable and facilitate comparisons across time and countries. Beside variables on the socio-economic background and household structure the MTUS includes the time used on the survey day(s)[16] for 51 different categories of activities. For unpaid work we include the activity categories cook/wash up, housework (laundry, cleaning activities), other domestic work (repair, paperwork, pet care, care for adults), gardening, shopping, childcare and travel related to these activities.

[12] This document presents results drawn from the Multinational Time Use Study (MTUS), but the interpretation of this data and other views expressed in this text are those of the authors. This text does not necessarily represent the views of the MTUS team or any agency which has contributed data to the MTUS archive. The authors bear full responsibility for all errors and omissions in the interpretation of the MTUS data.

[13] Statistics Austria, Time Use Survey 2008/09 (developed on behalf of the Federal Minister for Women and Public Services)

[14] The 2005 survey from the UK does not contain all the required information on the household structure.

[15] This survey does not include the Basque country. The Basque survey has been carried out separately from the rest of Spain and does not include required information on the household structure.

[16] While there are diaries for two days for each observation in Slovenia, Finland, Sweden, the UK and Germany, it is one day in the other countries.

4.4.2 Methodology

The estimation of production, i.e. the amount of time used for unpaid work by age and gender is straight forward: we simply take the average number of minutes devoted to these production activities by gender and single years of age. The age- and gender-specific estimates for the consumption of goods and services emerging from unpaid work require assumptions about their distribution within the households. The basic assumption regarding the consumption of these goods and services (excluding childcare) is, that they are distributed within the household in equal shares, i.e. every household member consumes the same amount. Such an assumption is necessary since it is not observable how much each member of the household really consumes.[17] To calculate the consumption of goods and services produced by household members we sum up the total time which is spent to produce these goods and services, divide it equally among all household members and calculate the average consumption level for each age group. The consumption age profiles are then adjusted so that aggregate consumption (age averages multiplied by population numbers and added up over all ages) through unpaid work equals aggregate production.

Childcare is treated differently: the bulk of childcare activities is enjoyed by the children in the first years of their life, the amount of consumption is therefore strongly dependent on the age of the child. Most time use surveys include only household members above the age of ten (France 15+, Italy 3+ and UK 8+). Furthermore, while MTUS contains a variable with the number of children, it does not contain information on the age of household members that are not included in the survey. It is therefore not possible to obtain age-specific estimates for the consumption of children. To be comparable across countries we report estimates of the production and consumption of goods and services which are produced by unpaid work only for the age groups 15+. It is assumed that childcare services are completely consumed by persons below the age of 15 years.

4.4.3 Results

The averages of time devoted to unpaid work by age and sex are plotted in Figure 4.2. For women the average time devoted to unpaid production activities peaks in the age group from 30 to 35 years (childcare) and in the age group from 60 to 70 years. The amount of time which is used by women for unpaid work is quite similar in Austria, Germany, Finland, France and the UK, where adult women devote on average about 5 hours (300 minutes) daily to non-market production activities. In Spain women spend around 1 hour more in non-market production

[17] The assumption that the goods and services produced by unpaid household work are shared among the household members is simplifying also in another dimension: Unpaid production can also be carried out for members of another household. While most national time use surveys include an indicator if an activity is also carried out for another household such information is not included in the version of MTUS we are using.

activities (around 360 minutes) and in Italy almost two hours more than in the other countries (around 400 minutes). Slovenia is exceptional: like in most of the other countries there is a smaller peak in childbearing age at which women use about 5 1/2 hours a day for unpaid work. However, elderly women between 55 and 70 use between 6 and 7 hours for unpaid work in Slovenia, about the same as in Italy and much more than in the other European countries. For men the picture is different: from the age of 30 to about 50 they devote on average between 2 hours and 2 1/2 hours to unpaid work. Men do most of household work in retirement, when they devote between 3 and 4 hours to unpaid work. Their contribution is over the whole age-range comparatively high in Slovenia and rather low in Italy, Spain and France.

The consumption of goods and services which are produced by household members through unpaid work is similar across gender and rather constant until the age of 50. There is a slight reduction at the age of 35, when due to the presence of children the household size is larger and household production has to be distributed over a larger number of persons. The consumption peaks in old age together with the unpaid production activities. As we assume that transfer flows in form of goods and services from unpaid work occur only within the households, intergenerational flows are only possible if several generations live together. However, in all of the countries the majority of elderly persons do not live with their children or grandchildren. The share of persons aged between the age of 60 and 70 who still live together with their children is below 10% in Finland, France and Germany, 14% in the UK, 16% in Austria, 28% in Slovenia, 35% in Italy and 40% in Spain. While in most of the countries the age profiles of male and female production add up to male and female consumption (the consumption age profiles lie between male and female production), this is obviously not the case for Slovenia. The pattern for Slovenia, where production around the age of 60 is much higher than consumption, indicates a transfer of household production goods and services from people around the age of 60 to younger generations. This is in line with information on childcare arrangements included in EU-SILC 2010, showing that in Slovenia grandparents are more involved in childcare activities than in other countries.

The difference between the consumption and production age profile represents the LCD for unpaid work. While this difference is low but positive for men between the age 30 and 50 in Austria, Germany, Finland, Slovenia and the UK, household production of men hardly exceeds their consumption in France, Spain and Italy, reflecting their low contribution to unpaid household work. In Italy the LCD for men stays positive over the whole age range. Women in turn produce more non-market goods and services than they consume with the exception of the teen ages in all countries. Their additional production is used for transfers to their children and partners. Compensating for the low contribution of men in Italy and Spain, the difference between production and consumption of women (the LCS) is much larger in these two countries than in the other European countries.

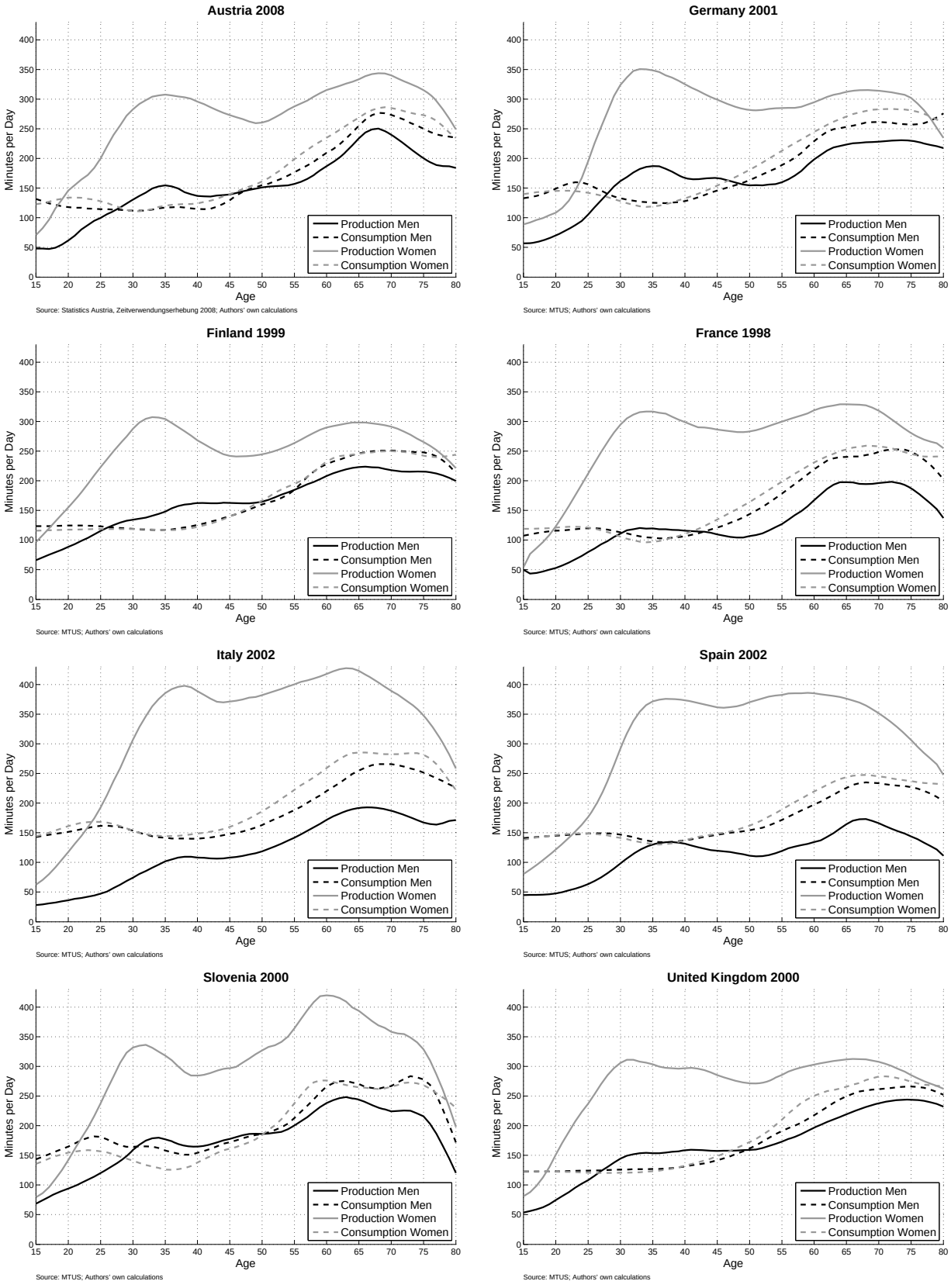


Figure 4.2: Unpaid Work: Production and Consumption in Minutes

4.5 The Life Cycle Deficit for Paid- and Unpaid Work

In the next step we combine production through paid and unpaid work into one single measure. The common approach is to value the time used for unpaid work by using wage rates which would be obtained on the market for similar activities (e.g. European Communities, 2003). As in MTUS the activity categories are quite general and include many different tasks, we use the same wage for all of the household production activities. The wage we apply to value unpaid work corresponds to the average hourly net income of a worker in the age group 30-49 years within a country.[18] This approach has the advantage that we can use the same data source as for the estimates of paid work. It ensures, first, the comparability of unpaid work and paid work within a country, and second, the cross-country comparability as this is given by the EU-SILC dataset.

The measures for total production and total consumption at each age are plotted in Figure 4.3. As expected, the gender differences are lower as compared to the results for paid work in Section 4.3. According to the new measure, which includes paid and unpaid work, women in Spain and Slovenia contribute more to production than men. In Spain women devote considerably more time to production activities than men, mainly to unpaid household work. Although unpaid work is valued less (net-wage) than paid work (gross wage), Spanish women compensate for this with their higher involvement in production activities. This is easier in Spain than in the other countries, as in Spain wages are less heavily taxed and thus the valuation of unpaid work as compared to paid work is higher. Also in Slovenia women devote on average more time to production activities than men. But, contrary to Spain, Slovenian women devote almost the same amount of time to paid work as men and have almost the same average labour income as men. Nevertheless, they use more time than men for unpaid household work. As a result their total production is higher than the total production of Slovenian men. For the other countries a gender gap remains. However, this does not imply that women engage less in production activities. Indeed, in most countries women are involved in production activities to the same extent as men. The size of the gap rather depends on the female share of household work and its valuation.

Table 4.4 shows the combined aggregate LCS and the LCD in old age for paid and unpaid work. To allow a comparison with the results for paid work (Table 4.3) we measure the

[18] The average hourly net income is calculated from EU-SILC by dividing the average weekly gross income through the average number of working hours. The gross-net conversion was made using EUROSTAT data on net earnings and tax rates. However, the information on working hours corresponds to the survey period and not necessarily to the income reference period. We restrict the analysis to the age group 30-49 years because we assume that in this group changes in the employment status between the income reference period and the survey are low. Information on the employment status during the whole income reference period is unfortunately not available for all of the countries.

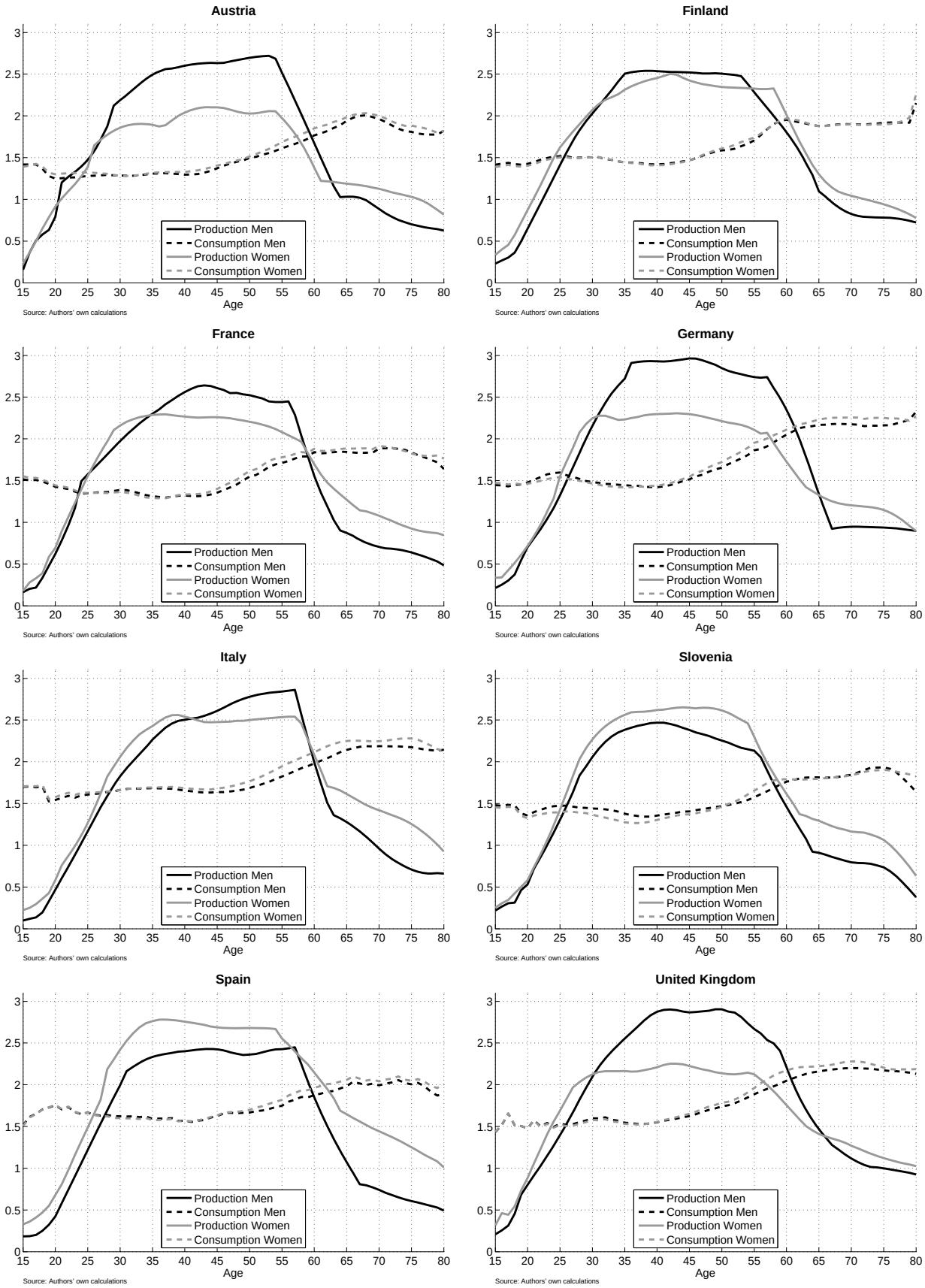


Figure 4.3: Paid and Unpaid Work: Production and Consumption by Age and Gender relative to the Sample-Average of Labour Income from Paid Work

aggregate LCS/LCD in percent of income from paid work. The inclusion of unpaid work increases the LCS of women in all countries: it ranges from 13% of labour income in the UK to 30% in Slovenia. The LCS of men on the contrary remains nearly the same: in most of the countries men in working age produce a small LCS in terms of unpaid work, their overall LCS is therefore constant or slightly higher than in Table 4.3. An exception are France, Italy and Spain: the male population in working age generates a deficit in terms of unpaid work. This is reflected in the lower LCS in Table 4.4 as compared to Table 4.3 where only paid work is considered. The total LCS of men is lowest in Spain with 19% of labour income and highest in Austria and Germany with 31%. Although the gender differences within countries decrease once we include unpaid work, there remain large differences between countries: the total LCS (men and women) for paid and unpaid work ranges from 38% in Italy to 53% in Slovenia. The high involvement of women in unpaid work does not compensate for their low involvement in paid work, except for Spain.

The aggregate LCD of the elderly men and women is rather constant, as most of the resources generated by the elderly through unpaid work are consumed by the elderly themselves. Although the inclusion of unpaid work has little effect on the overall LCD/LCS, there are effects on the LCD/LCD for men and women separately: the LCD of men in old age has been increasing in all of the countries; but this increase has been compensated by a decrease in the LCD of women. Women provide unpaid services not only to children but also to the elderly male household members. The age borders that separate the LCS from the LCD do not change much for the total population (men and women) if unpaid work is included.

Table 4.4: The life Cycle Surplus/Deficit for Paid and Unpaid Work

		Aggregate Lifecycle Surplus/Deficit in % of Labour Income		Age Borders LCD	
Country	**Sex**	**Working Age**	**Old**	**pos. until**	**pos. from**
Austria	Women	15	14	24	58
	Men	31	12	21	60
	Total	**45**	**25**	**23**	**59**
Finland	Women	21	14	23	61
	Men	22	11	25	59
	Total	**42**	**24**	**24**	**60**
France	Women	19	12	23	59
	Men	25	12	23	60
	Total	**44**	**23**	**23**	**59**
Germany	Women	16	17	24	58
	Men	31	11	26	62
	Total	**47**	**28**	**25**	**60**
Italy	Women	18	13	27	60
	Men	21	13	28	61
	Total	**38**	**26**	**27**	**60**
Slovenia	Women	30	13	24	59
	Men	23	13	26	59
	Total	**53**	**26**	**25**	**59**
Spain	Women	27	10	25	62
	Men	19	13	27	60
	Total	**46**	**24**	**26**	**61**
UK	Women	13	16	23	57
	Men	27	10	25	61
	Total	**39**	**26**	**24**	**60**

Source: Authors' own calculations
Note: Information on the LCD for children cannot be provided, as there is insufficient information on their age in the MTUS.

4.6 Conclusions

The current public welfare system consists to a large degree of transfers from the active population to inactive elderly persons. Faced with population ageing and an increase of the population in retirement the funding of this system is under pressure in virtually all European countries. Our analysis shows, that the consequences of population ageing for the overall economic development and in particular for public finances do not only depend on the extent of demographic change, but are also determined by the design of the economic life cycle, i.e. by the relation between the age of individuals and the type and intensity of their economic activities. We compare selected European countries using the aggregate life cycle deficit (LCD). The LCD is a dependency ratio which takes into account not only the population structure, but also the age-specific levels of production and consumption. In order identify the effect of the design of the economic life cycle on the dependency of children and the elderly we use country-specific age profiles of production and consumption. To control for the different age structures across Europe, we assume a standard population for all of the countries included in our analysis.

Our comparative analysis reveals large cross-country differences in the aggregate LCD (respectively the aggregate LCS) as a result of the differences in the economic life cycle. High values of the aggregate LCD in young and old age in Italy are a consequence of the high consumption relative to labour income. Low values of the aggregate LCD in young age for Austria and Germany are driven by an early entry into the labour market and low consumption expenditures of children. The low value of the LCD in old age for Sweden in turn can be explained by the late exit from the labour market. Hence, the entrance to employment and retirement age plays an important role in determining the aggregate LCD. While in France average consumption exceeds average labour income already at age of 23, the corresponding value for Italy, the country with the highest LCD in young age, is 27. In Sweden, the country with the lowest LCD in old age, average labour income exceeds consumption until the age of 63; the corresponding age is between 57 and 59 in the other countries. Interesting are the cross-country gender differences in the life cycle surplus, a measure for the ability of the working age population to finance the LCD of the children and the elderly. These differences can be largely explained by the different shares of total labour income which are generated by women. In Slovenia and Sweden the contribution of women to total labour income is among the highest within Europe, resulting in a high LCS as compared to the other analysed countries. In Italy and the UK the LCS is low, as consequence of the low participation of working age women in paid work.

The gender-specific analysis of the LCD/LCS is misleading if we ignore unpaid work. In all of the countries women contribute significantly more time to unpaid work than men do. The

difference between production and consumption of goods and services produced by unpaid work indicates that women carry out a large part of unpaid work for men living in the same household and that the working age population carries out a large part of unpaid work for other age groups, mainly their children. Elderly persons also devote a lot of time to unpaid production activities. However, our measure of consumption indicates that these goods and services are consumed by older age groups themselves. The combination of paid and unpaid work illustrates the total dependency of elderly persons and the total contribution of the working age population to production. However, even after taking into account unpaid work together with paid work there remains a gender gap in the LCS across European countries: men in working age usually produce more than working age women, mainly because unpaid work is valued less than paid work. In Slovenia and Spain however women contribute more to total production than men; they contribute much more to unpaid work than men and are therefore able to compensate for the lower valuation of unpaid work.

The on-going changes in the age structure of the population require changes in the design of the average economic life cycle. When the share of inactive elderly persons increases, at least some age groups have to increase their production relative to their consumption. The example of Sweden shows that a higher involvement of older age groups in the production process is an effective way to reduce total economic dependency of elderly persons: although Sweden has a comparably old population, the aggregate dependency of elderly persons is comparably low. Another way to adjust the funding of public transfers is through a higher involvement of working age women in paid work. The majority of women in Sweden and Slovenia is employed full time, the difference between the average labour income of men and women is low. The higher contribution of women results in a higher life cycle surplus of the working age population and resources which can be transferred to other age groups or used to accumulate assets. However, increasing the involvement of working age women in paid work requires a reduction of their (scarce) leisure activities or a reduction of unpaid work. Our results clearly indicate that a reform of the transfer system needs to take into account not only public transfers but also private transfers, in particular those in form of services which are produced for other household members through unpaid work.

References

Abraham, K. G. and Mackie, C. D. (2005). *Beyond the Market: Designing Nonmarket Accounts for the United States*. National Academies Press, Washington,D.C.

Bengtsson, T., editor (2010). *Population Ageing - A Threat to the Welfare State? The Case of Sweden*. Springer.

European Communities (2003). *Household Production and Consumption: Proposal for a Methodology of Household Satellite Accounts*. European Communities. Office for Official

Publications of the European Communities, Luxembourg.

Geist, C. (2005). The welfare state and the home: Regime differences in the domestic division of labour. *European Sociological Review*, 21(1):23–41.

Gershuny, J., Fisher, K., Altintas, E., Borkosky, A., Bortnik, A., Dosman, D., Fedick, C., Frederick, T., Gauthier, A. H., Jones, S., Jun, J., Lai, A., Lin, Q., Lu, T., Lui, F., MacRae, L., Monna, B., Gimnez Nadal, J. I., Pauls, M., Pawlak, C., Shipley, A., Tinonin, C., Torres, N., Victorino, C., and Yeung, O. (2012). Multinational Time Use Study, Versions World 5.5.3 and 5.80, October 2012.

Gimenez-Nadal, J. and Sevilla, A. (2012). Trends in time allocation: A cross-country analysis. *European Economic Review*.

Hammer, B. and Prskawetz, A. (2013). The public reallocation of resources across age: a comparison of Austria and Sweden. *Empirica*, 40(3):541–560.

Holloway, S., Short, S., and Tamplin, S. (2002). *Household Satellite Account (Experimental) Methodology*. Office for National Statistics, London.

Hook, J. (2010). Gender Inequality in the Welfare State: Sex Segregation in Housework, 1965–2003. *American Journal of Sociology*, 115(5):1480–1523.

Lee, R. and Mason, A., editors (2011). *Population Aging and the Generational Economy: A Global Perspective*. Edward Elgar Publishing Limited. Download from: `http://idl-bnc.idrc.ca/dspace/bitstream/10625/47092/1/133467.pdf` (accessed 9 February 2014).

Mason, A., Lee, R., Tung, A.-C., Lai, M.-S., and Miller, T. (2006). Population Aging and Intergenerational Transfers: Introducing Age into National Accounts. NBER Working Paper 12770. Download from `http://www.nber.org/papers/w12770` (accessed 9 May 2013).

Miranda, V. (2011). Cooking, Caring and Volunteering: Unpaid Work around the World. *OECD Social Employment and Migration Working Papers*, (116). `http://dx.doi.org/10.1787/5kghrjm8s142-en`.

Sanderson, W. C. and Scherbov, S. (2010). Remeasuring aging. *Science*, 329(5997):1287–1288.

UN (2013). *National Transfer Accounts Manual: Measuring and Analysisng the Generational Economy*. United Nations, Department of Economic and Social Affairs, Population Division. Download from: `http://www.ntaccounts.org/doc/repository/NTA%20manual%202013.pdf` (accessed 5 February 2014).

Zannella, M. (2013). *Economic Life Cycle and Intergenerational Transfers in Italy. The Gendered Dimension of Production and the Value of Unpaid Domestic Time.* PhD thesis, Sapienza Università di Roma.

Appendix

A-1 Determinants of Time Use for Household Production

The construction of appropriate weights and the imputation of missing data in the time use survey (TUS) require knowledge about the characteristics of individuals which influence the amount of time they use for household production. I try to identify these characteristics by using a regression analysis.

Weights

The Austrian microcensus is a large quarterly survey with compulsory participation; it includes information on about 48,000 individuals in 20,000 households. The sample population is representative for the total population living in private households. For the TUS 2008/09 a random sample of households was drawn out of the households which took part in the microcensus. But contrary to the microcensus was the participation in the TUS voluntary. It seems, that persons who spent more time at home (e.g. persons on parental leave) were more likely to take part in the survey. As a consequence households with small children are overrepresented in the TUS sample. To see this problem we derive an estimate for the total number children from the TUS and compare it to the population number. The microcensus (and consequently the TUS) includes data for all household members, including a variable which identifies the mother of a participant if she lives in the same household. This information allows the generation of a variable which includes for each woman the number of own children who live in the same household. By using the survey weights we can derive an estimate for the total number of children below a certain age who are living with their mother. Since most of smaller children actually live with their mother, we would expect this estimate to be close to the total number of children. It should be a bit lower, since some of the children live with their father, grandparents or in institutions. By using the information in the TUS we get an estimate of 1,526,444 children below the age of 16 who live with their mother. However, the actual size of the population younger than 16 was at the beginning of the year 2009 only around 1,360,000.[1] The microcensus estimate for the number of children below the age of 16 who live with their mother is 1,345,855. The survey weights should correct for the differences in the willingness of households to participate in the survey. However, in the construction of the weights which are provided with the TUS, household structure as one of the most important determinants of housework and childcare activities has not been taken into account (Statistik Austria, 2011, p.9f). I therefore construct own weights for the TUS, which better reflect the household structure in the population. Furthermore, the estimation of age-specific non-SNA consumption requires appropriate weights for persons who live in households which took part in the TUS (at least one household member), but who themselves

[1] *Source:* EUROSTAT, Population on January 1, 2009. The exact value was 1,360,570

did not provide information on their time use (in particular children below 10). To create weights for the TUS population and the "extended" TUS population[2] the microcensus survey weights are used as basis. These weights are adjusted so, that the weighted population in the TUS (respectively the extended TUS) corresponds to the population in the microcensus regarding the distribution of characteristics which are related to the engagement in unpaid household work.

Missing Data

It has been tried to include all adult household members in the TUS. Nevertheless, there are households in which not all adult members provided data on their time use. In the estimation of non-SNA consumption the total time which the household members spend in household production is summed up within the household, and divided between all of the household members, including those who did not provide information on time use. If there are contributors to household production who are not included in the TUS, the consumption of all household members is underestimated. Total consumption is later adjusted to total production, but the consumption age profile can be biased if the probability to be missing in the TUS is related to a certain age-structure of the household. If for example young men with small children are less willing to participate in the survey, total housework consumed by small children would be underestimated relative to the consumption of elderly persons. I therefore impute the amount of household production for missing household members using the mean from similar TUS observations. The characteristics which have to be taken into account are identified using a regression analysis.

A Regression Model for Time Use Data

The amount of time which is used for certain activities on the survey day is a random variable whose distribution is non-negative, often (dependent on the activity) right skewed and there are frequent observations of zeroes. The zeroes emerge because a share of the participants does not engage in the analysed activities on the survey day. The exact shape of the distribution which has to be modelled is dependent on the activity as well as on the investigated subgroup. A model which is flexible enough to fit many of the distributions emerging in time use analysis is a generalized linear model (GLM) with a Poisson-gamma distribution (also named compound Poisson distribution) as random component. This model has been suggested by Brown and Dunn (2011) and has been evaluated for Austrian time use data in Hammer (2012). For the estimation of the GLM model with the compound Poisson distribution I use the R-packages *tweedie* (Dunn, 2010) and *statmod* (Smyth et al., 2012).

[2]The extended TUS population includes all persons of households which took part in the time use survey, even when they did not fill in the time diary.

Generalized linear models have three components:

1. The distribution of the dependent variable Y_i given the mean μ_i, is called the *random component*.

2. The *linear predictor* for observation i consists of k explanatory variables x_{ij} and regression coefficients b_j that produce a linear prediction η_i:

$$\eta_i = \sum_{j=1}^{k} x_{ij}\beta_j \tag{5.1}$$

3. The *link function* g, links the expectation of the i^{th} observation μ_i to its linear predictor η_i:

$$g(\mu_i) = \eta_i. \tag{5.2}$$

Random Component

The total amount of time which is devoted to a certain activity (or category of activities) on the survey day consists usually of several episodes with a different length. Brown and Dunn (2011) suggest that the number of times a person engages in a certain activity on the survey day might be modelled with a Poisson process, which allows the occurrence of zeroes. Once a person carries out the activity, the duration can be modelled using a gamma distribution which can account for the skewness to the right. If the random variable N (number of episodes) is Poisson distributed and the random variable Z_h (length of an episode) follows a gamma distribution. Then the sum $Y = \sum_{h=1}^{N} Z_h$ (total daily time devoted to an activity) follows a Poisson-gamma distribution. The density has no closed form representation. Figure A-1 shows a compound Poisson distribution fitted to the empirical distribution of the time spent in housework activities.

Linear Predictor

The variables in the linear predictor should reflect those characteristics and life circumstances of individuals which are expected to influence the time use for unpaid household work. Among them are clearly the household structure and the position of an individual within the household (e.g. parent, child). To capture the effect of the household structure and the position I include variables with the number of additional adult household members (older than 15), the number of own children aged 10-15 years, the number of own children aged 2-9 years, and the number of own children below the age of two.[3] The economic status is certainly also important. I tried first to distinguish several different inactivity states: unemployment, retirement, parental

[3]The number and age of own children can only be identified if they live in the same household.

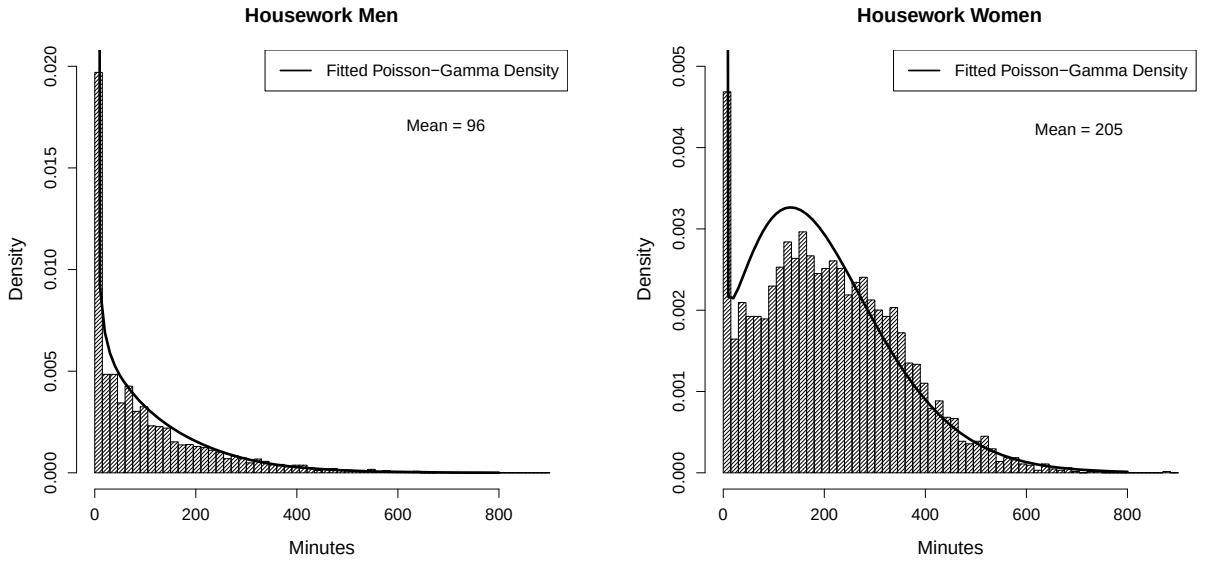


Figure A-1: Empirical Density of Daily Time Use for Housework and Childcare: Approximation through a Poisson-Gamma Distribution

leave, domestic worker and other. There is not so much difference regarding the average time use for unpaid household work in these groups; therefore I include only one dummy indicating inactive persons. A variable for part time work is also included. Other characteristics which have been identified as being important for the amount of time which is used for household work is education and if the household is situated in an urban or rural area (Hammer, 2012). The reasons why the amount of household work might differ between rural and urban areas are different norms, better access to household services on the market and a different organization of childcare. Two education dummies are included; one indicating that the highest completed education level is upper secondary with Matura, and the second for tertiary education. The effect of living in an urban area on household work is captured by a variable which identifies households in a city with more than 100,000 inhabitants. We already know that the amount of housework is related to age, therefore 10-year age dummies are included from age 30 to age 80+. And the time use at weekends is certainly different from the working days; therefore I include a dummy for Saturday and Sunday, respectively. The linear predictor for household work can be written as:

$$\begin{aligned}\eta_{housework} = const. + \beta_1 * no.\ adults + \beta_2 * no.\ children\ 10\text{-}15 + \beta_3 * no.\ children\ 2\text{-}9 + \\ \beta_4 * no.\ children\ 0\text{-}1 + \beta_5 * part\text{-}time + \beta_6 * inactive + \beta_7 * upper\ secondary + \\ \beta_8 * tertiary + \beta_9 * city + \beta_{10} * saturday + \beta_{11} * sunday + \\ \beta_{12} * age\ 30\text{-}39 + \ldots + \beta_{17} * age\ 80plus \quad (5.3)\end{aligned}$$

Link Function

The link function g determines how the linear predictor influences the mean. I use the logarithmic link, assuming a multiplicative influence of the explanatory variables on daily time use for household work.

Results

The results from the regression analysis are shown in Table A-1. Included are all time use survey participants who are older than 15 and not pupil or students. The reference person is younger than 30, single, working full-time, filled out the diary on a weekday and has basic education. The estimates for the regression coefficients can be interpreted as having a multiplicative influence. For example, the estimated coefficient for the variables inactive and part-time is around 0.38 for the housework of men. This means, that men who are inactive or work part-time do about $e^{0.38} = 1.64$ times as much housework as a full-time working male person. Variables which are strongly related to time use for household work are the age of children, the economic status, the weekday and age. The number and age of children is an almost perfect predictor for the amount of childcare activities which are carried out, for both, men and women. The number and age of children is also related to the amount of housework activities carried out by women; women with a child below 2 years devote about 50% more time to housework than those without children below 16. Since the daily time use for any activity is constrained to 1440 minutes, people who carry out paid work have less time available to do housework. Not surprising is therefore the importance of the economic status: non-active persons do considerably more housework than those in the labour force, and part-time working persons do more than those who work full-time. The time use on weekends differs from weekdays: on Saturdays more housework is carried out, on Sundays less. Surprising is the lower amount of time which women devote to childcare activities at the weekend. Age is strongly related to the time which is devoted to housework. The results reflect the high amount of housework which is done by the age groups from 50 to 70. The other variables are found to be not, or not strongly, related to time use for housework. Tertiary educated men engage a little bit more in childcare activities (plus 15%). The number of adult household members is related with the amount of housework carried out by women (plus 10% for each member). The persons having upper secondary education are not significantly different from those with basic education regarding their time use for household work. No relation is found between time use for unpaid household work and the degree of urbanisation.

Variables which have to be taken into account in the generation of weights and in the imputation of missing values are the number and age of children, economic status, weekday and age. For the construction of weights a stepwise procedure is applied: first I adjust the weights so, that the share of active persons in the TUS corresponds to the share in the microcensus

Table A-1: Explanatory Variables for the Amount of Unpaid Household Work

	Housework		Childcare	
	Men	Women	Men	Women
Intercept	3.62***	4.33***	1.81***	2.83***
Number of adults in HH	-0.02	0.09***	-0.12	-0.07
Number of children aged 10-15	0.05	0.14***	0.63***	0.50***
Number of children aged 2-9	-0.02	0.21***	1.00***	0.95***
Number of children below 2	0.16	0.40***	1.69***	1.85***
Part time	0.38***	0.17***	0.03	0.32***
Inactive	0.37***	0.29***	0.03	0.25***
Upper Secondary	0.00	-0.04	0.05	0.06
Tertiary	-0.04	-0.15	0.14***	0.17
Living in City	-0.02	-0.01	0.18	0.05
Saturday	0.38***	0.11***	0.13	-0.41***
Sunday	-0.14**	-0.26***	0.15	-0.36***
Age 30-39	0.61***	0.52***	0.40**	0.10
Age 40-49	0.73***	0.68***	0.07	-0.11
Age 50-59	0.95***	0.86***	-0.10	-0.41***
Age 60-69	1.10***	0.90***	0.16	-0.28*
Age 70-79	1.05***	0.88***	-0.49	-1.23***
Age 80+	0.79***	0.62***	-1.80**	-2.14***
Number of Observations	3550	4297	3550	4297

Significance levels: *** p<0.01, ** p<0.05, * p<0.1

and the sum of the sample weights equals the total population living in private households. All the adjustments are done for men and women separately. In the second step the weights of parents are chosen so, that the share of parents with one or more children between 10 and 15 equals the share in the microcensus. This is repeated with children between 5 and 9 and children below the age of 5. In the last step the weights are adjusted so, that the number of persons in each age-group (15-year age groups) equals the corresponding microcensus estimates of the population, and 1/7 of survey days are Saturdays and Sundays, respectively. After these adjustments the weighted TUS population corresponds to the microcensus population regarding sex, age and survey day. More problematic is the household structure, in particular the number of children. Table A-2 shows the estimates for the total number of children below 16 and the number of children below the age of 2 using different weights. The TUS weights slightly overestimate the number of small children, but underestimate the total number of children below the age of 15. The age structure of households in the TUS seems to be different from the one in the microcensus. Down-weighting parents of small children results in a even stronger underestimation of the total number children. Likewise, giving the parents of older children a bigger weight increases the estimate also for very small children. However, with the new weights the estimates are much closer to the population number than by using the original weights, which overestimate the number of small children (below 2) by about 25 percent. Regarding the characteristics which we identified as being important for the amount of household work, the weighted TUS population corresponds well to the weighted population

in the microcensus. We can therefore expect that it also corresponds well to the total population. The values of daily time use for housework are imputed for those observations that did not provide information about their time use. For the imputation a regression model is used, taking into account sex, age, the number and age of the children as well as the weekday and economic status.

Table A-2: Comparison of Weights: Estimated Number of Children

Number of children	Microcensus	Original TUS Weights	Own TUS Weights	Population*
Age 15 and younger	1,345,855	1,526,444	1,317,473	1,360,570
Age 0-1	152,661	209,907	160,549	154,998

* *Source:* EUROSTAT, Population January 1^{st} 2009

References

Brown, J. and Dunn, P. (2011). Comparisons of Tobit, Linear, and Poisson-Gamma Regression Models. *Sociological Methods & Research*, 40(3):511–535.

Dunn, P. (2010). R-package `tweedy`: Tweedy exponential family models. Version 2.0.7.

Hammer, B. (2012). Statistical Models for Time Use Data: An Application to Housework and Childcare Activities using the Austrian Time Use Surveys from 2008 and 1992. Master's thesis, University of Vienna.

Statistik Austria (2011). *Standard-Dokumentation, Metadaten: Zeitverwendungserhebung 2008/09*. Statistik Austria. Download from: `http://www.statistik.at/wcmsprod/groups/gd/documents/stddok/060010.pdf` (accessed 22 August 2013).

Smyth, G., Hu, Y., Dunn, P., and Phipson, B. (2012). R-package `statmod`: Statistical modeling. r package version 1.4.14.

Curriculum Vitae

Bernhard Hammer

Personal Information

Born:	April 9, 1979 (Schwarzach im Pongau)
E-mail:	bernhard.hammer@gmx.at

Current Position

01/2014 –	Researcher, Vienna Institute of Demography
07/2010 –	Researcher and doctoral student, Vienna University of Technology

Education

2010 –	Doctoral studies in Economics and Social Science, Vienna University of Technology Thesis-Supervisor: Alexia Fürnkranz-Prskawetz
2007 – 2012	Master studies in Statistics, University of Vienna Master-thesis: *Statistical Models for Time Use Data: An Application to Housework and Childcare Activities Using the Austrian Time Use Surveys from 2008 and 1992*
2007 – 2008	Visiting student, Charles University in Prague
2001 – 2007	Diploma studies in Economics, University of Vienna Diploma thesis: *Equity in Education and the Role of Tracking and Pre-Primary Education*
10/2005 – 02/2006	Erasmus exchange program, University of Tampere/Finland
1997 – 2001	Evening school in Salzburg (Abendgymnasium)

Publications

2013	Hammer Bernhard and Alexia Prskawetz. *The public reallocation of resources across age: a comparison of Austria and Sweden*. Empirica 40/3 541-560
2013	Hammer Bernhard, Alexia Prskawetz and Inga Freund. *Reallocation of Resources Across Age in a Comparative European Setting*. WWWforEurope working paper