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Ageing Europe – An Application of National Transfer Accounts for Explaining and Projecting Trends in Public Finances

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This project is dedicated to the memory of Professor Thomas Lindh (1952-2013).

Published by
Austrian Academy of Sciences
Welthandelsplatz 2/D5/2
1020 Vienna

Editors
Alexia Fürnkranz-Prskawetz, Bernhard Hammer and Bernhard Rengs

With contributions by
Gemma Abio, Tommy Bengtsson, Agnieszka Chłoń-Domińczak, Alexia Fürnkranz-Prskawetz, Róbert Gál, Bernhard Hammer, Tanja Istenič, Judit Monostori, Ció Patxot, Jože Sambt, Miguel Sánchez-Romero, Kirk Scott and Lili Vargha

Layout
Bernhard Rengs

Language Editing
Werner Richter

Printing
AV-ASTORIA Druckzentrum GmbH

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Österreichische Akademie der Wissenschaften
Stiftelsen Institutet för Framtidsstudier
Lunds Universitet
KSH Népességtudományi Kutatóintézet
Universitat de Barcelona
Univerza v Ljubljani
École d'Économie de Paris
Szkoła Główna Handlowa w Warszawie
National Institute of Economic and Social Research

This project has received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no. 613247.

Contents

Preface

The European population is ageing at a rapid rate. Within the next few decades in most countries, the changing ratio between workers and the retired will exert pressure on the funding of public transfers. While many of the European countries have started to reform their welfare state systems in order to cope with the ageing of their populations, high levels of public debt spur the need for further reforms. Deriving adequate and evidence-based options for policy reforms of public finances requires a thorough understanding of the system of intergenerational support, including the link between the public and private components of the system.

The aim of the EU-funded AGENTA project (www.agenta-project.eu) is to study the means by which children and the elderly population draw on resources from the working-age population, considering both public and private support, and to project future public transfers in the face of population ageing. The AGENTA project relies on the methodology developed in the National Transfer Accounts (NTA). NTA measures how much income each age group generates through labour and through capital ownership, how income is redistributed across age groups through public and private transfers and how each age group uses its disposable resources for consumption and saving. Public intergenerational transfers consist mainly of pensions, health care, long-term-care and education, while private intergenerational transfers are mainly from parents to their children.

Since most of the intergenerational transfers are provided by the working-age population, there is clearly a trade-off between transfers to children, transfers to the elderly population, consumption by the working-age population themselves, and saving for future consumption. The challenge for the public welfare systems is the adjustment to ageing populations that ensures a decent level of well-being for elderly persons without overburdening the working-age population. Therefore, data on the relation between age and economic activity and a thorough understanding of the reallocation of resources across age groups are key for guiding any welfare system reform in the face of population ageing.

In this brochure we summarise selected results of the AGENTA project.

1. The European National Transfer Accounts (NTA): data and applications

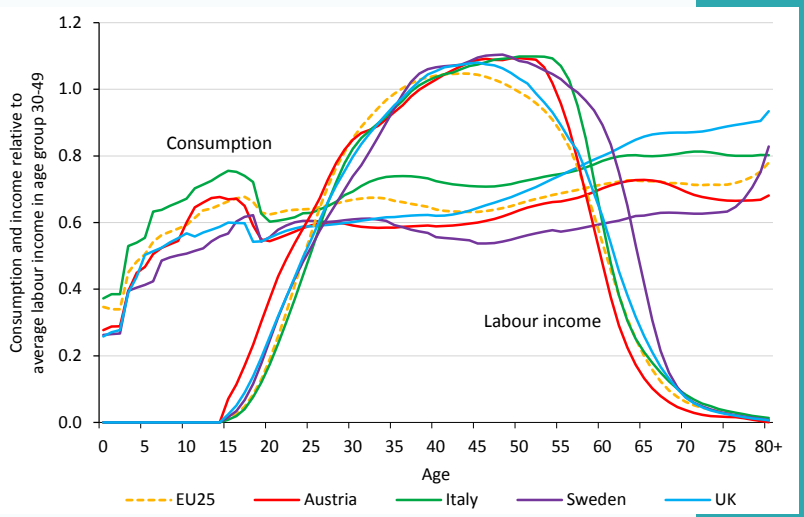
Jože Sambt, Tanja Istenič and Bernhard Hammer

A characteristic of the economic life course is that there are periods of economic dependency in childhood and old age. During these periods (part of) the individual's consumption is not covered by labour income but has to be financed by transfers and by asset-based reallocations such as asset income and the disposal of assets. In old age, the most important transfers are public transfers in form of pensions and health services. The increasing share of dependent elderly persons exerts pressure on the funding of the public transfer systems. To adapt the system to the changing age structure, it is necessary to either increase the tax burden on the working-age generations, decrease the level of benefits paid to elderly persons, or have people stay longer in the labour market.

The degree of economic dependency and the relative importance of the different channels of age reallocation of resources are different across countries. Consequently, population ageing affects the European countries to a different degree and in different ways. We use National Transfer Accounts (NTA) to measure important dimensions of the age reallocation systems across Europe in 2010 and to analyse the consequences of demographic changes. NTA measure age-specific income, the redistribution of income among age groups through public and private transfers and the age-specific use of income for consumption and saving. By comparing the different organisations of transfers across countries, we identify strategies that can be used to deal with the consequences of population ageing.

Consumption and labour income

The consequences of population ageing are determined by the speed of ageing and by the design of the economic life cycle. Figure 1.1 presents the age pattern of consumption and labour income for four selected European countries as well as the average of 25 EU countries in 2010 (all EU Member States except Malta, Croatia and the Netherlands). The basic pattern is common in all the countries. The market consumption of very young children is low, but increases strongly once they enter the educational system. Education is responsible for the peak of the consumption age profile at age 10–14. The age profiles reflect the lower average consumption at age 40–50, when income and consumption goods are shared by parents with their own children. There is another consumption peak at older ages due to the high private consumption around age 60 (consumption is no longer shared with their children since they moved out) and the consumption of health and long-term care services at older ages that is especially pronounced in Sweden. The labour income is concentrated at the age groups 20–60 with zero or very low values in childhood and old age.



The impact of population ageing on the transfer system depends on the age patterns of consumption and labour income. Sweden's transfer system is less vulnerable to population ageing because of higher employment rates of the elderly population.

Source: EU-SILC; HBS; Eurostat database; authors' own calculations.

Figure 1.1: Consumption and labour income in EU countries in 2010

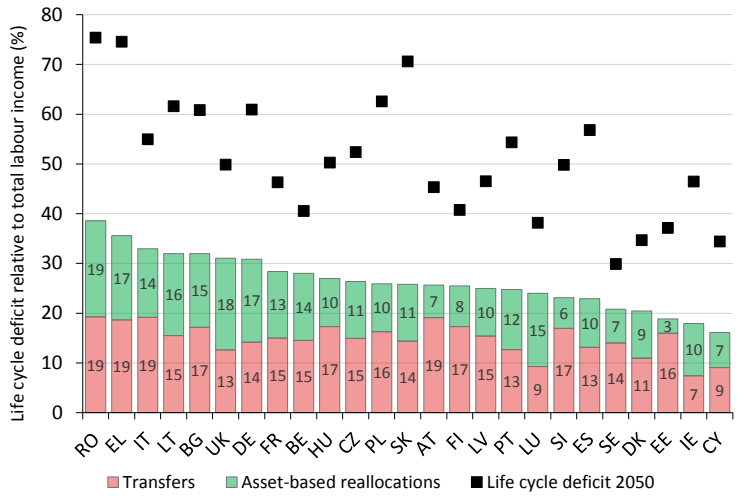
However, there are also important cross-country differences that will determine the consequences of population ageing for the transfer system. In Sweden, for example, people stay in the labour force longer than in other countries. A higher employment rate at older ages is positive for the sustainability of the public system and makes it less vulnerable to population ageing. It turns out that by converging to the age pattern of labour income in Sweden, the EU countries could neutralise most of the

projected increase in public expenditures due to the population ageing (Loichinger et al. 2017). On the other hand, Italy is characterised by a high level of consumption which, together with an old population, will translate into high economic dependency of elderly people (see Figure 1.2). Austria and the UK have similar age patterns of labour income, but per-capita consumption in old age is considerably higher in the UK. These profiles can be explained by the fact that the savings rate is lower in the UK than in Austria, with the consequence that consumption relative to income is higher.

Economic dependency – the life cycle deficit

The difference between consumption and labour income in childhood and old age can serve as a measure of economic dependency. In the NTA framework this difference has been termed "life cycle deficit" (LCD). By adding up the age-specific LCD of the elderly population we obtain the aggregate LCD for the elderly population. To facilitate comparison among countries we relate aggregate LCD to the total labour income. The indicator measures total consumption of the elderly population that is not covered by their own labour income relative to total labour income in a country. The results are shown in Figure 1.2 together with the share of the LCD that is covered by transfers and asset-based reallocations, and projected values of the LCD in 2050.

The total LCD of the elderly population amounts to 16–19% of total labour income in Cyprus, Ireland and Estonia and 36–39%[1] in Greece and Romania. The size of the life cycle deficit reflects the population structure, but also age-specific patterns of economic activities and the level of consumption and labour income. In Romania, average labour income falls short of consumption already at the age of 54, while the corresponding age for the average EU citizen is 58. Greece and Italy are characterised by a pronounced public redistribution to the elderly population, low saving rates, low labour force participation rates and high unemployment. The LCD of elderly people in relation to total labour income in Greece and Italy is therefore among the highest across all the countries. On the other hand, in Sweden and Denmark, high labour force participation at older ages is reflected in the comparable low aggregate LCD. In these two countries average consumption only starts to exceed the labour income at ages 64 and 62, respectively. To simulate the aggregate LCD until 2050, we keep age-specific economic characteristics constant at the level observed in 2010 and only vary the population structure according to the Eurostat population projections (2015). The highest LCD in 2050 is projected for Romania and Greece with an LCD of around 75% of total labour income. Such values are clearly impossible to maintain in the long run and emphasise the need for changes in the age pattern and level of intergenerational transfers. It is particularly alarming that the countries with a high LCD in 2010 are also those confronted with a fast and strongly ageing population. On the other hand, high employment rates combined with relatively favourable population projections lead to the lowest LCD in Sweden, accounting for only 30% of the total labour income in 2050. In contrast, the ranking of some countries is projected to change substantially. The population is ageing at a moderate pace in



The size of economic dependency reflects the population age structure and age patterns of consumption and production. In countries where elderly persons rely on asset-based reallocations, the strain on the public sector is lower.

Note: Countries are represented by their ISO 3166 code (https://www.iso.org/iso-3166-country-codes.html)

Source: EU-SILC; HBS; Eurostat database; various other sources; authors' calculations.

Figure 1.2: Financing the difference between consumption and labour income of elderly people in EU countries in 2010 and 2050

1 Due to rounding, the numbers presented in the figures may not add up precisely to the totals provided.

Belgium and France, consequently reflected in a moderate increase of the LCD. Slovakia, Poland, Spain and Germany, on the other hand, are ageing more rapidly, which is reflected in a strongly increasing LCD.

Financing the life cycle deficit

Not only the level but also the channels through which old-age dependency is financed are of utmost importance for the economic consequences of population ageing. In countries where elderly people rely on asset-based reallocations (like a funded pension system or interests and dividends from private savings) the strain on the public sector will be lower. Savings and investment also have positive effects on the economy (Mason & Lee 2007, Prskawetz & Sambt 2014). On the other hand, if elderly people mainly rely on transfers, the economy is vulnerable to an increasing ratio between the elderly and the working-age population. Therefore, Figure 1.2 distinguishes the part of the LCD that is financed through transfers and the part financed through asset-based reallocations. For example in Romania, Greece, Italy and Austria the LCD that is covered through transfers amounts to 19% of total labour income. The corresponding values are 7% in Ireland and 9% in Cyprus and Luxembourg. Old-age dependency in the UK, Germany, Luxembourg and Ireland shrinks considerably once we take into account only the part of LCD financed through transfers.

Economic surplus

Population ageing clearly increases the share of the economically dependent elderly population and the LCD. The pressure that this development exerts on the funding of public transfers depends on the ability of the working-age population to provide these transfers. In analogy to the LCD we use the age-specific values of consumption and labour income to calculate the life cycle surplus (LCS), defined as the difference between labour income and consumption. The level of the surplus depends on individuals' age; however, there are also large gender differences in the surplus that individuals generate during their prime age (see Figure 1.3). There is a redistribution of income between genders within households; therefore, the differences in consumption are rather small. The gender differences in the LCS are thus mainly caused by gender differences in the labour income. These differences mainly reflect considerable cross-country variations in gender-specific enrolment and labour market participation rates, and also differences in the gender wage gap of fully employed males and females. In Italy the labour income of females exceeds their consumption only around ages 40–50, while in Slovenia this period lasts almost 30 years during the life cycle.

The gender difference in economic surplus mainly reflects the gender difference in labour income. The gender gap in labour income varies strongly across countries.

EU-SILC; HBS; Eurostat database; various other sources; authors' calculations.

Figure 1.3 Consumption and labour income for males and females in EU countries in 2010

In Figure 1.4 we present the total value of LCS relative to the total labour income, decomposed by gender. The total LCS ranges from 12–13% of labour income in Lithuania and Greece, to more than 35% in Slovenia, Belgium and Luxembourg. We observe a relation of the LCS and the contribution of women to total labour income. The female contribution to the LCS is highest in Slovenia, Denmark, Sweden and Hungary. These countries are also among those with the highest total LCS. In Cyprus, Greece, Romania, Italy, Slovakia and the UK the surplus is (almost) entirely generated by males. These countries have a potential to increase their LCS and improve the sustainability of the public system by increasing the labour market participation and the labour income of women.

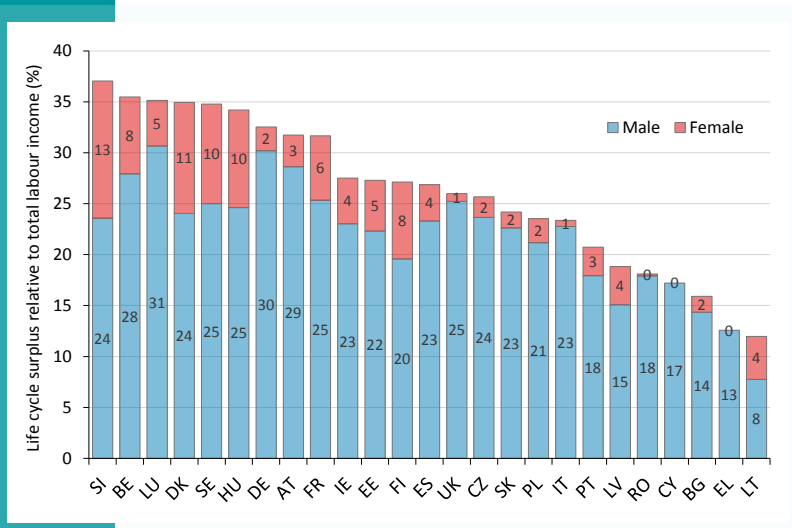


Figure 1.4 Life cycle surplus for males and females in EU countries in 2010

Total economic surplus is positively correlated with women's participation in the labour market.

Source: EU-SILC; HBS; Eurostat database; various other sources; authors' calculations.

Conclusions

The economic consequences of population ageing depend on the degree of ageing and on the age patterns of economic activity. While there are common patterns of economic activity across European countries, there are large differences in the degree of dependency, as well as the length of the period an average person is dependent. This cross-country variation allows us to identify strategies that could be successful in reducing the negative consequences of population ageing, in particular the pressure on the funding of public transfers. These strategies generally include: 1) reducing the economic dependency of the elderly population and 2) increasing the ability of the working-age population to support others.

Among the most efficient strategies to decrease the economic dependency in old age is an increase in the labour force participation of elderly people. Sweden is clearly a role model in this regard, where the average citizen stays in the labour market for about five years longer than in the majority of European countries. Additionally, reducing the consumption level of the elderly population is inevitable in some countries with particularly high dependency ratios, such as Italy. The overall saving rate of Italy was negative in 2010. To avoid a steady deterioration of economic conditions and a decrease of the capital stock, consumption expenditure relative to income has to decrease.

A high economic dependency in old age is not necessarily related to a high pressure on the funding of public transfers. In all countries, part of consumption in old age is financed through asset-based reallocations. The UK is characterised by a comparatively high consumption in old age, but elderly Britons finance a large part of consumption through their own savings. Elderly people in Austria, in contrast, finance their consumption mainly by means of generous public transfers. The consequences of ageing for the public transfer system are therefore more severe in Austria than in the UK.

The dependent elderly population can be supported if the surplus of the working-age population is large enough. This in turn depends largely on employment rates. The negative consequences of population ageing can be avoided if it is possible to increase the employment rates of the working-age population, including a decrease in unemployment and an increase in the labour force participation rates of women. Those measures could be the main driver of policy reforms in Europe.

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2. The European National Time Transfer Accounts (NTTA) database

Róbert Gál and Lili Vargha

The household economy (the production and consumption of goods and services through unpaid household labour), is a large and integral part of the total economy. Despite its importance, even in industrialised countries, most of its outputs are excluded from the National Accounts aggregates, such as GDP or the net national income. This accounting practice is tolerable in a wide range of fields of research but it is distortive in others, such as the analysis of financing the life cycle through inter-age reallocations. Data compiled in AGENTA show that just over half of total net inter-age reallocations reaching net beneficiaries, such as children and elderly people, are registered in the National Accounts either as asset-based reallocations (21 per cent) or public transfers (33 per cent). The rest are either hidden in the accounts as private transfers (22 per cent) or take place beyond the boundaries of the national economy, in the household economy (23 per cent). There are two asymmetries that particularly motivate the inclusion of the production and consumption of unpaid household labour: the division of labour between the two genders and the asymmetry in the way children and elderly people are supported by their working-age contemporaries.

National Time Transfer Accounts

The extension of the NTA methodology to unpaid household labour is labelled the National Time Transfer Account (NTTA)[2]. The age profiles of the production and consumption of unpaid household labour and the resulting difference, which we call net time transfers, are created in three steps. First, we identify the time spent on household production activities and break it down by age. The source of data for Belgium, Bulgaria, Estonia, Finland, France, Germany, Italy, Latvia, Lithuania, Poland, Slovenia, Spain, Sweden and the UK is the Harmonised European Time Use Survey Web Application (HETUS)[3] from which we download the average time spent on selected activities on an average day by country. In addition, the Multinational Time Use Study (MTUS)[4] is used for Austria, Denmark and the Netherlands, as well as for retrospective NTTA. We identify household production activities by virtue of the third-person principle: activities are considered unpaid household labour if they can be done by someone else (a third person) on behalf of the respondent, such as cooking, cleaning, making repairs, shopping or caring. We omit parallel activities.[5]

As a second step, home production is assigned to its consumers. Estimating economic flows of home production between co-habiting individuals relies on the identification, if possible, of the beneficiary of the specific activity and the application of an equivalence scale in other cases. Since goods and services produced by housework frequently represent household public goods, we allocate housework time equally among household members. In the case of childcare, time is consumed only by children and the allocation is straightforward in all households with only one child present. If there is more than one child living in the household, time is distributed among them with the help of data-driven equivalence scales calculated separately for each country.

Finally, wages are assigned to impute the value of time spent on the chosen activities. Pricing unpaid household labour is difficult just because it is unpaid: there is no market mechanism to make the evaluation. Applying the observable market prices raises two problems. First, it is not obvious whose wage should be considered: the wage of the person who is doing the household work (the opportunity cost approach) or that of the person whose job is done (specialist replacement wage approach). In the first case we apply the unit wage of the respondent of the survey, an IT expert for instance, even if he/she just does the dishes. In the second case we use the regular market wage of someone

2 We follow Donehower (2011) both in terminology and methodology but the brief description here is based on Appendix 1 by Gál, Vanhuysse & Vargha (forthcoming).

3 HETUS is an effort by the EU to harmonise European time use surveys. It is currently maintained by Statistics Sweden. Information and metadata are at: https://www.h2.scb.se/tus/tus/default.htm.

4 MTUS offers harmonised episode and context information on time use surveys. Data and documentation can be found on its website: http://www.timeuse.org/mtus.

5 Time use questionnaires usually allow parallel (or 'secondary') activities, such as cleaning the dishes while helping a child with homework, to be recorded at the same time. However, given the considerable variance in the time spent on these activities across European countries—and in line with the Donehower methodology—we leave these secondary activities aside.

who does dishwashing full-time as his/her main job. The current NTTA standard applies the latter specialist replacement wage approach. Wages assigned to home production are taken from the Structure of Earnings Survey (SES) by Eurostat for more recent years and from the World Bank for the retrospective calculations.

Note, lastly, that valuing household labour based on market wages raises the problem of selection bias. Professionals work more efficiently than laymen, so applying their wages may overestimate the value of household labour. However, there are various activities which are prone to reverse this selection bias. Telling bedtime stories to a child or caring for a relative can be more valuable if performed by a loved one even if his/her skills are less developed than those of a professional. Since the final balance of such biases is far from obvious we leave the issue of selection bias aside.

The resulting per-capita age profile of net time transfers is presented in Panel B of Figure 2.1.[6] The figure contains the market value of all time transfers across age groups in the household.[7] Clearly, the shape of the net time transfer profile (panel B) is radically different from its counterpart in the national economy, the life cycle deficit (panel A). In Panel C of the figure we show the total life cycle deficit (TLCD), which is the combination of LCD and net time transfers.

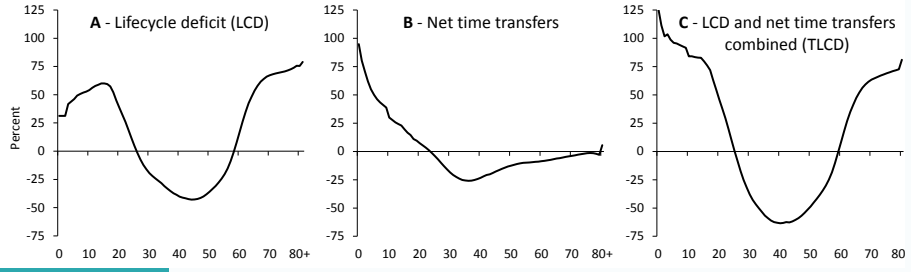


Figure 2.1: Per-capita lifecycle deficit, net time transfers, and total lifecycle deficit by age in Europe, 2010

The age pattern of inter-age transfers of the household economy (unpaid household labour) is radically different from those of the market economy. All combined, children receive more net transfers per capita than the elderly.

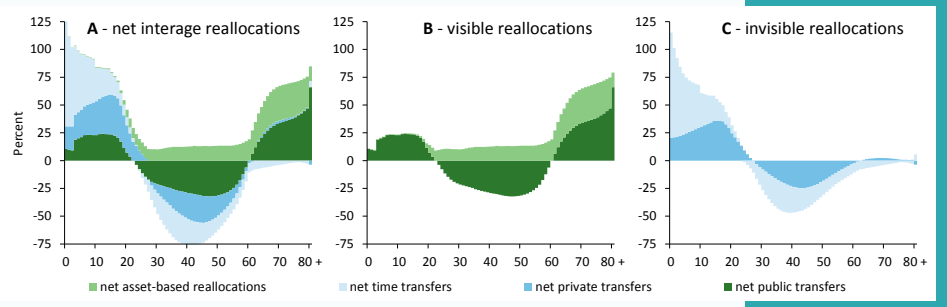
Notes: Values are population weighted averages of 17 European countries in percent of the per capita market labour income of persons aged 30-49 of the respective country.

Source: AGENTA, except for Austria (Hammer, 2014) and Hungary (Gál, Szabó and Vargha, 2015).

6 Figures 2.1 and 2.2 have been published by Gál, Vanhuysse & Vargha (forthcoming) on a smaller sample of countries. Recalculations were made for the purposes of this Brochure based on the new AGENTA database.

7 That is the total value of household labour less the value consumed directly by the worker or any beneficiary of his/her age. Since time transfers flow almost exclusively among close relatives who are rarely of the same age, the latter volume is negligible.

By introducing time transfers, the list of inter-age reallocations, public and private transfers as well as asset-based reallocations is extended with a fourth alternative. On Panel A of Figure 2.2 we show the way the total life cycle deficit is financed through these channels.



Net transfers to the old are typically well documented and recorded because they go through institutions larger than the household. Net transfers to children remain largely invisible and unaccounted for as they take place mostly in the family.

Notes: Panel A: the complete package; Panel B: visible transfers are transmitted and registered by public or market actors; Panel C: invisible transfers are unregistered reallocations flowing mostly among family members. For further notes and source see Figure 2.1

Figure 2.2: Inter-age reallocations by visibility

Visibility of reallocations

We also split the full reallocation package by visibility (Panels B and C of Figure 2.2). Visibility of a transfer depends on the nature of the bond linking the people involved. Reallocations conveyed by market actors and transfers transmitted by the government flow between people connected by relations enforceable by law. The value of these reallocations/transfers is largely set by market forces and regulations. Social actors therefore know the transfer values and record them in their books either at both ends of the transaction or unilaterally. In the case of what we call invisible transfers, one or both of these conditions are not met. Cooperation of the actors, most frequently relatives, is regulated by customs and social norms. Violation of these norms is less observable and, except for extreme cases, not enforceable by law and therefore not recorded by the actors. In the case of

time transfers, they cannot even be measured directly because these transfers are not evaluated in the market. Either way, these transfers are difficult to collect information on and missing from public statistics.

In short, visibility corresponds with what we call socialisation of transfers since it is socialisation that leaves traces. By socialisation we mean the arrangement of intergenerational reallocations by large-scale, necessarily anonymised institutions (rather than close kin or local communities), including not just governments (e.g. public child care facilities, child support programmes, education, social security and public health plans), but also non-profit organisations serving households and for-profit corporations (e.g. private schools, pension plans, insurance agencies).

As Panels B and C of Figure 2.2 demonstrate, there is a significant asymmetry in the level of socialisation of financing the two large groups of net beneficiaries, children and elderly people. Old age is almost exclusively funded through socialised channels, public transfers and asset-based revenues, whereas childhood is financed by, in the order of growing importance, public, private and time transfers. There is a functional division of labour between public and private channels. Working-age citizens pay taxes and social security contributions to care indirectly and generally for currently old generations through public programmes. However, they predominantly spend private time and private resources to directly care for their own children themselves. Notwithstanding the notable increases in resources invested in public education over the past decades, the resources involved in raising children remain mostly a family affair. By contrast, working-age adults no longer tend to live with their parents. Financing consumption in old age is largely institutionalised through government programmes or markets. Transfers to elderly people are easier to socialise: elderly people can use public services or can be given cash without the intercession of a guardian; they can also produce household goods that children cannot. Consequently, net socialised transfers are skewed towards elderly people whereas net non-socialised transfers flow almost exclusively to children.

A consequence of asymmetric socialisation is the illusion of pro-elderly bias in public spending. As it has been demonstrated in the literature (1) currently older persons receive more public transfers than in past decades; (2) older persons receive more than children; and (3) the elderly/children public transfer ratio has been increasing over time. However, these observations, while true and are replicated in the figure above, ignore other transfers. As Figure 2.2 demonstrates, children receive more, not less, transfers per capita than elderly people; only they receive them through private rather than public channels. Our results significantly modify the one-sided narrative of intergenerational transfers as a sneaky grab for resources by the old. This portrayal of reality is misleading, since it is limited to the statistically visible world of public transfers and largely ignores intra-familial transfers of cash and time.

So far we do not have sufficient retrospective information to describe temporal processes. Did children in the past benefit from higher reallocations per capita than older persons, or are their transfers higher only nowadays? Are higher public transfers to elderly recipients a form of compensation for lost private and time transfers due to lower co-habitation levels with adult children? Although we cannot address these questions at this stage, the growing public share of resources flowing to older persons might well have gone in parallel with increasing societal resources for the young. Notwithstanding a growing pro-elderly policy bias, the 20th century might have also been the century of the child, as Ellen Key predicted at its start.

NTTA by gender

The other asymmetry motivating the creation of NTTA is the division of labour between genders. It has been shown that women produce great economic value in the form of unpaid household labour, more than men, but due to the invisibility of this contribution in public records or statistics it is hardly recognised by society; for instance, it does not generate eligibility for public benefits or services, such as pensions or health care. The NTTA methodology offers further insights by breaking down the aggregates by age allowing for comparisons not only over all contributions but by life patterns of men and women.

In Figure 2.3 we present age profiles of household production,

consumption and net time transfers by gender for 16 European countries (see the list under the figure). Instead of monetary terms we present figures in hours here. The two genders have almost identical age patterns in their consumption of household goods and services (Panel B of Figure 2.3) but their production profiles (Panel A) differ appreciably. The female age profile is more explicitly bi-modal, with a peak among women in their late 20s and early 30s, the childrearing age, and in their 60s, as young pensioners. The first peak is not so obvious among men. In general, women work significantly more in the household but the difference is the highest in childbearing age. Women are net providers of time transfers through almost their entire adult life, from age 20 till they pass age 80. The corresponding age span for men is only 20 years, between ages 30 and 50.

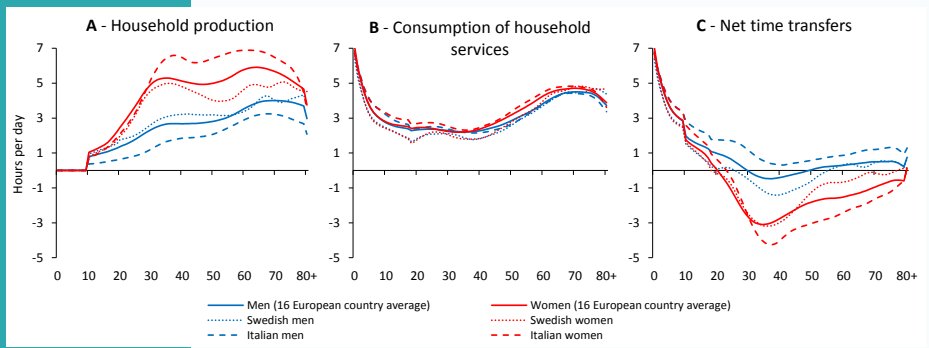


Figure 2.3: Daily per-capita household production and consumption and net time transfers by age and gender

While consumption of the value of unpaid household labour is mostly gender-neutral, the production of the value in question is female-dominated. Women are net providers of time transfers from early adulthood almost until death. Men are net providers only in a few age groups – if at all. Country variations are remarkable.

Notes: Numbers are shown for the average of 16 European countries as well as for Sweden and Italy separately, in the early 2000s.

Source: Vargha et al. (2016).

There are important country-specific variations. In Italy, all generations of men are dependent on the housework of women, there is not a single Italian male age group generating a surplus. In Sweden, however, net time provided by working-age men is significant, it is indeed the highest figure among the countries analysed. These two countries represent the two extremes in general: they show the highest (Italy) and the lowest (Sweden) gender gap in the household economy at almost all ages.

The figure illustrates another important aspect of the life cycle component in household production. Although older men receive transfers of time, the main beneficiaries of household goods and services are children (age 0–17).

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3. Informing the retirement discussion – different retirement patterns throughout the EU

Tommy Bengtsson
Kirk Scott

While all European Union countries are experiencing the challenges of population ageing, there is no real one-size-fits-all solution to maintaining welfare levels in the face of increasing shares of elderly persons. Population ageing, propelled by a continuous increase in old-age life expectancy and persistent low fertility, presents a challenge for many welfare states to keep up their welfare expenditures on pension, health care and all old-age services. Options for tackling this daunting challenge, such as increasing fertility and immigration levels, cutting benefits and growing public debts, present numerous obstacles. Therefore, recent discussions on potential solutions have increasingly focused on how to encour-

age workers to postpone retirement in order to maintain the size of the labour force necessary to provide economic support for the ageing society.

As longevity increases, individuals spend a larger proportion of their lives as pensioners. It stands to reason that adjustments of the legal retirement age will be both possible and necessary to account for this new reality. If we are to successfully raise average retirement ages, we will need a deep understanding of the factors which influence the timing of the individual retirement decision. This is one of the goals of the AGENTA project, and the results point to the conclusion that retirement patterns are not the same throughout the European Union. To understand this, the project has focused on different retirement patterns based on gender and educational levels.

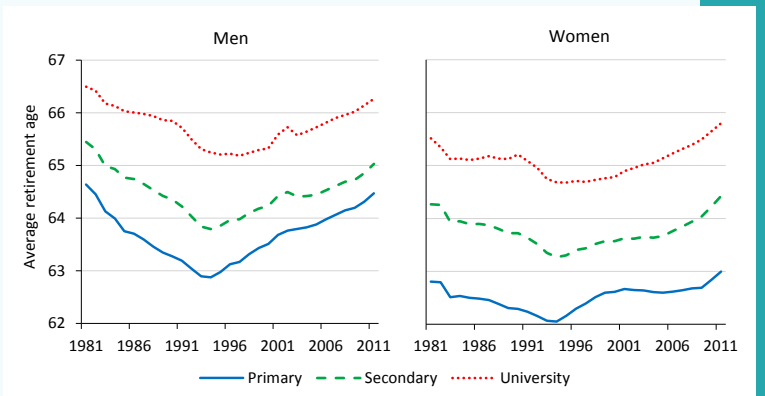
Differential retirement patterns

If policy measures are to be developed to encourage later retirement, it is important to understand how groups in society differ in their approach to retirement. While much research on retirement patterns is focused on male exit from the labour market, increasing female labour force participation rates make gender differences in retirement patterns highly relevant when talking about future developments. Additionally, immigrants are another group whose retirement patterns has lacked research focus in the past, though this population will be increasingly important in the future. Using a number of data sources, the AGENTA project has surveyed the situation in 13 European Union countries.

Using the Survey of Health, Aging and Retirement in Europe (SHARE) we have analysed the ages at retirement by educational level (Divényi & Kézdi 2015). The results of this study are not overly surprising, but they do point to potential problems. Individuals with different educational levels have clearly different patterns of retirement. Those individuals with the lowest educational levels (8 years or less of formal schooling) display the highest retirement ages, while those with secondary education have somewhat lower ages at retirement. Falling between these groups are the university-educated, which have higher retirement ages than those with secondary education, but still retire at a younger age than those with low education levels.

This situation indicates a possible problem in that those with the lowest educational levels work until higher ages, and they also enter the labour force at younger ages since their educational pathway stops earlier than the other groups. If we add the fact that many occupations available to the less educated are physically demanding, we can begin to see a challenge to extending the working life. These individuals already work more years on average than their more highly educated counterparts, and, given their strenuous jobs, may have difficulty maintaining their health. This poorer health may very well make it impossible to effectively increase the retirement age of the less educated.

Using SHARE data poses a problem, however, in that the number of individuals in the sample requires us to look at the EU as a whole, and therefore our results may conceal considerable differences between countries within the union. For this purpose, we went on to focus on two specific countries which represent very different welfare state regimes within the European Union: Spain and Sweden.



Development of average retirement age in Sweden 1981–2012, by gender and education. The steady retirement age decline which occurred during the 1970s and 1980s was reversed in the mid-1990s, after which the retirement age has risen consistently for both genders and all educational groups.

Source: Qi 2016.

Figure 3.1: Development of retirement ages in Sweden 1981-2011

The Swedish experience is somewhat different from that of the EU as a whole, as found in our research (Qi et al. 2015, Qi 2016). We can see in Figure 3.1 that there is a clear gradient

in retirement ages in Sweden, with higher educational levels implying higher ages at retirement. This is contradictory to the general patterns seen at the European level. One factor remains the same, however, and that is that Swedes with low educational levels still work for more years than those with higher education, since they enter the workforce at a younger age.

Another result noticeable in this diagram is that there has been a steady increase in retirement ages across educational levels and gender from the mid-1990s until today. While working life has been extended for both men and women in Sweden during the recent decades, the underlying mechanism driving these changes appears different between the sexes. We compared the retirement ages across the cohorts born 1937–1944 in Sweden under two scenarios: with pension reform versus without pension reform. Our results suggest that the 1994 Swedish pension reform which phased in the Notional Defined Contribution (NDC) scheme explains most of the increase in men's average retirement age, it however accounts much less for the increase in that of women (Qi et al. 2016a, 2016b).

The case of Spain shows a different pattern than the Swedish one, and is much more in line with the observations for Europe as a whole. When examining differences by educational level, Spanish men with university education are more prone to retire than their less educated counterparts (Patxot et al. 2015). Figure 3.2 shows average waiting times until retirement once an individual is eligible, and clearly shows that the more highly educated leave earlier than the less educated.

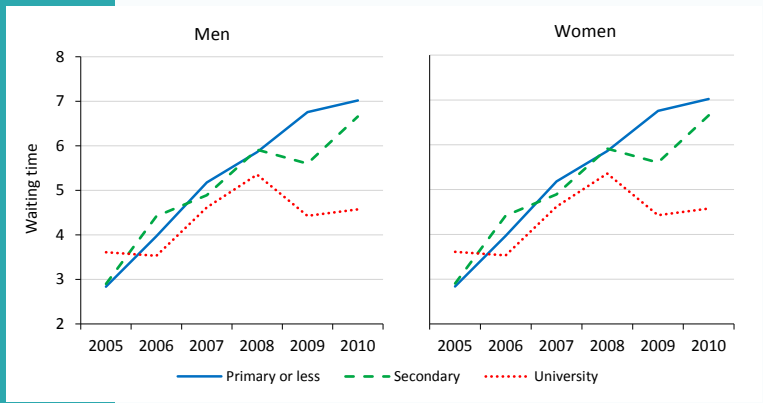


Figure 3.2: Waiting time until retirement in Spain 2005-2010

Average waiting time (in months) from eligibility until retirement in Spain, by gender, education and year. During the financial crisis, differences in retirement timing became evident, with the university-educated of both genders retiring earlier than those with primary and secondary education.

Source: Patxot et al. 2015.

The differences found in retirement age by educational level between Sweden and Spain may indicate underlying inequalities which deserve closer attention. The fact that the less educated work longest in Spain, despite having more physically demanding employments, points to a situation where pension amounts are not considered high enough to allow for retirement at the desired age. The situation in Sweden conforms more closely to expectations in a system where the retirement decision is not based on the capability of self-sustainment. It is possible that the least educated Europeans in some national systems find themselves forced to work the longest, at the lowest pay and in the worst living conditions, thereby accentuating the economic marginalisation of their working lives.

Implications for an ageing Europe

Recent increases in average retirement age are widely believed to be a consequence of many governments' interventions to increase statutory retirement ages and/or impose benefit reduction for early retirement. However, AGENTA researchers examined the causal effects of pension reform on retirement behaviour in Sweden, and found that the increased retirement age might not be fully driven by the changes applied to the pension system. Similar results are found in Spain. Despite the fact that the 2011 Spanish reform also introduced a compulsory delay of the retirement age, its effective delay can be greatly associated with the consequences of the financial crisis.

Our studies of patterns in Sweden provide a number of promising prospects in terms of the future labour supply (Qi 2016). First, impaired health does not prevent people from working longer, as the average retirement age of those unhealthy has been increasing to the same extent as that of healthy workers during the recent decade. Second, the younger cohorts will increasingly be facing more pension reduction if they retire early, therefore they have a stronger incentive to work longer. Third, we have

seen an astonishing improvement in the average education level of younger cohorts. If this human capital development continues, and if future trends move toward the Scandinavian situation where more highly educated people persistently retire later than less educated, we may expect to see a growing number of individuals continue to work after age 65. All these factors imply that the aggregate trend towards working longer could continue. However, this outlook may not necessarily be the case for many other European countries. Results examining other countries in the AGENTA project find a negative relationship between education and retirement rate, based on SHARE and Spanish administrative data, respectively (Divényi & Kézdi 2015, Patxot et al. 2015). This implies that there are capacities of older workers with high levels of education and occupation remaining unused. Such an unused capacity brings us to the discussion of how to encourage the highly educated to work for more years. A more troubling implication is that the most vulnerable workers in many countries—those with low education levels—may very well be the ones finding themselves forced to work longer due to the structure of pension systems that will not provide them with the resources needed to retire.

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4. Age reallocation through public transfers in Europe

Population ageing challenges the funding and organisation of the public transfer system. Pensions and health services as the largest components of public transfers constitute mainly a redistribution from the working-age population to the elderly population. The increase in the number of old-age pensioners relative to workers therefore requires adjustments in the public transfer systems. The AGENTA project aims at the measurement and better understanding of the age reallocation through public transfers in EU countries. In particular, it generates insights in the consequences of population ageing for public finance.

The age-specific per-capita estimates of total public transfer benefits are shown in Figure 4.1. The public benefits received by the population in old age amount to 70–80 per cent of the labour income at age 30–49, on average. However, there are considerable differences in the age pattern and the level of benefits between countries. In Greece, the country with the highest level of public benefits relative to labour income, the transfers received by people 70 years and older correspond to 90 per cent of the average earnings at age 30–49. In Bulgaria, the country with

the lowest level of public benefits relative to labour income, the corresponding level is around 60 per cent.

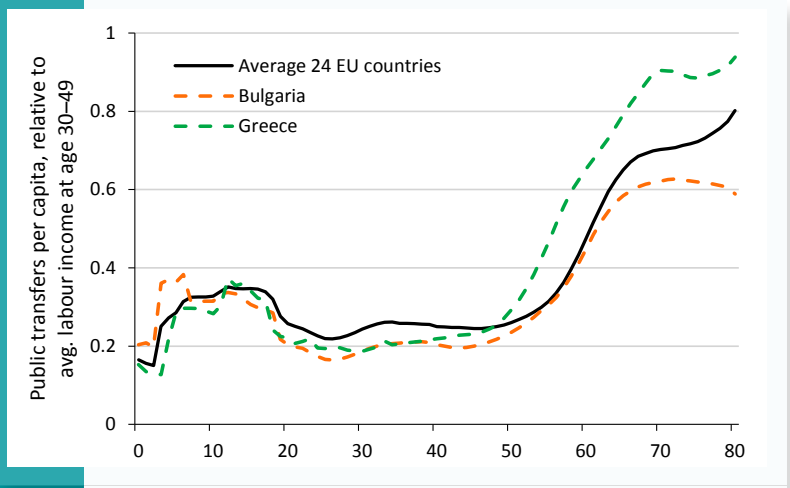


Figure 4.1: Public transfer benefits per capita relative to labour income at age 30–49

Public transfers redistribute to the elderly population with large differences across countries. In 2010, Greece was the country with the most pronounced redistribution to elderly people, while Bulgaria was characterised by a small public sector and a low redistribution.

Source: http:/www.wittgensteincentre.org/ntadata

Welfare states in Europe

The level and type of public transfers received and paid by different generations reflect the differences in social policies across European countries. European countries are frequently grouped into welfare state models, depending on certain characteristics of welfare state institutions and policies. In his seminal typology, Esping-Andersen (1990) classified welfare regimes using three characteristics: de-commodification, social stratification and the mix of private and public social transfers. This approach allowed identifying three main types of welfare regimes in the European countries:

- Conservative/corporatist: moderate de-commodification, social benefits and old-age provision related to contributions, care provided by the family.
- Liberal: emphasis on individual responsibility regarding income, social insurance and old-age provision. State support is provided only to those who cannot purchase them on the market.
- Social-democratic: high level of de-commodification with universal public benefits and public provision of care.

De-commodification refers to the reliance on tax-financed social entitlements rather than on voluntary exchange on markets, especially in terms of pensions, unemployment benefits and health insurance. Esping-Andersen defines de-commodification as the "the degree to which individuals, or families, can uphold a socially acceptable standard of living independently of market participation". The differences in the age pattern of public transfers should reflect the differences in the de-commodification across countries. We expect liberal countries to be characterised by low levels of public benefits relative to total labour income, social-democratic countries by high levels of public benefits and conservative countries somewhere in between.

Interrelated with the de-commodification is the private–public mix of social transfers as these two components complement each other. High levels of public transfers are expected in social-democratic type of countries, in particular also high transfers to children and the working-age population. We would expect high levels of public transfers also in conservative/corporatist type of countries, together with a larger redistribution to the elderly population as in particular the care for children remains the responsibility of the family. In liberal countries, we generally expect a lower level of public involvement in intergenerational transfers.

We use characteristics of the NTA age profiles of public transfers to describe and analyse the organisation of public transfers across countries (for more details see Chłoń-Domińczak et al. 2016). In particular, we identify groups of countries with similar characteristics of the public age reallocation regarding the total level of public transfers and redistribution to the older generation. For this purpose, we use the ratio of total public benefits relative to total labour income and the ratio of public benefits paid to the elderly population 60+ relative to total benefits. In Figure 4.2, 24 EU countries are plotted according to these two characteristics. The amount of total public transfer benefits ranges between 62 per cent of labour income in Bulgaria to 82 per cent in Greece. The amount of net public benefits of elderly people relative to total public benefits ranges between 11 per cent in Ireland and 28 per cent in Greece.

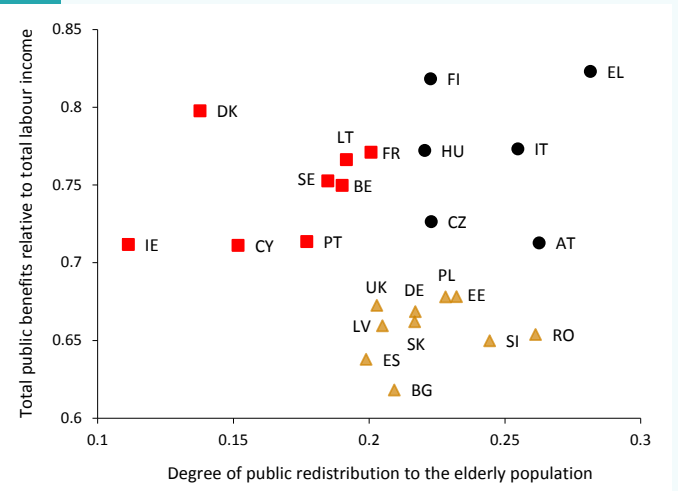


Figure 4.2: Ratio of public benefits to total labour income vs. ratio of public old-age benefits to total public benefits

The total size and the generosity to the elderly population are important characteristics of public transfers. Three clusters of countries can be identified: small public sector (yellow), medium-sized public sector and little age reallocation (red); large public sector and strong age reallocation (black).

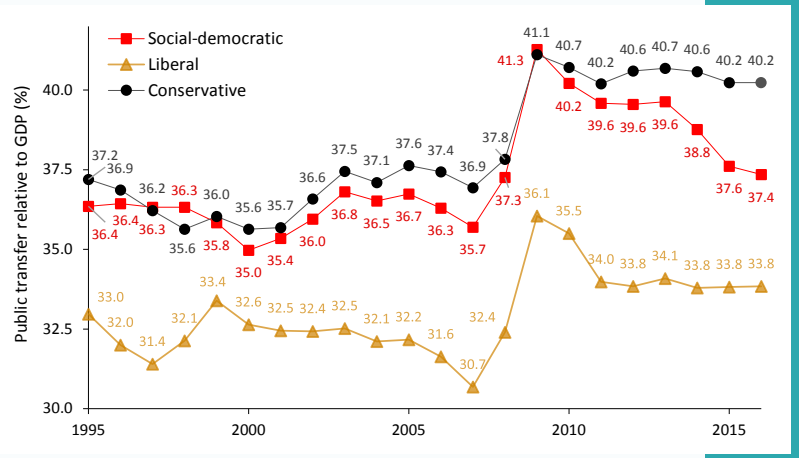
Source: http:/www.wittgensteincentre.org/ntadata

Using cluster analysis, we identified three groups (clusters) that reflect different generational outcomes of social and fiscal policies. We use Esping-Andersen's denotation for the different groups, although the classification of single countries differs from the original work.

1. Large public sector – generationally balanced distribution (social-democratic): above European average public transfers to all generations.
2. Large public sector – strong redistribution to elderly (conservative): high public transfers relative to labour income and pronounced redistribution to the older generation.
3. Small public sector (liberal): low public transfers relative to labour income and a more than average distribution to the older generation. Includes most of the central and eastern European countries as well as Germany and the UK.

Change of public expenditure over time

The development of public spending over time is informative as well. General government expenditure differs between the three groups of countries, as shown in Figure 4.3. Increases in public spending relative to GDP during and in the aftermath of the financial crisis around 2008 are common to all groups. The liberal countries have the lowest level of public spending, before and after the crisis. The countries in the social-democratic type of countries decreased public spending considerably in the last years, while public spending remained at a high level in the countries that are characterised by a strong redistribution to the older generation.



The financial crisis is related to an increase in public expenditure in all types of welfare regimes. Countries with a large redistribution to the elderly population face difficulties in decreasing public expenditure after the peak around 2009.

Source: EUROSTAT

Figure 4.3: Public transfer expenditure in per cent of GDP

Conclusions

The NTA-based study on links between public finances and population ageing extends research on economic consequences of ageing in several aspects. NTA provide harmonised data that measure private and public transfer flows in EU countries. These data are predestined for comparative studies of public transfers across age groups. By analysing the data and NTA-based indicators, we gain new perspectives on the welfare state regimes and deeper insight into the relation between the design of public transfers and the consequences of ageing. The consequences of population ageing for the public sector depend on the overall income generated in an economy, the size of the public sector and the extent to which the public transfer system redistributes

to the growing elderly population. The development of public expenditure over time indicates that in particular the countries with a high distribution to the older generation face problems to reduce public spending to the pre-crisis levels, making them more vulnerable to economic shocks than countries with a smaller public sector and a more generational balanced distribution of public benefits.

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5. Simulations and projections of public transfers

Miguel Sánchez-Romero, Gemma Abio, Ció Patxot

Analysing the future consequences of public reforms in the light of population ageing requires projecting the evolution and interaction of key demographic and economic indicators. To improve the knowledge about the economic consequences of public transfer reforms, research within the AGENTA project assesses the economic impact of demographic changes and simulates the effect of public transfer reforms on the reallocation of resources across generations.

To analyse and project the future challenges of the population ageing process, it is crucial to understand the economic impact of past changes in the demographic structure and in the transfer system. Population ageing is usually associated with a slowdown in economic growth, since the number of workers declines while the number of dependent persons increases. As a consequence, this process raises concerns about the sustainability of current welfare state programmes. However, economic growth is also determined by the growth rate of the productivity per worker. This additional factor is affected not only by changes in the age structure of workers, but also by compositional changes in the working-age population (e.g. gender, education) and by behavioural responses to the new demographic and economic circumstances—e.g. a longer retirement period needs to be financed by higher savings and by an increasing labour supply. Since the supply of labour and capital will also change, wages and interest rates are bound to vary as well. Hence, a shift-share analysis, which does not consider behavioural responses and changes in wages and interest rates, is insufficient for fully understanding the implications of the population ageing process for economic growth and its impact on the future evolution of public transfer systems. Thus, we develop a model populated by overlapping generations (OLG) in which heterogeneous individuals, who differ in their educational attainment, decide about their consumption, labour supply and savings. The model replicates the main macroeconomic indicators of three European countries (Austria, Spain and Sweden) from 1870 until 2015 and takes into account the evolution of two main public transfer programmes—i.e. publicly provided education and pension expenditures. For further information about the model see Sánchez-Romero et al. (2016, 2017).

Long-run economic growth: the role of changes in the age structure and education on economic growth

The unprecedented economic growth (i.e. per-capita income growth) observed in western European countries during the last century and a half was accompanied by a change in the age structure of the population, known as the demographic transition, and by the expansion of the educational system. Thereby, past changes in the population age and educational structure are related to many of the economic outcomes that we currently observe. The strategy followed in the AGENTA project is to understand the behavioural response to these historical changes in order to properly project the economic consequences of population ageing, taking into account the behavioural response of individuals.

Using an Overlapping Generations (OLG) model, we assess the impact of demography on several macroeconomic indicators and especially on per-capita income growth. Demographic chang-

es can produce a demographic dividend (i.e. higher per-capita income) either when the working-age population grows faster than the dependent population or when it induces an increase in the productivity per worker, but it can also cause a demographic burden when the opposite effects occur. Figure 5.1 shows the contribution of changes in the age structure and the educational expansion to per-capita income growth in three European countries (Austria, Spain and Sweden). These countries represent well the economic and demographic patterns as observed in central, southern and northern Europe, respectively. The total height of the bars in Figure 5.1 shows the total per-capita income growth rate observed during the period 1870–2014 and the projected growth from 2015 until 2100. Colours blue and orange show the per-capita income growth associated to changes in the age structure and in the educational attainment of the population, respectively, while the grey colour represents the contribution of all other factors. The sum of the blue and orange bars suggests that demography, i.e. the changes in the population size and in its composition, accounts at least for around 25 per cent of the total per-capita income growth during the period 1870–2014. Figure 5.1 shows a smaller impact of demography on the per-capita income growth during the 21st century. This is explained by a small negative effect of the change in the age structure of the population on per-capita income and a positive effect of education, especially in countries like Spain with a late introduction of public upper secondary and tertiary education. The small impact that demography will have on per-capita income growth in Sweden during the 21st century is explained by the low inequality in labour income across educational groups, i.e. the educational expansion will not produce an increase in the productivity per worker. Our simulation suggests that education, rather than the age structure of the population, is the demographic characteristic that will have the biggest influence on economic growth in the future. Hence, we find that the future demographic dividend can only be an educational dividend.

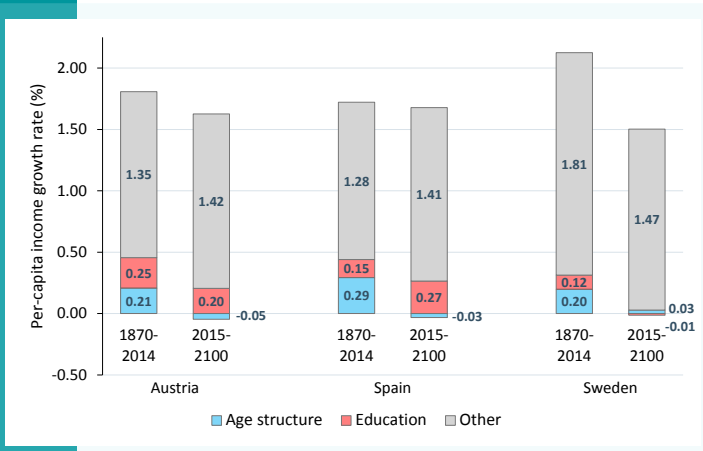

Figure 5.1: Source of per-capita income growth during the period 1870-2100 in Austria, Spain and Sweden

The contribution of changes in the age structure and educational expansion to per-capita income growth accounts at least for around 25 percent during the period 1870-2014. The expansion of education has the biggest influence on per-capita income growth from 2015 to 2100.

Source: Results obtained using the model developed in Sanchez-Romero et al. (2016, 2017)

Wealth effect of public education and public pensions across birth cohorts

The model also allows us to project the evolution of taxes and pension contributions that are necessary to finance the public transfer system. The difference between benefits and taxes/contributions will determine the wealth generated by the transfer system for each cohort, which may induce individuals to reduce private savings. As a consequence, an explicit analysis of the wealth generated through public transfers and the behavioural response of individuals to changes in transfer wealth is key for understanding the future evolution of capital per worker and hence the growth rate of per-capita income.

The transfer wealth of an individual is determined by the difference between the expected future stream of income out of the transfer system and the expected future stream of payments into the transfer system. So public transfers also generate or destroy wealth as individuals expect to receive public benefits and to pay taxes and contributions along their life span. The concept of transfer wealth is crucial for analysing whether specific generations are net contributors to the state or net beneficiaries over their whole lives.

Using the OLG model we simulate the evolution of public education and pension transfers up to 2100. Note that the net transfer wealth is the sum of a positive transfer wealth from the public education system, where individuals receive benefits before they

pay taxes, and a negative transfer wealth from the social security system, where individuals pay contributions before receiving benefits. When these transfers are introduced, the pension system creates a windfall for the first generations of pensioners, while public education implies a shortfall for the taxpayers. Figure 5.2 shows the net transfer wealth from public education and the social security system for cohorts born between 1900 and 2000. According to our results, cohorts born in Austria, Spain and Sweden between 1900 and the first world war (WWI) experienced a positive transfer wealth from the public sector. In Spain, the cohorts born between WWI and the second world war (WWII) continued to experience a positive transfer wealth as they did not yet have to finance a modern educational system, which was only implemented in the late 1960s. In contrast,

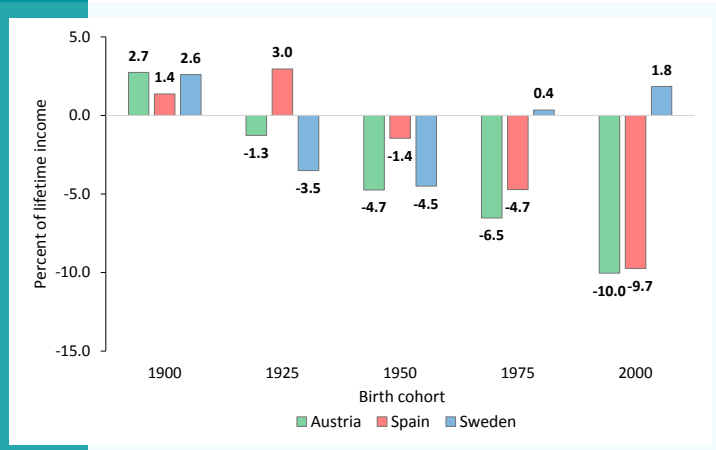

Figure 5.2: Present value of education and Social Security payment as a percent of lifetime labour income

The net transfer wealth from the public education and the Social Security system is positive before WWI. After WWII, cohorts born in Austria and Spain experience an increasingly negative transfer wealth due to the rapid population ageing process.

Source: Results obtained using the model developed in Sanchez-Romero et al. (2016, 2017)

the cohorts born after WWII in Austria and Spain experience an increasing negative transfer wealth from under 5 per cent of the expected lifetime income for the cohort born in 1950 to 10 per cent of the expected lifetime income for the cohort born in 2000. Therefore, if individuals spend on average 45 years working, the results imply that those individuals born in 2000 can expect to spend 4.5 years of work paying to the state in order to finance the difference between the stream of taxes/contributions paid and the education and pensions received. By contrast, the net transfer wealth in Sweden becomes positive for the cohorts born after 1975 due to a more favourable demographic scenario characterised by a moderate increase in the future number of retirees per worker, which allow for a lower social contribution rate than in Austria and Spain.

Public pension cost up to 2070 and its impact on economic growth under different retirement ages

In addition to analysing the long-run economic impact of demography on per-capita income growth and the wealth effect generated by the public transfer system, the model also allows us to study the economic consequences of alternative policy reforms. For instance, during the last two decades many governments have introduced policies aimed at increasing the average retirement age so as to reduce the cost of the public pension system for future workers and to guarantee the feasibility of the system. The impact of this policy on the future evolution of per-capita income is key for understanding its economic consequences.

Table 5.1 shows the economic impact of increasing the retirement age from 65 to 70 in Austria, Spain and Sweden. In particular, the table shows the increase in per-capita income and the evolution of the pension cost as a percentage of GDP from 2010 to 2070. In order to simulate this policy, the government is assumed to increase linearly the retirement age from 65, starting in year 2020 (phase-in), up to age 70 in year 2040 (phase-out). Moreover, pension benefits are adjusted downwards when the social security contribution rate exceeds thirty five per cent. Under this setting, Table 5.1 reports how this policy has a moderate impact both on per-capita income and on the total cost of pensions by year 2070. However, this policy substantially reduces the burden of population ageing by year 2040. Specifically, the total cost of public pensions as a percentage of GDP is reduced by 3.6 (=21.3 – 17.7) percentage points in Austria, by 6.7 percentage points in Spain and by 2.5 percentage points in Sweden. Per-capita income also increases in 2040 by 4 (=158.9 / 152.8 – 1) per cent in Austria, by 13.8 per cent in Spain and by 4 per cent in Sweden.

		Retirement age 65		Retirement age 70	
		Per-capita income	Pension to output	Per-capita income	Pension to output
	YEAR	(2010=100)	%	(2010=100)	%
AUSTRIA	2010	100.0	12.4	100.0	12.4
	2040	152.8	21.3	158.9	17.7
	2070	254.8	21.8	256.1	20.5
SPAIN	2010	100.0	9.2	100.0	9.2
	2040	156.0	21.9	177.5	15.2
	2070	261.1	21.2	263.5	19.8
SWEDEN	2010	100.0	7.2	100.0	7.3
	2040	150.6	9.5	156.6	7.1
	2070	245.6	10.8	254.4	8.4

Table 5.1: Economic impact of increasing the retirement age in Austria, Spain and Sweden

Conclusions

Simulating and projecting planned reforms of public transfers is crucial for assessing their redistributive effect, efficiency and their impact on economic growth. In general, a standard shift-share analysis is insufficient for a proper assessment of these reforms, since individuals will react to a longer and healthier retirement period by changing their behaviour. It is therefore necessary to develop models that do not only account for changes in the age structure of the population but also for the behavioural reaction of individuals to the new economic and demographic environment. These models must be able to explain the economic consequences of past changes in the age structure and in the transfer system.

To explain the economic consequences of past changes in the age structure and in the transfer system, we implement an economic model with realistic demography, in which overlapping generations decide about their accumulation of capital and labour supply. Applying the model, we find that demographic changes—i.e. changes in the age structure and educational composition of the population—account for 25 per cent of the observed per-capita income growth during the period 1870–2014 in Austria and in Spain. In addition we also find that education will be an important driver of future economic growth from 2015 to 2100, while the changing age structure will have a small negative effect in the future.

We have applied our model to study the effect of the public transfer system (education and pension) on the wealth of different cohorts over time. Simulating the evolution of public education and pension transfers up to 2100, we find for the cohorts born after the Second World War in Austria and Spain that the positive wealth received from public education is offset by the negative wealth from pension expenditures. In contrast, the positive demographic scenario of Sweden makes the pension system not as burdensome there as in Austria and Spain. As a consequence, net wealth from these public transfers is positive in Sweden for the cohorts born after 1975.

Within our model we can also study reform scenarios of the public transfer programme. To reduce the burden of public pension programmes on future workers, governments are introducing policies that extend the normal retirement age above age 65. We find that the impact of this policy on economic growth is not significant beyond 2070. However, delaying the retirement age helps to substantially reduce the economic burden of the pension system around the year 2040.

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6. Indicators of sustainability and fairness

Róbert Gál and Judit Monostori

Economic sustainability and intergenerational fairness are closely related issues. The problem of sustainability, which includes long-term affordability of public programmes such as health care and pensions but in more general terms the subsistence of current consumption patterns, came to the fore as a result of the changing age composition of society owing to the second demographic transition, which is characterised by the combination of low fertility and increasing life expectancy. Ageing societies face problems of financing their large intergenerational transfer programmes. Alternatively, they have to come to terms with the fact that currently young and future cohorts must accept significantly worse conditions, which translates the problem of sustainability into the terms of intergenerational fairness. The connection between the two issues is intuitive even though both sustainability and intergenerational fairness have various definitions and reference points. Many of the indicators measuring the two interlinked issues reflect one or the other such reference points.

	Cross-sectional				Long time-horizon		
	Partitioning of the population by			Parametric characterisation	Cohort		Population
	Chronological age	+ Other non-economic characteristics	+ Other incl. economic characteristics		Remaining lifetime	Entire lifetime	
Specific public programmes	old-age dependency ratio			pension support ratio; turnover duration		net transfer rate	pension wealth
General government				fiscal support ratio	human capital investment gap		sustainability gap
Market economy				economic support ratio; Lee's Arrow; Silver Club			
Total economy				total support ratio			

Table 6.1: A taxonomy of indicators of economic sustainability and intergenerational fairness

Note: The original table (Gál and Monostori 2016) includes over 80 indicators. Here we list only those referred to in this brief summary. Definitions and further description can be found in the text.

As population ageing is becoming a growing concern, a number of new indicators have been suggested by the research community. Currently the problem is not that we do not have indicators describing the ageing process and its consequences, the problem is that we have too many, and that they are frequently misinterpreted; besides, we possibly do not have the most meaningful of them yet.

Surveying the related literature, we have collected over 80 indicators of which we will refer only to a few in this short summary; further details can be found in our report (Gál & Monostori 2016). We created a notation system and translated each indicator in order to make them comparable. We established a taxonomy to find overlaps, connections and families of indicators as well as to facilitate the invention of new ones. The structure of the taxonomy is presented in Table 6.1.

Scope

The first dimension of our taxonomy is the scope or measurement level of the indicator. We distinguish four such levels, those of

- specific public programmes, such as education, health care or pensions
- the general government (the entire tax transfer system)
- the market economy
- the total economy, which combines the market economy and the household economy.

The 'scope' dimension can be applied to establish families of related indicators such as the group of support ratios. All members of this indicator family include the age distribution of the population but in addition to that they also take into account economic characteristics. The fiscal support ratio (Miller 2011) weights the demographic age distribution by the age profiles of benefits received from and taxes paid to the general government, respectively, and calculates the ratio between the resulting numbers of effective taxpayers and effective beneficiaries. The pension support ratio does the same but it is limited to benefits and contributions of the public pay-as-you-go pension system. In contrast, the economic support ratio (Cutler et al. 1990) extends

the scope to the entire market economy and applies per-capita age profiles of labour income and consumption as weights. Finally, the total support ratio extends the economic support ratio to include age profiles of unpaid household labour produced and consumed.

The rationale of connecting related indicators or to extend the scope of analysis from the pension system to the general government to the market economy and finally to the total economy is that sustainability conclusions can turn out to be quite different at the various levels. In Figure 6.1 we demonstrate, for a sample of selected countries, that the dramatic unsustainability in the pension system can go hand in hand with modest or even mild sustainability problems in the general government and the economy in particular if the household economy is also taken into account. The columns in the figure represent percentage changes in the respective support ratios if the current age profiles of inflows and outflows mentioned above are combined with the age distribution of the population in 2010 and in 2060.

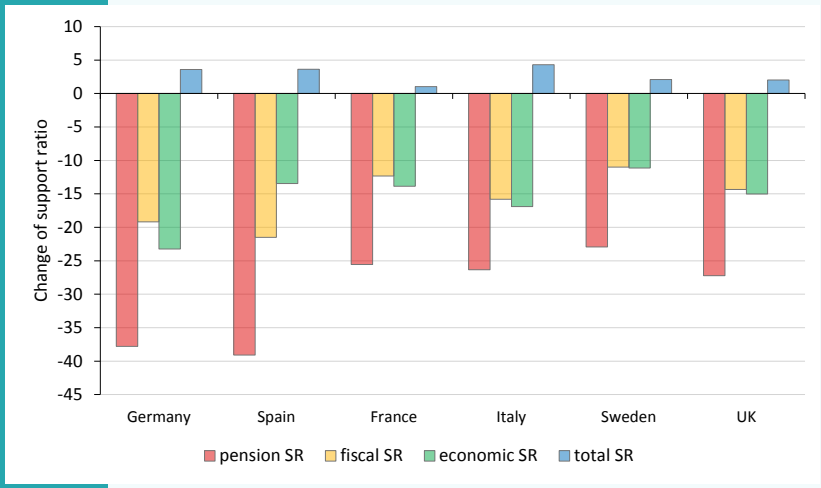

Figure 6.1: Changes in various support ratios if current age profiles of the public sector and the economy are applied to the expected age distribution in 2060 for selected European countries

Population ageing will affect pension systems more seriously than public budgets or the economy in general. Labour currently performed in households offers further capacities to absorb the negative consequences.

Note: SR = support ratio in %; see descriptions in the text

Source: Population projection: Eurostat; other age profiles: AGENTA.

The countries in Figure 6.1 were selected so as to include the five largest nations in the EU and at least one representative of all European welfare regimes. In each case, the pension support ratio, that is the rate of the number of effective contributors to the number of effective pensioners, would take a major negative drop between 23% in Sweden and 39% in Spain, should current age profiles of contributions and benefits still prevail in 2060. This implies serious sustainability problems. However, the population pressure on the general government is less severe (the fiscal support ratio would decrease between 11% in Sweden and 22% in Spain), because the beneficiaries of the general government are less old and its contributors are older than those of the pension system. Consequences on the economic support ratio would be comparable. More strikingly, if the total economy is considered, which includes the market economy registered in the National Accounts as well as the household economy that is the output of unpaid household labour, population ageing would not create any negative effect at all. The age profile of consumption is so much younger, and that of labour is so much older in the household economy (Vargha, Gál & Crosby-Nagy 2017) that the resulting decrease in consumption and growth in labour would compensate for the imbalances of the market economy.

In short, population ageing affects the pension (and health care) systems seriously and these institutions require major reforms but societies on the whole can mobilise the necessary resources when confronted with the later phases of the demographic transition.

Cross-sectional indicators

Support ratios are cross-sectional indicators (see Table 6.1), which take their values from one period of time, *t*. This *t* is not necessarily the current period; it can also be in the past or in the future. As a matter of fact, cross-sectional indicators are frequently applied in projections. However, even if *t* takes place in the future, a cross-sectional indicator takes the value of one period at a time (or potentially a compound of two such measures) irrespective of where this period is in the timeline. By contrast, what we call long time-horizon indicators are meant to sum up information of the base period, *t*, as well as subsequent periods in one indicator. Whenever cross-sectional indicators are applied to characterise the future, they refer to the future. In contrast,

long time-horizon indicators as present values include references to the future even when they are used to characterise the present. Cross-sectional indicators are central tendencies (medians or means), rates or subtractions whereas long time-horizon indicators are built on summations or integrals over a specified time period.

Most cross-sectional indicators partition the age distribution and compare its sections with each other (in the first three columns of Table 6.1). This is the most populous group in our collection (even if not in this short summary but see Gál & Monostori, 2016, for further details). The relevant partitioning in the context of AGENTA is the triad of childhood, active or working age and old age. All related indicators are based on some simple or more chiselled definition of the three life stages. Some of them cover part of the population such as the various beneficiaries/contributors (or benefits/contributions) ratios characterising pension systems. Others range over the entire population including children as well. Partitioning of the age distribution can be based purely on age but more sophisticated partitioning methods include other pieces of information. They can be monetary but they can refer to other conditions such as health, level of education, labour market position or some institutional conditions as well.

Instead of partitioning, other cross-sectional indicators comprise the information on the age distribution in one parameter such as a weighted mean (column 4 in Table 6.1). An NTA-based indicator, the Lee arrow is built on two such parametric characterisations of age profiles. Lee's arrow is the difference between the mean age of consumers weighted by the amount of their consumption and the mean age of workers weighted by their labour income (Lee 1994). It gained its name by its arrow-shaped graphical representation where the difference between the two means is the length of the arrow, the sign of this difference is its direction and the actual amount of consumption in the time period of the cross-section is its width. If it is negative (the arrow heads to the left), consumers are younger than producers, or in a longitudinal interpretation consumption precedes production; if it is positive (the arrow heads to the right), producers are younger than consumers and it is production that precedes consumption. The dominant effect in young societies is that consumers build up debts in order to finance their consumption. Such a debt can be an implicit or even informal intra-familial debt; the latter can be denominated in time instead of monetary terms. In contrast, the dominant effect in an old society is that of saving and wealth accumulation. It can be shown that the area of the arrow diagram gives an indication of the aggregate debt or wealth accumulating in the future. As such, the Lee arrow is a simple and powerful tool for sustainability analysis.

	mean age of consumer	mean age of worker	length and sign of Lee's arrow
Germany	46.7	43.9	2.7
Spain	42.3	42.0	0.3
France	43.3	42.2	1.1
Italy	45.1	43.8	1.3
Sweden	43.4	44.5	-1.1
United Kingdom	44.1	42.6	1.5
European Union	42.3	42.4	-0.1
USA	41.8	44.0	-2.2
East Asia	36.8	40.5	-3.7
Latin America	33.9	40.0	-6.1
South and South East Asia	31.2	39.4	-8.2
Africa	26.1	39.5	-13.4

Industrial nations are about to become members of the Silver Club one after the other. Club members are countries with consumers being older than workers. Such economies are characterised by a demand for wealth which, if combined with reliable financial institutions and reasonable public policies, offers the chance for wealth creation.

Note: figures for the EU give unweighted average of 26 Member States in 2010.

Source: European figures: AGENTA; other figures: Lee and Mason (2011).

Table 6.2 Weighted mean ages of consumers and workers and the resulting Lee Arrows

A closely related indicator, Miller's Silver Club, applies the arrow diagram.[8] A society becomes a member of the Silver Club in the moment its Lee arrow changes sign and consumers grow older than producers. In Table 6.2, we present Lee arrows for selected European countries, the European Union as a whole as well as other regions of the world. Countries that are already Silver Club members are set in boldface and italics.[9]

8 The concept of the Silver Club was suggested by Timothy Miller.

9 European Union values are simple averages of 26 out of the 27 member states in 2010 (with Malta missing). Altogether 13 of them were Silver Club members and 5 others were on its threshold (with consumers being less than one year younger than workers). Only Cyprus and Ireland were still a few years away.

Another related indicator, called in pension economics the turnover duration of a pay-as-you-go pension system, is a counterpart of the Lee arrow with a narrower scope. In this context, turnover duration is the difference between the average age of pensioners weighted by the amount of their benefits and the average age of contributors weighted by the amount of their contributions. The distance of the two weighted means indicates the average length of "maturation" of contributions in a notional account of a non-financial defined contribution system.[10] In other words it signals the average time that contributions "spend" in the "accumulation phase" in a notionally funded scheme. Multiplied by the period amount of contributions it gives an indication of the accumulating stock of contributions of the system. Expressed in an alternative way, it reflects the amount of notional wealth held by the pension system. Differences between turnover durations reflect the variance in the underlying age distribution as well as in employment patterns. One of the potential applications of the turnover duration is the automatic balance mechanism of the indexation formula used in the Swedish public pension system. The formula in question adjusts benefits of retirees and the notional wealth of contributors in an annual, incremental way in order to assure smooth and continuous adjustment to a sustainable path.

Sustainability versus fairness

In Table 6.1, we distinguished among long time-horizon indicators between those referring to a cohort and those applying to the entire population. Conclusions based on one or the other are rather different. Whereas indicators containing information on the entire population all at once are applied in sustainability analysis, cohort figures can also serve for intergenerational comparisons and in this way help analyse intergenerational fairness. Although some indicators can be interpreted both at cohort level and at population level the analyses they are applied in are different. Our example here is pension wealth, sometimes called social security wealth, an indicator with frequent references in the academic literature but also used by international agencies such as the OECD. Pension wealth is the expected present value of the future stream of benefits in a pay-as-you-go pension scheme.

Population level indicators hardly contain retrospective information. They are typically used in sustainability analyses, which are based on current and future data. In special cases "current" may be set in the future, as future base years can also be selected, for instance, when the researcher wants to quantify the increasing costs for future generations of a postponement of reforms.

By contrast, cohort level indicators are often fed with historical data. In fact, this is what distinguishes a proper analysis of intergenerational fairness from a sustainability test. Indeed, the results of sustainability studies are often interpreted in terms of intergenerational fairness saying that current patterns are so much unsustainable that the adjustment will unfairly affect future generations. While such predictions may sound convincing, proper statements on intergenerational fairness cannot be made without covering the entire lifetime of cohorts in the comparison, which usually requires retrospective data. Proper inter-cohort comparisons require data covering the entire life cycles of the cohorts in question often involving the collection of retrospective information and projections regarding the future. Once such a dataset is prepared, various methods are available to quantify intergenerational equity. Such indicators can be based on subtractions (net present values of lifetime inflows and outflows like taxes and benefits or labour income and consumption) such as the net transfer rate, which projects the net present value of lifetime benefits and taxes on lifetime earnings. Alternatively, they can be ratios of present values such as the benefit/tax ratio. Such calculations have been published for public pension systems of numerous countries but only a handful of net transfer rates of the entire tax transfer system have been calculated so far.

A new invention by AGENTA, the Human Capital Investment Gap (Hammer et al. 2016) combines sustainability and fairness interpretations in that it gives its unsustainability measure in terms of inadequate investments of one generation in the human capital of a subsequent generation. The reader finds further details of the indicator below in work package 7.

10 Non-financial defined contribution (NDC) systems of pay-as-you-go financing imitate funded schemes in that they set up individual accounts on which contributions are credited. The accumulating notional wealth grows by new contribution inflows and a notional interest, which in one way or the other is related to the system's period rate of return.

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7. Sustainability of public transfers in the light of demographic change – new insights using an NTA-based indicator

Bernhard Hammer & Alexia Fürnkranz-Prskawetz

The AGENTA project aims at explaining and forecasting public transfers in the light of demographic change. A special focus is on the links between the public and private components of economic transfers between generations. Accounting for these links is key to a proper understanding of public transfers and correct forecasts of public transfers in the future. We develop a sustainability indicator for public transfers using a framework that takes the full system of intergenerational transfers, public as well as private ones, into account (Hammer et. al., 2016b).

Population ageing goes hand in hand with fundamental changes in lifestyles and the life course of individuals, such as higher levels of education, lower fertility, better health and a higher life expectancy. These changes affect the funding of the public transfer system: increasing life expectancy together with fixed retirement ages leads to an extended period of retirement, while declining fertility results in an increase in the number of older persons relative to the size of younger generations. Consequently, the population in employment has to support an increasing share of inactive elderly persons. It is of utmost importance for individuals and policy makers to understand how, and to what extent, demographic changes and the associated changes in individual behaviour affect the public transfer system in the future. Incorrect projections and unmet expectations can result in economic hardship and a considerable loss of personal welfare. Appropriate indicators provide information that can improve assessment and decision-making of individuals and policy makers. Loichinger et al. (2017) compare and project several of such indicators that combine demographic and economic information.

The Generational Contract

Characteristic for the human life course are two stages of economic dependency: childhood and old age. Consequently, the principal direction of inter-generational transfer flows is from the working-age population to children and the retired elderly

population. There is a relationship between the (mostly private) transfers to children and the (predominantly public) transfers to the elderly population. The public transfer benefits that a generation receives in old age depend on its "investments" in children, in terms of their number, their education but also their integration into the labour market and their equipment with capital. These investments determine the ability of the generation of children to generate income and to finance the public old-age benefits of the generation of their parents.

The reciprocal transfer flows between children and the generation of their parents can be described as an intergenerational contract: the parental generation provides resources for children until they are able to support themselves and enter the labour force. The children in turn pay a share of their income for funding transfers to elderly persons in form of public pensions, health care and long-term-care. The main question regarding the sustainability of public sector transfers is therefore whether the investments in children are, and have been, large enough to enable transfers to elderly people at the expected level.

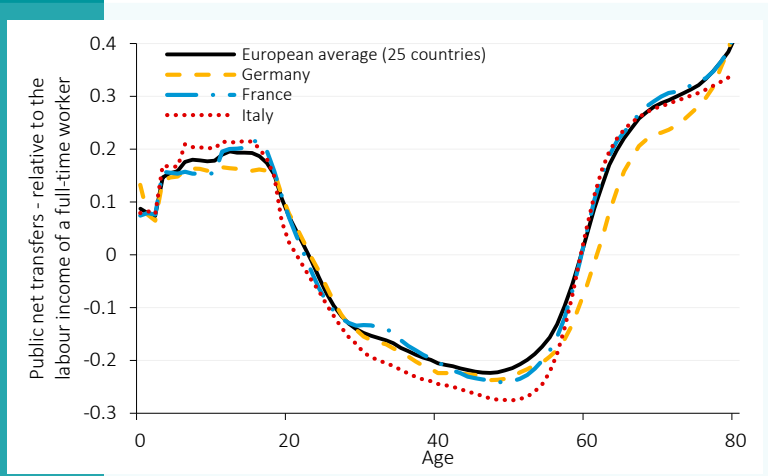

Figure 7.1: Public net transfer benefits by age in 2010

The basic age pattern of net public transfers is similar across European countries, with considerable differences in the level of transfers especially in old age. Germany is among the countries with comparable late retirement and a moderate level of public transfers.

Source: http://www.wittgensteincentre.org/ntadata.

The Human Capital Investment Gap Indicator

We evaluate the sustainability of the public transfer system in European countries using the Human Capital Investment Gap (HKIG) indicator. The HKIG measures the difference between the values of total public net benefits that a certain cohort is projected to receive in old age and the projected public net contributions of their children's generation over the entire working life. A positive HKIG reflects that the public net benefits expected in old age are higher than the expected contributions of the child generation. It indicates that the system is not sustainable and requires adjustments, either by increasing the contributions of the child generation or by decreasing the benefits of the parental generation. We calculated the HKIG for the cohort born in 1950 by simulating public benefits in old age and the children's contributions over their working life. The simulations are based on NTA data from 2010 and age-specific employment projections.

Public transfer benefits in old age

We project the public old-age benefits of a member of the 1950 cohort by assuming that the age-specific benefits per capita relative to the income of a full-time worker remain at the level we observe in the NTA cross-section data for 2010 (Figure 7.1). These values are adjusted with survival probabilities and added up over all ages.[11]

Public transfer contributions during working age: generation of children

For the public contributions of an individual member of the child generation, we assume that age- and employment-specific public contributions and benefits, relative to the income of a full-time worker, remain at the level observed in 2010. We then combine the estimates of age- and employment-specific contributions with the employment projections of Hammer et al. (2016a) to obtain estimates for the public contributions at each age. To calculate total contributions over working life, we simply add up the values at each age. Of interest are the con-

11 Survival probabilities are calculated using the EUROPOP 2013 (EUROSTAT 2016) population projections, no migration scenario.

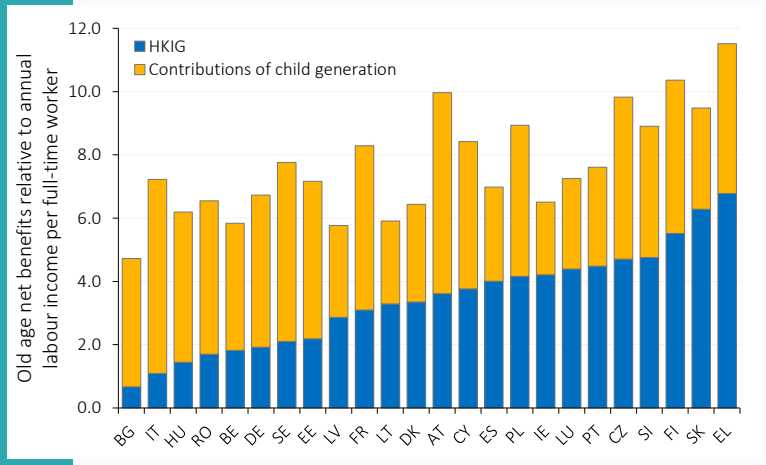

Figure 7.2: Projected old-age benefits of the 1950 Cohort

For individuals born in 1950 only part of the expected public benefits in old age are covered by the contributions of their children (yellow part). There remains a considerable gap (blue) corresponding to more than 4 yearly incomes of a full-time worker in Slovenia, Finland, Greece and Slovakia.

Source: Authors' own calculations

tributions of children per member of the 1950 generation. We therefore project the total contributions of the child generation transferred to the elderly and divide it by the size of the 1950 cohort. The size of the child generation is calculated using data on completed cohort fertility of the 1950 generation, the share of public contributions transferred to the elderly was estimated using NTA data from 2010. The difference between total old age net benefits that are expected by a member of the 1950 cohort and the contributions of the children per 1950-cohort member represents the HKIG of the 1950 cohort.

Results

In none of the analysed countries are the contributions of the child generation sufficient to finance the old-age benefits of the 1950 cohort, given the age- and employment-specific transfer pattern observed in 2010. The total height of the bars in Figure 7.2 shows the total public net benefits that a member of the 1950 generation can expect in old age relative to the yearly production of a full time worker. It requires slightly more than the income of four years of full-time work to finance the public old-age net benefits in Bulgaria, and the income of more than ten years of full-time work to finance the benefits in Slovakia or Greece. The yellow part of the bars represent the share of the benefits that can be financed by the contributions by the child generation, the blue part represents the HKIG. Obviously, there is a considerable gap between the old-age benefits and the contributions by the younger generation, ranging from less than one year in Bulgaria to around six in Slovakia and Greece. The HKIG identifies those countries as least sustainable that financed a large part of public expenditure through issuing new public debt in 2010. The HKIG is relatively small in Bulgaria, Hungary, Italy and Sweden although this has very different explanations: the small role of public old-age benefits in Bulgaria, the high share of public transfers directed to elderly persons in Italy and Hungary, and the high labour market participation rates of elderly people and comparatively high fertility in Sweden.

Conclusions

Intergenerational transfers can be understood as being governed by an implicit generational contract: the parental generation provides resources for children until they are able to support themselves and enter the labour force. The children in turn pay a share of their income for funding transfers to elderly people in form of pensions, health care and long-term-care. The investment in children in the form of having children, nurturing and educating them are an essential element of the generational contract, which enables and justifies the transfer benefits received by the parental generation in retirement. The crucial question regarding the sustainability of public transfers is, if these investments have been high enough to finance the expected old-age transfers of the parental generation.

We find a considerable gap between the projected old-age benefits of the 1950 cohort and the public contributions of their children. This finding stresses the need to adjust public transfer systems to the age structure of the population. Many European countries experienced a baby boom at some time between the end of the second world war and 1980. The high fertility together with increasing employment rates of women and high productivity growth rates stimulated an unprecedented expansion of the public transfer systems. The levels and age pattern of public transfers observed in 2010 are appropriate for the parents

of the baby boomers, but hardly sustainable for generations with low fertility and increasing life expectancy.

Public transfers therefore require a readjustment to be in line with the investments into the young generation. A reform of public transfers towards a sustainable system has to address the pivotal defect in the design of public transfers: the transfers to elderly persons rely on the level of investments in children, but these investments are largely ignored in the calculation of the benefits.

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Appendix

European National Transfer Accounts Data Explorer

The European National Transfer Accounts data can be downloaded using the data explorer at

http://www.wittgensteincentre.org/ntadata

The European **National Transfer Accounts** provide comprehensive and detailed age- and gender-specific economic data on income, transfers, consumption and saving in 25 EU countries.

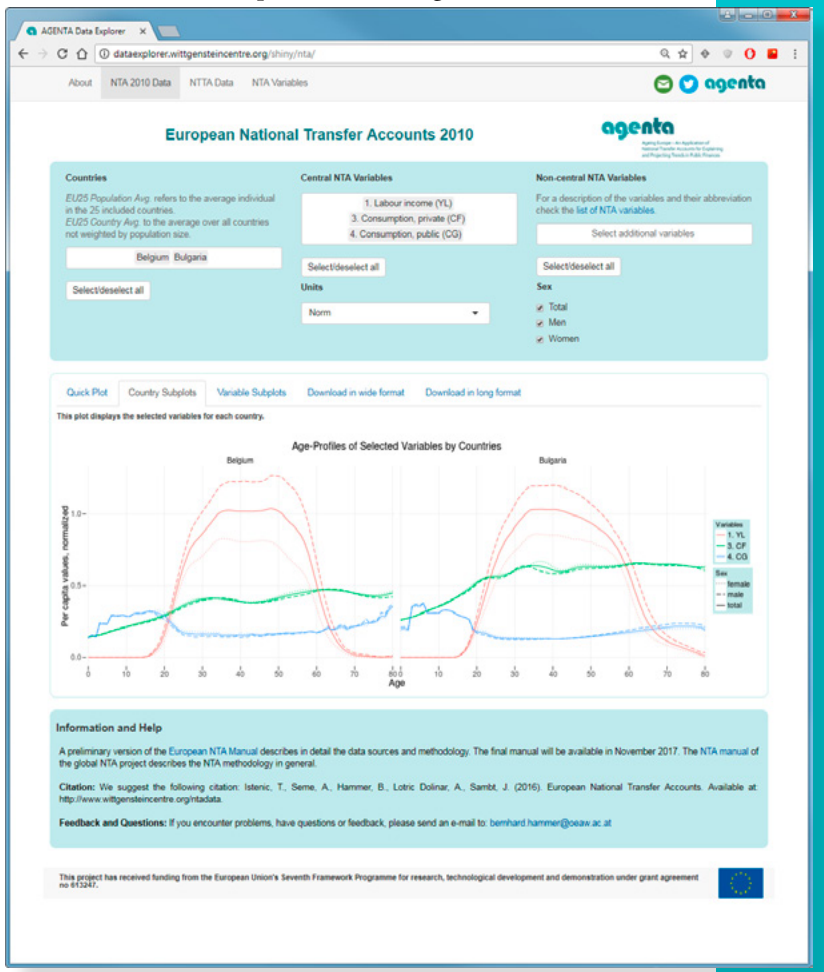

Figure A.1: Screenshot of the National Transfer Accounts data explorer

National Time Transfer Accounts include time use based estimates of production, transfer and consumption of services produced by unpaid household work for 17 EU countries.

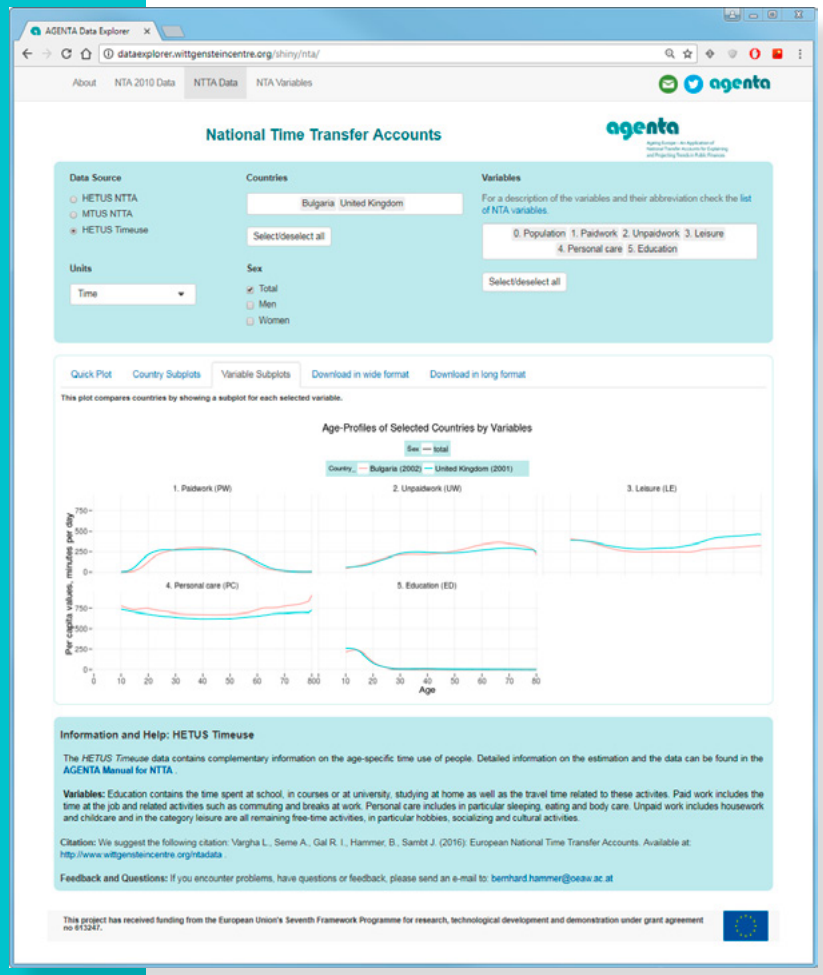

Figure A.2: Screenshot of the National Time Transfer Accounts data explorer

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AGENTA Team

Austrian Academy of Sciences, Austria

Alexia FÜRNKRANZ-PRSKAWETZ
Inga FREUND
Bernhard HAMMER
Lisa JANISCH
Elke LOICHINGER
Bernhard RENGS
Miguel SÁNCHEZ-ROMERO
Marina ZANNELLA

Institute for Futures Studies, Sweden

Nicholas ADJEI
Bo MALMBERG
Gustav ÖBERG
Charlotte THULSTRUP

Lund University, Sweden

Tommy BENGTSSON
Cécile BROKELIND
Asa HANSSON
Jonas HELGERTZ
Gustav ÖBERG
Haodong QI
Kirk SCOTT

Hungarian Demographic Research Institute, Hungary

Lajos BÁLINT
Janos DIVENYI
Erzsébet FÖLDHÁZI
Robert I. GÁL
Gábor KÉZDI
Judit MONOSTORI
Levente PAKOT
Lili VARGHA

University of Barcelona, Spain

Gemma ABIO ROIG
Alfonso HERRANZ LONCÁN
Giorgos PAPADOMICHELAKIS
Concepció PATXOT
Elisenda RENTERIA
Guadalupe SOUTO NIEVES
Martin SPIELAUER

University of Ljubljana, Slovenia

Boris CUPELJIC
Tanja ISTENIČ
Alesa LOTRIC DOLINAR
Irena OGRAJENSEK
Jože SAMBT

Paris School of Economics, France

Hippolyte d'ALBIS
Carole BONNET
Anne SOLAZ
Elena STANCANELLI
Olivier THEVENON

Warsaw School of Economics, Poland

Anita ABRAMOWSKA-KMON
Agnieszka CHLON-DOMINCZAK
Irena E. KOTOWSKA
Wojciech LATKOWSKI
Pawel STRZELECKI

National Institute of Economic and Social Research, UK

Monique EBELL
Katerina LISENKOVA
David McCARTHY
Miguel SANCHEZ-MARTINEZ
James SEFTON

Kickoff Meeting
Vienna, Austria
January 2014

Project Meeting,
Barcelona, Spain
June 2015

Project Meeting
Lund, Sweden
May 2016

Ageing Europe – An Application of
National Transfer Accounts for Explaining
and Projecting Trends in Public Finances