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

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1. AGENTA general

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.

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In this final report we summarize key outcomes and selected results of our research that was structured into eight work packages. Two additional work packages were devoted to dissemination & outreach and project management. We conclude the report by presenting our various dissemination activities in the appendix.

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2. Work Packages

2.1 WP1

Work Package 1 (WP1), that was led by UL and involved all partners, explored publicly available comparative datasets and applied them to set up **gender specific National Transfer Accounts (NTA) for countries of the European Union**.

Background

National Transfer Accounts measure important aspects of age-specific economic behaviour, in particular the generation of income, the redistribution of income between age groups and its use for consumption and saving.

To understand how the economy works, it is crucial to be able to observe and analyse the economic interactions among actors in the economy. National Accounts (NA) are a framework for quantitatively describing important aspects of the market economy and the interaction between the state, corporations and households. The development of NA gained momentum in the 1930s when the severity of the economic crisis sparked interest in better measurement and deeper understanding of macro-economic processes. Nowadays, national accounts provide estimates of economic activities for a series of time periods (United Nations, 2013).

Providing a continuous flow of harmonised and consolidated information is a prerequisite for rational and effective decision-taking and policymaking. The System of National Accounts (SNA), coordinated by the United Nations, is a collection of internationally agreed recommendations on how to measure economic activity at the level of individual economic agents, groups of agents or at the level of the total economy (System of National Accounts, 2009).

Numerous aspects of the economy are captured fairly well by the key aggregates of the SNA, however, some concepts and aspects of the economy remain outside its reach. For instance, the SNA does not offer information on how people are

affected by economic events, public policies or demographic changes at different stages of their life cycle.

Age is one of the main determinants of individuals' economic behaviour. In general, people experience three economically different phases in their life course. Working-age individuals are able to finance their own consumption by producing more than they consume (Lee & Mason, 2011), while at the youngest and oldest ages individuals' consumption exceeds their labour income. The gap between consumption and labour income can be financed by private transfers (e.g. transfers from parents to children), public transfers (e.g. publicly financed pensions and education) or asset-based reallocations resulting from participation on capital and financial markets (Mason et al. 2006). These transfers are called intergenerational because they capture flows between different generations (between young, working-age and old people).

Measurement of these flows across age groups is useful for understanding the intergenerational economy and the organisation of intergenerational support, i.e. how the gap between consumption and labour income is financed in childhood and old age. Both young and elderly people depend heavily on transfers from the working-age population (Mason et al., 2006). In contemporary societies, these periods of economic dependency are gradually extending because of a prolonged education period of young and increased longevity of the elderly.

Introducing the age dimension into the SNA is especially relevant in the light of the unprecedented demographic changes that Europe has been facing in the past few decades (Mason et al., 2006). These changes have dramatically affected the population age structure. Population ageing puts the system of intergenerational flows under pressure due to an increasing share of the elderly inactive population whose costs of pensions, healthcare and long-term care have to be financed by a shrinking labour force (Hammer, Prskawetz & Freund, 2015). Current standards of living can only be maintained if the working-age individuals are able to generate enough income to provide for their own needs, to save enough funds for their retirement years and also to support consumption needs of children and the

elderly in the form of private and public transfers (Mason & Lee, 2011; Patxot, Rentería, Sánchez-Romero & Souto, 2012).

The age structure of the European population is expected to further change significantly over the forthcoming decades. Eurostat's main scenario of population projections assumes below-replacement fertility and declining mortality rates to continue also in the future. Combined with the baby boom generation entering into retirement, the share of elderly people will rapidly increase. The proportion of the EU-28's population aged 65+ will increase from 18.9% in 2015 to 28.5% in 2050. In the same period, the percentage of working-age population (aged 15–64) is expected to decrease from 65.5% to 56.7%. In absolute numbers, the working-age population will shrink by approximately 34 million people, while the population aged 65+ will increase by approximately 55 million people. Consequently, the ratio between the working-age population and those aged 65+ will change dramatically: it is expected to decrease from 3.5:1 in 2015 to merely 2:1 in 2050 (Eurostat, 2015).

Population ageing will have significant social and economic consequences since individual behaviour varies with age. Changes in the population age structure affect the proportion of people at different life cycle stages that are associated with different economic behaviour, i.e. how much they produce, consume, save etc. (Mason & Lee, 2011). This gradually affects the aggregate levels in the economy, as well as the patterns of intergenerational flows among people. For the analysis of the demographic dividend in partial equilibrium see Mason & Lee (2011), Patxot et al. (2011), and Prskawetz & Sambt (2014); for the analysis of the role of education Rentería et al. (2016), and for the analysis based on a general equilibrium model Sánchez-Romero et al. (2013) and Sánchez-Romero et al. (2017).

Population ageing requires reforms of the public intergenerational transfers. Understanding the age patterns of production, consumption and intergenerational reallocation of resources is necessary for analysing the effectiveness of alternative policies. Some government policies can be advantageous for some generations, but burdensome to others. However, systems such as the SNA do not offer

information on age and generational aspect of the aforementioned changes. The ability to assess the consequences of population ageing is therefore very limited. The National Transfer Accounts (NTA) have been developed to fill this gap (United Nations, 2013).

The NTA extend the SNA by introducing the age dimension. Their focus is not on institutions, but rather on individuals and their age. Therefore, the NTA improve our understanding of the generational economy by estimating flows across age groups (United Nations, 2013). Concepts and definitions applied in the NTA are consistent with those in the SNA.

By introducing the age dimension, NTA shed light on the effect of the changing age structure on macroeconomic categories. Therefore, they are a valuable tool in addressing some of the major challenges of modern societies (United Nations, 2013).

Key outcomes of WP1

1. The European NTA data set. For 2010 we have created for all EU countries, except for Croatia, Malta and the Netherlands (thus, 25 countries in total), age profiles for all the economic categories that constitute the standard set of NTA results.
2. Age profiles of economic categories were further decomposed by socioeconomic characteristics: by gender (25 EU countries), by educational level (13 EU countries) and by country of birth (5 EU countries).
3. Historical database. A relatively complete set of NTA categories for 8 EU countries (Belgium, Denmark, Finland, Germany, Italy, Portugal, Sweden and United Kingdom) has been provided, whereas for the remaining 17 EU countries (for which NTA database for 2010 is provided) the results are provided only for a limited number of NTA categories (labour income and public transfer inflows in-cash with sub-components) and for country specific time horizon (depending on macro and micro data availability).

The European NTA Manual describing the steps, procedures and assumptions applied in creating the NTA results is currently revised. An earlier version can be

downloaded at http://www.agenta-project.eu/Jacomo/upload/publications/d-1.4-submitted.pdf.

An online data explorer including the NTA data has recently been launched at: www.wittgensteincentre.org/ntadata.

In policy Brief 5 (The European National Transfer Accounts: Data and applications. http://www.agenta-project.eu/Jacomo/upload/publications/policy_brief_5_final_v2.pdf) and the Project Brochure (http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf, chapter 1) the European National Transfer Accounts data and applications are summarized.

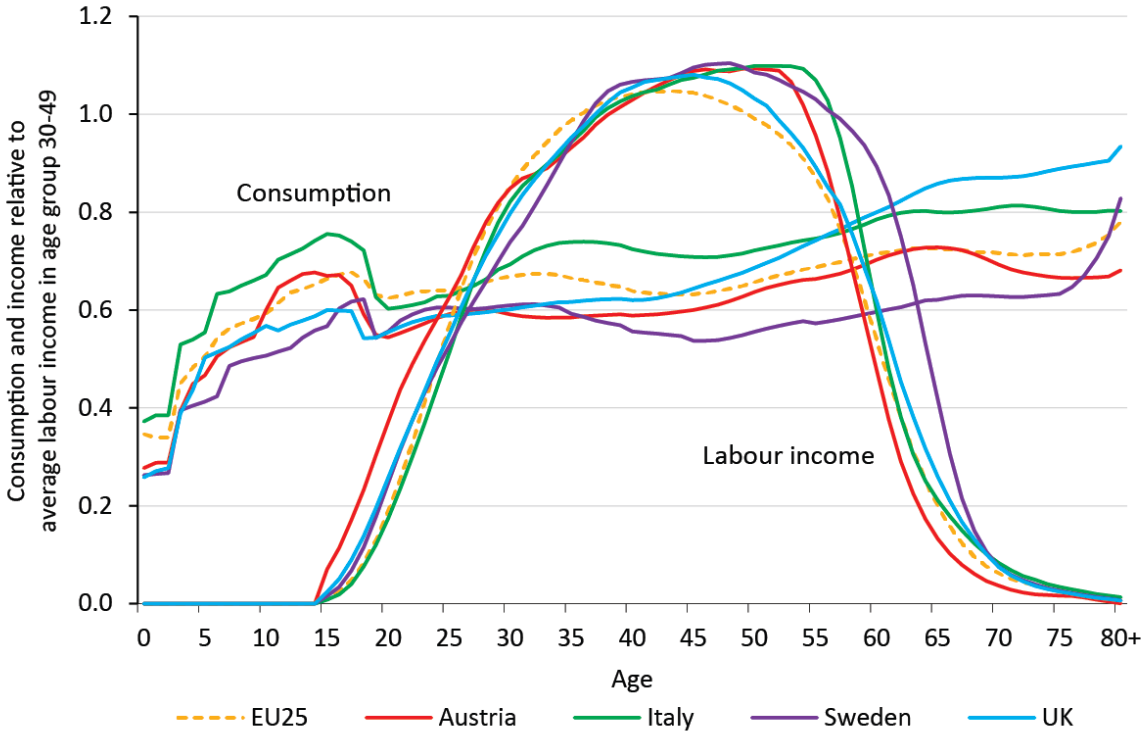
Selected Results

Figure 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 Croatia, Malta 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. Public 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 25–60 with zero or very low values in childhood and old age.

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 transfers towards the elderly and makes it less vulnerable to population ageing. In Italy, the relative level of consumption to labour income is high. As a

consequence, the rapid ageing of the population will translate into high economic dependency of elderly people. 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.

Figure 1: Consumption and labour income in EU countries in 2010



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 and alternatively young population we obtain the aggregate LCD for elderly and young people. To facilitate comparison across countries the LCD is related to total labour income in each country. Based on our NTA data we concluded that the total LCD of the elderly population ranges from 16-19% of total labour income in Cyprus, Ireland and Estonia up to 36-39% in Greece and Romania.

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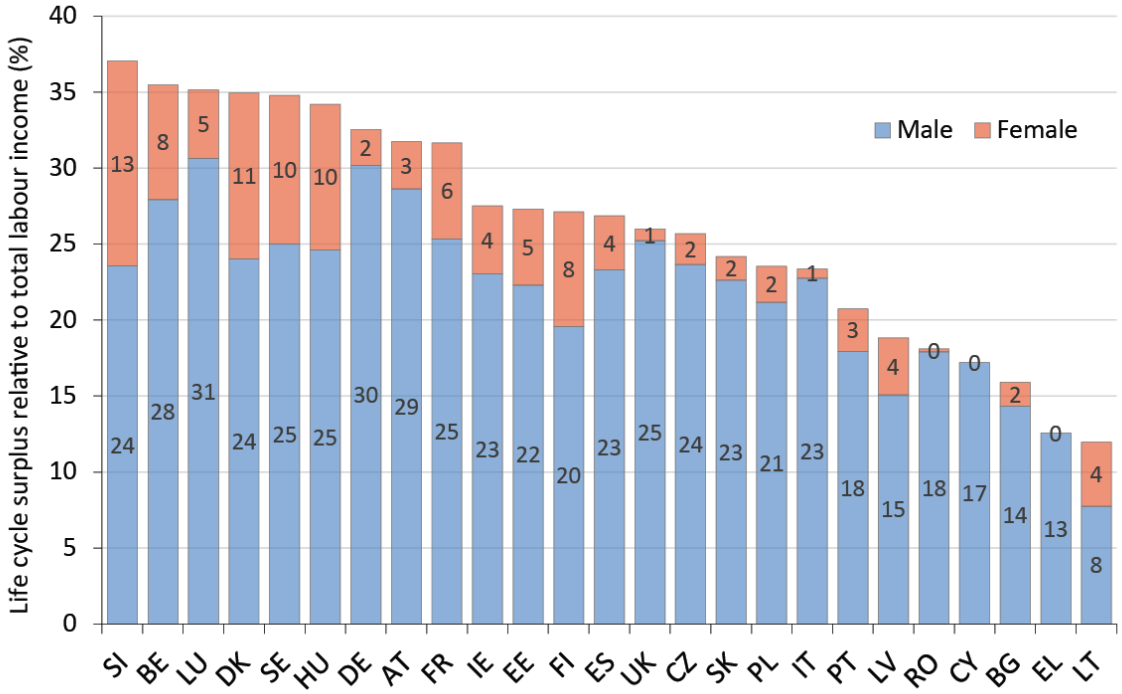
In analogy to the LCD the life cycle surplus (LCS), defined as difference between labour income and consumption can be calculated. As indicated in Figure 2 total LCS ranges from 12-13% of labour income in Lithuania and Greece to more than 35% in Slovenia, Belgium and Luxembourg.

Figure 2: Life cycle surplus for males and females in EU countries in 2010



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.

In summary, our data provide evidence that 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

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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 labour market participation of women and 3) extending the labour participation at old age.

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2.2 WP2

Work Package 2 (WP2), that was led by HDRI and involved all partners except NIESR, explored publicly available Time Use Surveys, both current and retrospective, in order to **measure the value of unpaid household production, as well as the transfers and the consumption of the produced goods and services by age and gender.**

Background

In order to analyse the role of demography in macroeconomic issues, Lee & Mason (2011) opened a new chapter in national accounting: National Transfer Accounts (NTA). The project developed a methodology to disaggregate national accounts by age. By examining age patterns in economic activity and estimating inter-age transfers, NTA explores how different generations acquire and use economic resources. Nevertheless economic flows generated by household production are missing elements in the basic NTA resource reallocation framework. Services provided to other household members such as care, cooking, shopping and cleaning constitute an important part of intergenerational transfers. Different calculations are needed to estimate how these non-market economic activities vary by age and by gender and to assess the providers and the beneficiaries of these services within these groups.

Extending measures of national income with the value of goods and services produced at home (i.e. household production) is not new. The estimations need special consideration, as the output of production in the household is not observed by surveys and there is no market-mechanism valuing it. Therefore, the calculations are based on time use surveys and a pricing procedure. Adding the dimension of age into the household economy and incorporating transfers of household goods and services into intergenerational reallocation patterns is a new direction of research that extends both the NTA and Household Satellite Accounts frameworks. Following Donehower (2014) we call these estimations the National Time Transfer Accounts (NTTA). The accounts estimate the value of goods and services produced by unpaid household work, transfers between age groups and genders, as well as the age- and gender-specific consumption of these goods and

services. The accounts consist of age profiles (averages by age and gender) for production, consumption and net transfers.

Net time transfers are calculated by subtracting production from consumption, age group by age group, and they show whether an age group is a net beneficiary or net giver of household products and services.

Like Household Satellite Accounts, NTTA are estimated using time use surveys and wage data. Our calculations are based on methods of National Time Transfer Accounts by Donehower (2014). The main steps of this method are (1) identifying time spent on household production activities by age and gender in time use surveys; (2) finding appropriate wages to impute the value of time spent on the chosen activities; and (3) estimating consumption of household labour by allocating the goods and services produced through unpaid work to the members of the household. The last step is performed using the household roster of time use surveys that includes information about the household composition as well as the age and gender of all household members.

We based our estimates on two publicly available European harmonised sources of data – the Harmonised European Time Use Survey Web Application (HETUS) and the Multinational Time Use Study (MTUS). We introduced a special imputation method of harmonised time use data to representative samples in order to allocate time spent on home production among consumers in the households. The valuation process of time spent on non-market activities also required special consideration, as the method has to be harmonised across all countries.

Because household production is to a large degree carried out by women and because it is not included in national accounts, the calculations are crucial to make women's total economic contribution and the resources flowing to children more visible. The comparative quantification would also enable easier observation by policy makers and the public as well.

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Key outcomes of WP2

1. Cross-sectional harmonized comparative European NTTA age profiles for 17 European countries representing about 84 per cent of the population of the European Union.
2. Historical NTTA database for selected European countries.
3. Pricing of household production that yield NTTA age profiles in monetary terms.

The European NTTA Manual describing the steps, procedures and assumptions applied in creating the NTTA results can be downloaded at http://www.agenta-project.eu/Jacomo/upload/publications/d-2.3-submitted.pdf.

An online data explorer including the NTTA data has recently been launched at: www.wittgensteincentre.org/ntadata.

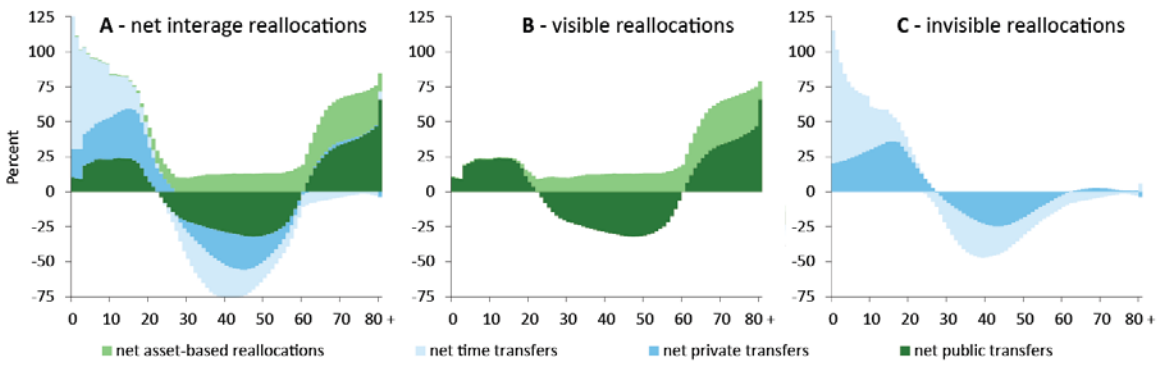
The results are summarized in Policy Brief 1 (The importance of the household economy in financing consumption over the lifecycle: extending NTA by time transfers. http://www.agenta-project.eu/Jacomo/upload/publications/d-9.4-policy_brief_1.pdf) and the Project Brochure (http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf, Chapter 2) the European National Time Transfer Accounts data.

Selected Results

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 production boundaries of national accounts, 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.

By introducing time transfers, the list of inter-age reallocations, is extended with a further type of private transfers. On Panel A of Figure 3 we show the way the total life cycle deficit is financed through these channels.

Figure 3: Inter-age reallocations



As Panels B and C of Figure 3 demonstrate, there is a significant asymmetry in the way the consumption of children and elderly people is financed. Old age is almost exclusively funded through public transfers and asset-based revenues, whereas childhood is financed by, in the order of growing importance, public, private and time transfers. A consequence of this asymmetry is the illusion of pro-elderly bias in public spending. As Figure 3 demonstrates, children receive more, not less, transfers per capita than elderly people; only they receive them through private, mostly invisible in NA data, rather than public channels.

This result significantly modifies the one-sided narrative of intergenerational transfers as a sneaky grab for resources by the old. The frequent references on “gerontocracy” and the growing “grey power” are limited to the statistically visible world of public transfers and largely ignore intra-familial transfers of cash and time. The more complete picture based on a family of related indicators is consistent with an alternative narrative of intergenerational developments. The growing public share of resources flowing to older persons may well have gone in parallel with increasing societal resources for the young. Higher public transfers to elderly recipients may turn out to be a form of compensation for lost private and time transfers mostly due to lower co-habitation levels with adult children. Notwithstanding elderly bias in public spending, the twentieth century may also

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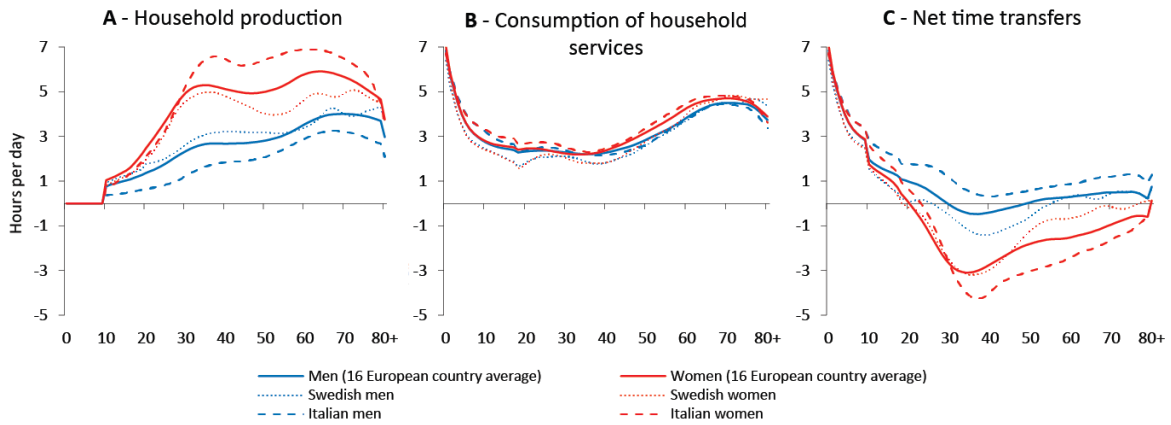
have been the Century of the Child, as Ellen Key predicted at its start (Gál, Vanhuysse and Vargha, forthcoming).

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.

Figure 4: Daily per-capita household production and consumption and net time transfers by age and gender



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 4 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 4) 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

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transfers through almost their entire adult life, from age 20 till they pass age 80 (Vargha, Gál and Crosby-Nagy, 2017).The corresponding age span for men is only 20 years, between ages 30 and 50. 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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2.3 WP3

Work Package 3 (WP3), that was led by LUND and involved DRI, PSE, and OEAW-VID as partners, studied the **determinants of older persons' participation in the labour market and retirement** at three levels of aggregation: the European level, using SHARE data, the Spanish level, using social security data, and the Swedish level, using register data for the entire population.

Background

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 encourage 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. Indeed, Europe has witnessed a reversal of old-age labour supply, from a trend towards early retirement to a steady increase in the average effective retirement age (OECD 2006, 2014). The mean retirement age across the EU-27 dropped by nearly seven years between 1970 and the late 1990s. This trend decline, however, was reversed at the turn of the millennium for most EU countries, which is seemingly promising news, as longer working lives are important for sustaining welfare systems in ageing societies. While these trends correspond to changes in average retirement age across the entire population, it remains unclear whether these changes are universal across different socio-economic and demographic groups. 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 aim of WP 3 was to examine the importance of life-course factors (education, health, work history, and family situation) and institutional conditions (labour market, pension and tax policies) on older workers labour supply and retirement behaviour. In addition the analysis was further extended to examine the impact of pension reform on retirement behaviour. The Swedish study focused on the impact of the 1994 pension reform on retirement age. The Spanish study, on the other hand, conducted simulation analysis to examine the impact of the reform approved in 2011 on pension expenditure.

Key outcomes of WP3

The study of the retirement decisions for:

1. Sweden http://www.agenta-project.eu/Jacomo/upload/publications/d-3.1-lund-final.pdf
2. Spain http://www.agenta-project.eu/Jacomo/upload/publications/d-3.2-submitted.pdf and
3. Europe http://www.agenta-project.eu/Jacomo/upload/publications/d3.3_submitted_copy1.pdf

The main results of WP 3 are summarized in policy Brief 2 (Live longer, work longer? http://www.agenta-project.eu/Jacomo/upload/publications/policy_brief_2.pdf) and the Project Brochure (http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf, Chapter 3).

Selected Results

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 for 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.

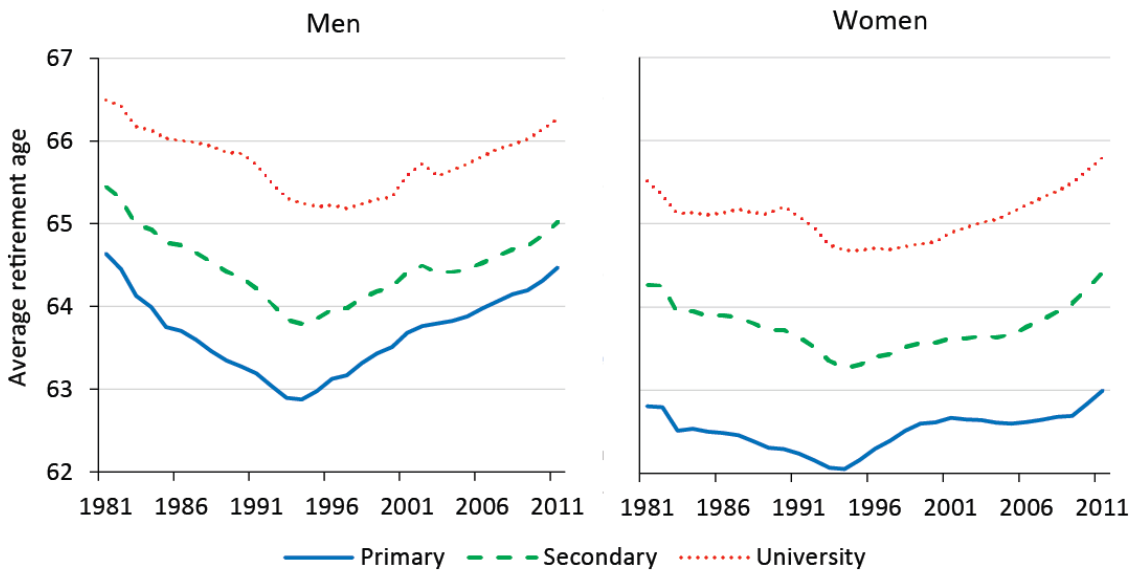
Using SHARE data poses a problem, however, in that the number of individuals in the sample requires us to look at the EU as a whole, and therefore our results may conceal considerable differences between countries within the union. For this purpose, we went on to focus on two specific countries which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

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 5 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).

Figure 5: Development of retirement ages in Sweden 1981-2011



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 6 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.

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 longer 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

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forced to work the longest, at the lowest pay and in the worst living conditions, thereby accentuating the economic marginalisation of their working lives.

Our studies of patterns in Sweden provide a number of promising prospects in terms of the future labour supply. 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 working 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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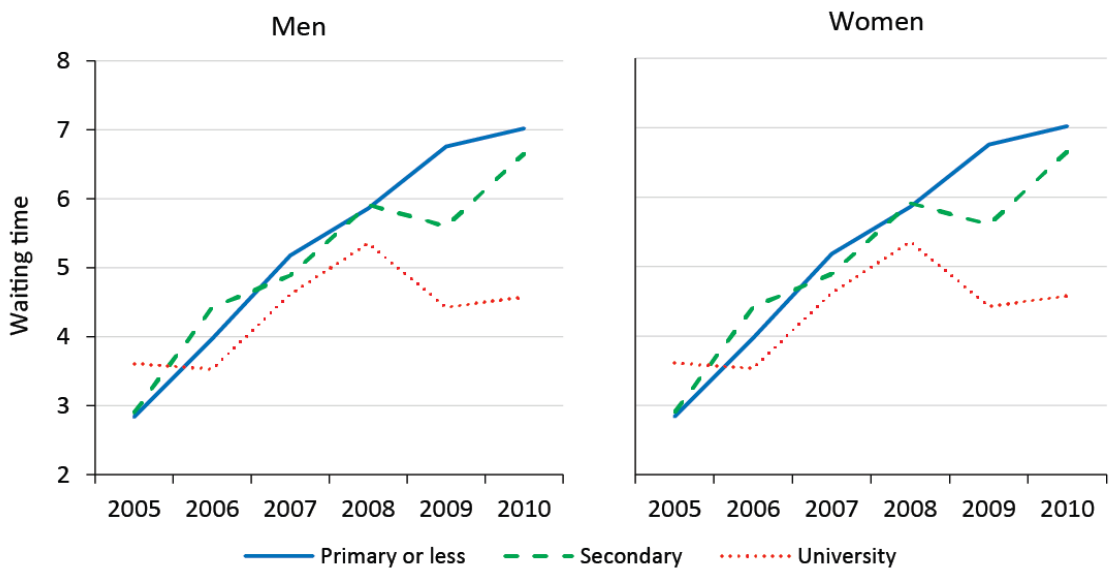
Figure 6: Waiting time (in months) until retirement in Spain 2005-2010



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2.4 WP4

Work package 4 (WP4), that was led by SGH and involved LUND as a partner, analysed **retrospective time series of public revenues and expenditures as they are related to the demographic structure and institutional context**.

Background

Population ageing challenges the funding and organisation of the public transfer system. Pensions and health services, as the largest components of public transfers, become the main tool to redistribute 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 aim of Work Package 4 was to study links between public finances (general government expenditure and general government revenue) and changes in the population age structure, combined with the economic flows related to consumption and labour income that are driven by the socio-economic developments as well as the existing welfare systems in the EU countries. For that purpose selected indicators related to public finance as well as to demographic change have been studied retrospectively.

In our analytical approach, we relied on the National Transfer Accounts (NTA) outcomes. The starting point to prepare the data for our study was the European-NTA database that was developed in Work Package 1. In addition, based on the Eurostat population database as well as on the Eurostat population projections (EUROPOP 2013), information for EU countries on the age structure of the population in the past (for the years 1995-2014) and in the future (for the 2015-2070) were applied. This database, combined with the European-NTA age profiles was used to calculate demographic and economic support ratios. For the assessment of the links between public finances and support ratios we used the Eurostat data on the general government revenue and the general government

expenditure of the EU countries for the years 1995-2014 (i.e. over 20 years). Finally, we also used the OECD information on students' achievement as well as UNDP database on the Human Development Index together with the NTA profiles on consumption, on health, and on education by the young generation to analyse returns to investment in human capital that would lead to improvements of productivity of the future generations. This analysis shows the utility of using the information derived from the NTA to analyse outcomes of social investment related to education and human capital development. It can provide additional information to policy makers on the importance of investing in development of children and youth at different stages of early development.

Key outcomes of WP4

The key results have been summarized in deliverable 4.1 (Demographic developments and public finances in the past two decades) that is available at http://www.agenta-project.eu/Jacomo/upload/publications/d-4.1-submitted.pdf

The main results are summarized In policy Brief 3 (Measuring the Economic and Fiscal Challenges of Population Ageing, http://www.agenta-project.eu/Jacomo/upload/publications/d-9-6-policy-brief-3.pdf) and chapter 4 of the Project Brochure: http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf).

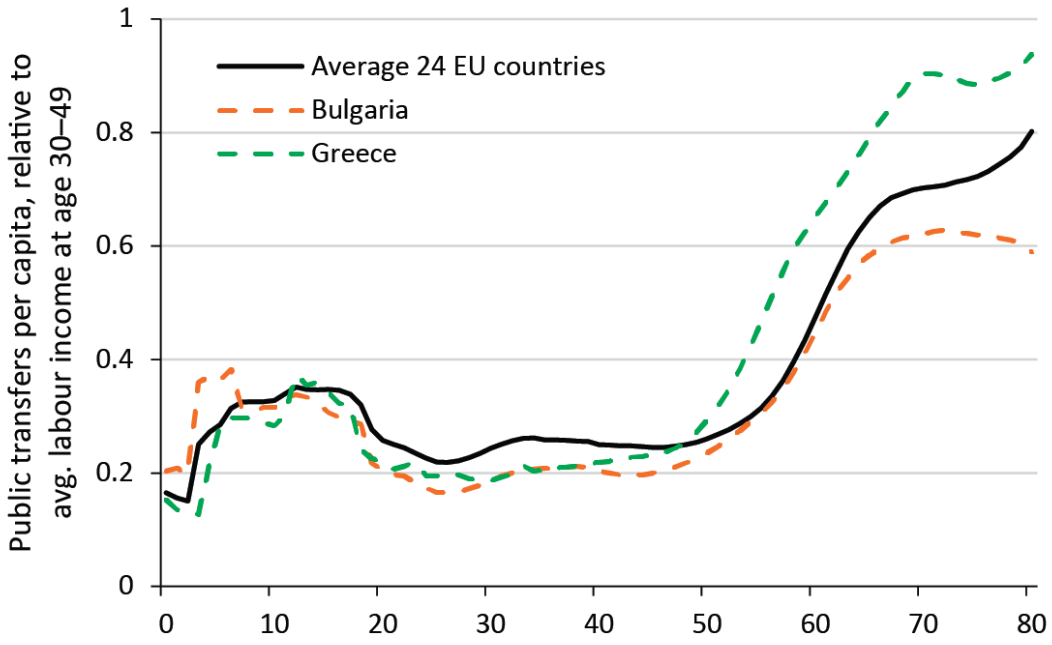
Selected Results

The age-specific per-capita estimates of total public transfer benefits are shown in Figure 7. 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.

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.

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 8, 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.

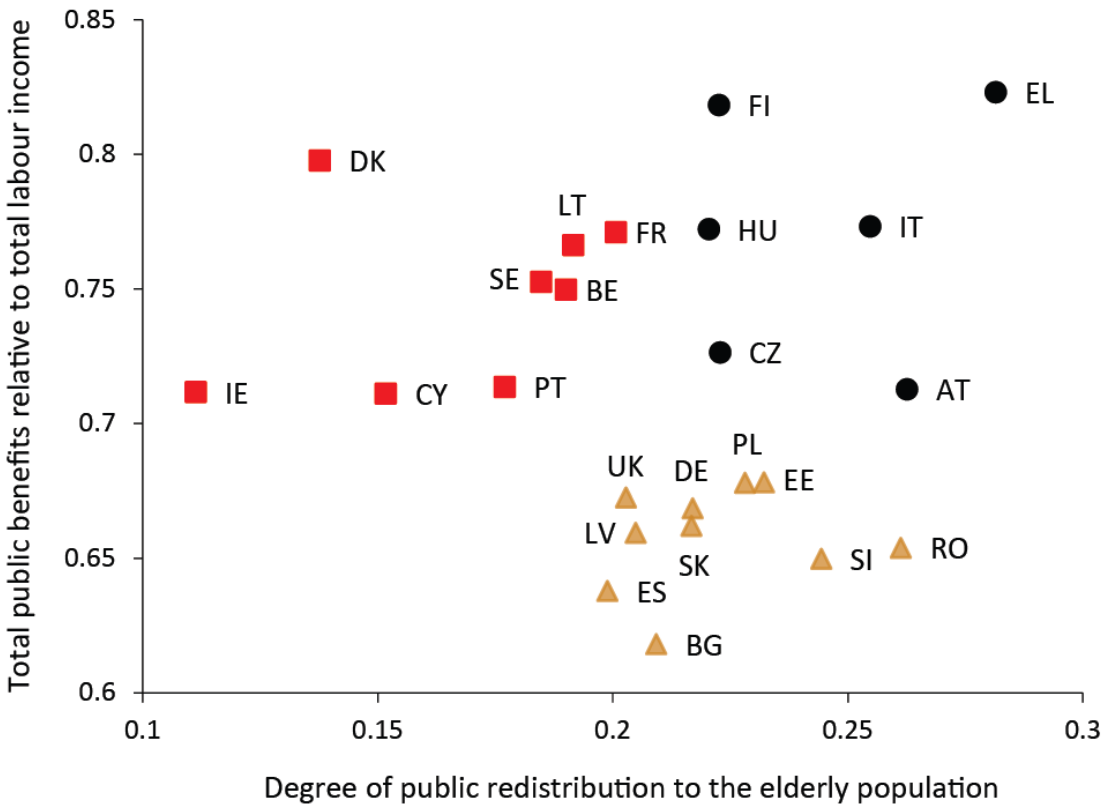
Figure 7: Public transfer benefits per capita relative to labour income at age 30-49



Using cluster analysis, we identified three groups (clusters) that reflect different generational outcomes of social and fiscal policies:

- Large public sector – generationally balanced distribution (social-democratic): above European average public transfers to all generations.
- Large public sector – strong redistribution to elderly (conservative): high public transfers relative to labour income and pronounced redistribution to the older generation.
- 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.

Figure 8: Ratio of public benefits to total labour income vs. ratio of public old-age benefits to total public benefits



By analysing the NTA 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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2.5 WP5

Work Package 5 (WP5), that was led by UB and involved PSE, NIESR, and OEAW-VID as partners, built up an **OLG-CGE model based on NTA and NTTA data**, which is capable of simulating the effects of reforms in the public tax-transfer system.

Background

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 mainly 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.

In Work Package 5 we developed a NTA/NTTA based overlapping generations general equilibrium (OLG-CGE) model. The OLG-CGE model provides a powerful tool for both academic and policy-oriented analysis of societies where the age of individuals, the age composition of a population, and the birth year of a cohort all matter. With respect to other dynamic general equilibrium models like the infinite horizon representative agent, the OLG models allow for an explicit account of the relevant life cycle events and the interaction between generations with different demographic characteristics. In our analysis, CGE models have been the

framework for simulating the role of the demographic structure for the future of taxes and public transfers, taking into account some of the behavioural reactions of individuals.

Key outcomes of WP 5

The various tasks of WP5 have been summarized in four deliverables with the work on the fifth deliverable currently still ongoing.

- Deliverable 5.1 Retrospective calibration of overlapping generations general equilibrium models (OLG-CGE) http://www.agenta-project.eu/Jacomo/upload/publications/d-5.1-olg-cge-models.pdf
  Deliverable 5.1 had a twofold motive. First, retrospective economic data was collected from the countries involved in the AGENTA project to reconstruct their historical populations, output , as well as public revenues and expenditures. The second motive was to explain the underlying models implemented for the reconstruction of the population and productivity, which were later on used as an input for the OLG-CGE model.
- Deliverable 5.2 Savings and demographic structure: a GWA approach http://www.agenta-project.eu/Jacomo/upload/publications/d5.2_web.pdf
  We investigated the empirical and theoretical relationship between saving and demographic structure. Canonical theoretical results, such as the life-cycle/permanent income hypothesis (LC/PIH), suggest that, in the absence of inter-generational consumption-sharing mechanisms other than individual saving, and assuming no exogenous productivity growth, there should be a strong relationship between age and saving behaviour. However, demographic structure does not, by itself, explain a significant fraction of the differences in savings behaviour between different countries.

  Using the framework developed by the National Transfer Accounts (NTA) project, we calculated tentative comprehensive wealth accounts by generation, using a framework called Generational Wealth Accounting (GWA), for four European countries. The GWA quantifies the relative importance of three channels in supporting future consumption: private saving, public transfer systems, such as publicly-provided old-age pensions,

medical and educational expenditure, and private transfers, such as bequests and inter vivos transfers. Our results provide some explanation for the weak empirical relationship between savings rates and demographic structure: individual savings are not the most important channel by which individuals smooth consumption over their lives, at least in the countries we examine. Public transfers are, arguably, the most important, while private transfers are also significant. These transfer systems are much more highly dependent on demographic structure than private saving or the returns earned on financial assets.

- Deliverable 5.3 Contribution of demography to the Spanish economic growth from 1850 to 2000 http://www.agenta-project.eu/Jacomo/upload/publications/d-5.3-submitted.pdf. We applied the OLG-CGE model to explain the contribution of changes in the demographic structure on per capita income growth in Spain from 1850 to 2000. Our findings indicate that the rise in longevity and the fall in fertility account for about 23% of the per capita income growth over this time period. Given the reconstruction of the population and the stock of productive factors over one-and-a-half centuries, the model sets the foundation for simulating and analysing intergenerational public transfer reforms using data from the AGENTA project (WP1 and WP2).
- Deliverable 5.4 Contribution of demography to economic growth from 1870 to 2100: A cross-country comparison of Austria, Spain, and Sweden using NTA/NTTA data http://www.agenta-project.eu/Jacomo/upload/publications/agenta-deliverable-5_4.pdf. We first assessed quantitatively the contribution of changes in the age structure of the population and in the stock of human capital to the growth rate of output per capita over the period 1870–2100 for Austria, Spain and Sweden. Second, we analysed the impact of changes in the population structure on the accumulation of wealth from 1870 to 2100. We based our simulation on a OLG-CGE model that uses NTA and NTTA data and is calibrated to match historical macroeconomic data. We found that the overall contribution of the change in the population structure —age and education structure— to per capita income growth from 1870 to 2014 was around twenty five percent. Given the current per-capita

pension benefit profiles and assuming that future contribution rates cannot exceed thirty five percent, we also found that the aging of the population in Austria, Spain, and Sweden will prevent future increases in the stock of physical capital per worker.

- Deliverable 5.5 Overlapping generations-general equilibrium (OLG-CGE) model: Underlying assumptions and projections. We detailed the main functioning routines of the OLG-CGE model, explain the assumptions introduced and give an intuitive explanation of the main behavioural reactions of individuals driven by changes in demographics, education, and technological progress. The report also provides the macroeconomic impact of a set of alternative policy reforms.

The main results from WP5 are summarized in policy Brief 6 (Adapting to population ageing: the welfare state reform http://www.agenta-project.eu/Jacomo/upload/d-9.9-policy-brief-6.pdf) and the Project Brochure (http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf, chapter 5).

Selected Results

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. 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 the OLG-CGE model developed in Sánchez-Romero et al. (2016, 2017), we assess the impact of demography on several macroeconomic indicators and especially on per-capita income growth. (It is important to bear in mind that the model abstracts from important interaction effects between education and key demographic and economic variables such as fertility, mortality, the demand for health care, or technological progress, among others.)

Figure 9: Source of per-capita income growth during the period 1870-2100 in Austria, Spain and Sweden

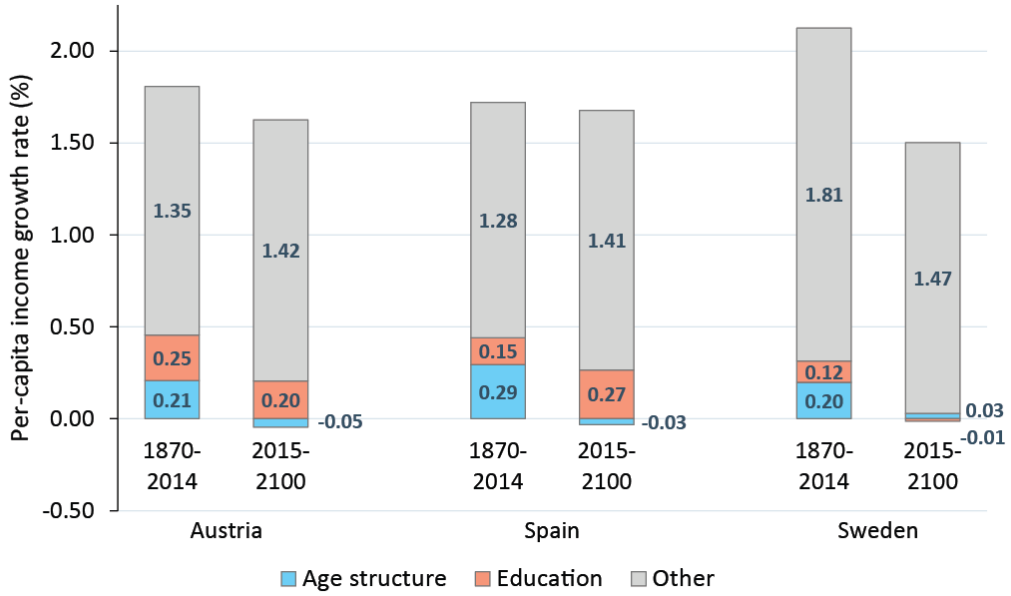

Figure 9 shows the contribution of changes in the age structure and the educational expansion to per-capita income growth in three European countries (Austria, Spain and Sweden). These countries represent well the economic and demographic patterns as observed in central, southern and northern Europe, respectively. The total height of the bars in Figure 9 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 9 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.

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2.6 WP6

Work package 6 (WP6), that was led by HDRI and involved UL, OEAW, and UB as partners, **established a taxonomy** in order to facilitate the informed choice among indicators of sustainability and fairness of public programmes and the decision about their uses, filled the taxonomy by collecting all relevant indicators in the literature, and developed new, NTA-based indicators.

Background

As population ageing is becoming a growing concern, a number of new indicators have been recently suggested. Currently the problem is not that we do not have indicators describing the ageing process and its consequences; the problem is we have too many (and possibly not the best yet). The Transfer Account Indicators Working Group of the international NTA project has collected dozens of such indicators proposed in the past. Therefore, the Work Package aimed at being exhaustive in collecting relevant indicators available in the literature and provide a taxonomy (a system of similarities and differences).

The ageing process is frequently described by demographic indicators based on the relative sizes of age groups.

Age limits separating these groups, such as the age of 20 years or 65 years, are given exogenously. In WP 6 we developed new indicators based on NTA age profiles that define age limits endogenously, making cross-country comparisons or longitudinal analysis more realistic.

Key outcomes of WP6

The key results have been summarized in deliverable 6.1 (Indicators of economic sustainability and intergenerational fairness) that is available at http://www.agenta-project.eu/Jacomo/upload/publications/d-6.1-submitted.pdf.

The report contains more than 80 indicators. Going beyond the original scope we included indicators measuring not just public spending but the entire economy and in some occasions the total economy (which also includes the household economy,

that is unpaid household labour). We established a notification system, which gave way to directly comparable mathematical definitions to each indicator.

The taxonomy was designed in a way that it revealed close relationships among existing indicators, which have not been shown in the literature. In this way related families of indicators could have been identified.

We also presented a family of NTA-related indicators, which go beyond the usual pre-defined demarcation ages between the main life stages (such as childhood between birth and the age of 19; active age between the ages of 20 and 64; and old age beyond). Instead, based on the NTA approach we identified indicators, which use data-driven demarcation ages such as the Pension Support Ratio (PSR); the Fiscal Support Ratio (FSR); the Economic Support Ratio and finally the Total Support Ratio. Here the demarcation ages separate net contributors from net pensioners (PSR); net taxpayers from net beneficiaries (ESR); and net producers from net consumers in the national economy (ESR) and in the total economy (TSR).

The main results are summarized in chapter 6 of the Project Brochure: http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf).

Selected Results

The first dimension of our taxonomy is the scope or measurement level of the indicator (Gál and Monostori, forthcoming). 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

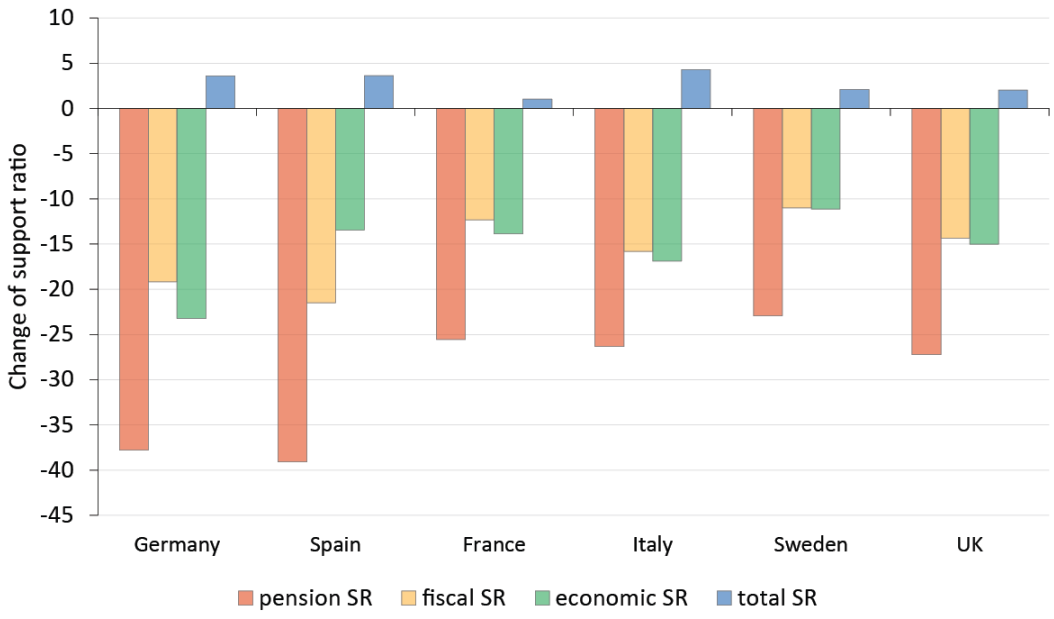
the age distribution of the population but in addition to that, they also take into account economic characteristics. The fiscal support ratio (Miller 2011) weights the demographic age distribution by the age profiles of benefits received from and taxes paid to the general government, respectively, and 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 10 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.

The countries in Figure 10 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.

Figure 10: 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.



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.

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2.7 WP7

Work package 7 (WP7), that was led by OEAW alone, developed **projections of the labour force, in particular labour force participation rates of the elderly, in relation to educational attainment**. These projections have been applied to an indicator that measures the sustainability of inter-generational public transfers in EU-countries.

Background

Low fertility and increasing survival to old age will lead not only to population ageing, but also to the ageing of the labour force and an increasing number of people at retirement age. On the other hand, in the last decades population ageing went hand in hand with increasing levels of education and better health of the population. Both of these developments are related with a higher labour force participation. Hence, projections of labour force participation can be refined using multistate cohort-component projections of populations by age, gender and education.

Key outcomes of WP7

The key results have been summarized in two deliverables.

Deliverable 7.1 (Projections of the Labour Force by Age, Gender and Highest Level of Educational Attainment until 2050, http://www.agenta-project.eu/Jacomo/upload/publications/0_education_and_health_d7-1.pdf)

The most important contribution of Deliverable 7.1 are projections of the size and age-, gender- and education-specific composition of the labour force in 28 European countries until 2050. The projections are based on the extrapolation of past trends in age-, gender- and education-specific labour force participation together with population projections by education. In addition to participation, we projected an employment measure that takes differences in labour market activity at the intensive margin into account. Thereby we gain insights into the differences in unemployment and part-time work across countries. Using these results, we built up measures of the unused age-, education and gender-specific labour force

potential across countries. Furthermore, we analysed the composition of the population aged 50-69 by health status, employment status and education. Additionally, we projected the change in health due to the improving education of this age group.

Among the most important developments that affect the size and composition of the labour force in the future are the changes in the educational composition of the working age population towards higher levels of education and increases of the labour force participation rates among women in prime working age and at older ages for men and women.

The measures of employment and non-employment turned out to be particularly useful. The comparison of the non-employment measure (in full-time equivalents) across countries reveals large differences that are not captured in participation rates or traditional employment rates, such as differences in unemployment and the prevalence of part-time work. There is obviously considerable labour force potential among the working age population in some of the countries.

The analysis of the health status reveals a strong correlation between education and health as well as between education and labour market activity. In all European countries there is a considerable potential of healthy inactive persons in the age group from 50 to 69.

Our results indicate that a lack of potential workers is unlikely to be a major economic problem in the future, despite pronounced population ageing. Far more challenging for societies is the integration of the potential labour force into employment.

Deliverable 7.2 (Sustainability of Inter-Generational Public Transfers in EU-Countries: A New Indicator Based on Projections of National Transfer Accounts, http://www.agenta-project.eu/Jacomo/upload/publications/0_sustainability_indicators_d7.2.pdf)

In Deliverable 7.2 we developed a new indicator for evaluating the sustainability of the public transfer system in 25 EU countries. The indicator is based on the combination of employment projections (as obtained in Deliverable 7.1) with age- and employment-specific information on public transfers derived from the NTA

database (WP1). Our indicator measures the gap between the expected public old age benefits of the cohort born in 1950 and the expected contributions of the generation of its children. We therefore use the term human capital investment gap (HKIG). The advantage of the HKIG compared to other commonly applied indicators is that it takes into account the investments in the young generation as essential part of the inter-generational transfer system and the main determinant of the systems' sustainability. A further, considerable contribution of Deliverable 7.2 is the method of projecting future public benefits and contributions. The combination of employment projections with age- and employment-specific information on public transfers allows keeping important characteristics of the transfer system constant, while accounting for the likely increase in employment rates and public contributions due to better education and better health of the young population.

In none of the analysed countries the contributions of the 1980 born child generation are sufficient to finance the old age benefits of their parents, given the age- and employment-specific transfer pattern observed in 2010. We conclude that public transfer systems across Europe require a re-adjustment to be in-line with the low investments into the young generations.

The main results of Deliverable 7.2 are summarized in policy Brief 4 (Under pressure: intergenerational public transfers in ageing societies, http://www.agenta-project.eu/Jacomo/upload/publications/d-9.7-policy-brief-4.pdf) and in chapter 7 of the Project Brochure (http://www.agenta-project.eu/Jacomo/upload/agenta_brochure_177_final_4web_2page.pdf, chapter 7).

Selected Results

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.

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.

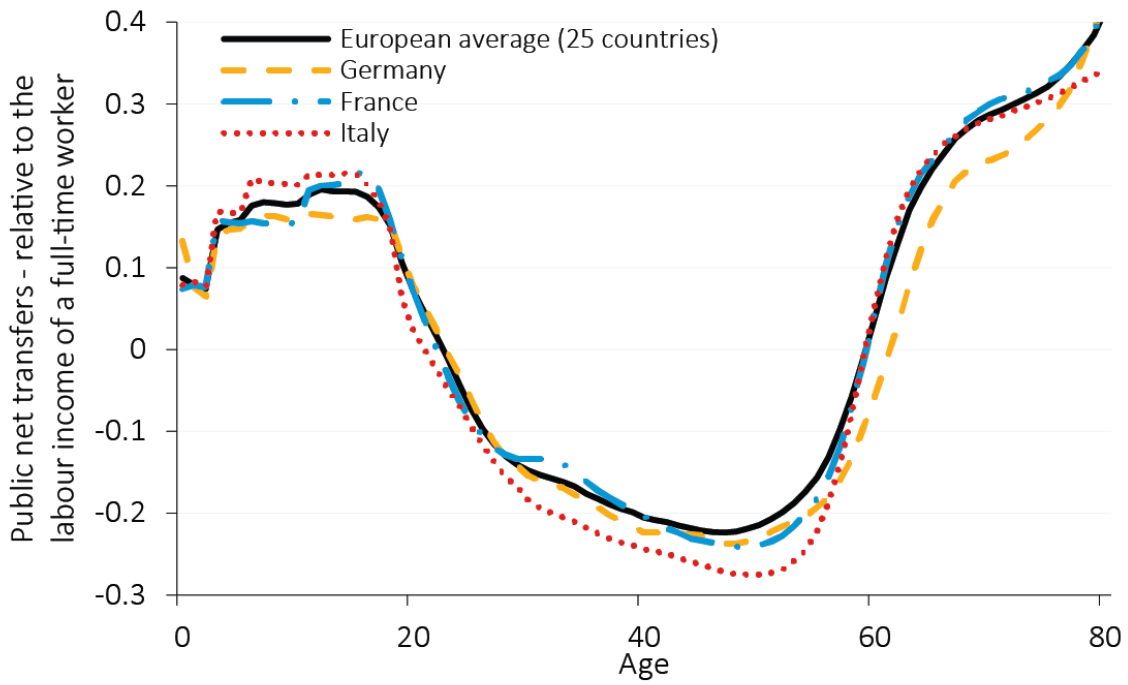
We evaluate the sustainability of the public transfer system in European countries using the Human Capital Investment Gap (HKIG) indicator. The HKIG measures the difference between the values of total public net benefits that a certain cohort is projected to receive in old age and the projected public 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.

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 11). These values are adjusted with survival probabilities and added up over all ages (survival probabilities are calculated using the EUROPOP 2013 (EUROSTAT 2016) population projections, no migration scenario).

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. (2016) 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 contributions 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.

Figure 11: Public net transfer benefits by age in 2010



In none of the analysed countries the contributions of the child generation are 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 12 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 represents 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, when a large part of public expenditure is financed 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

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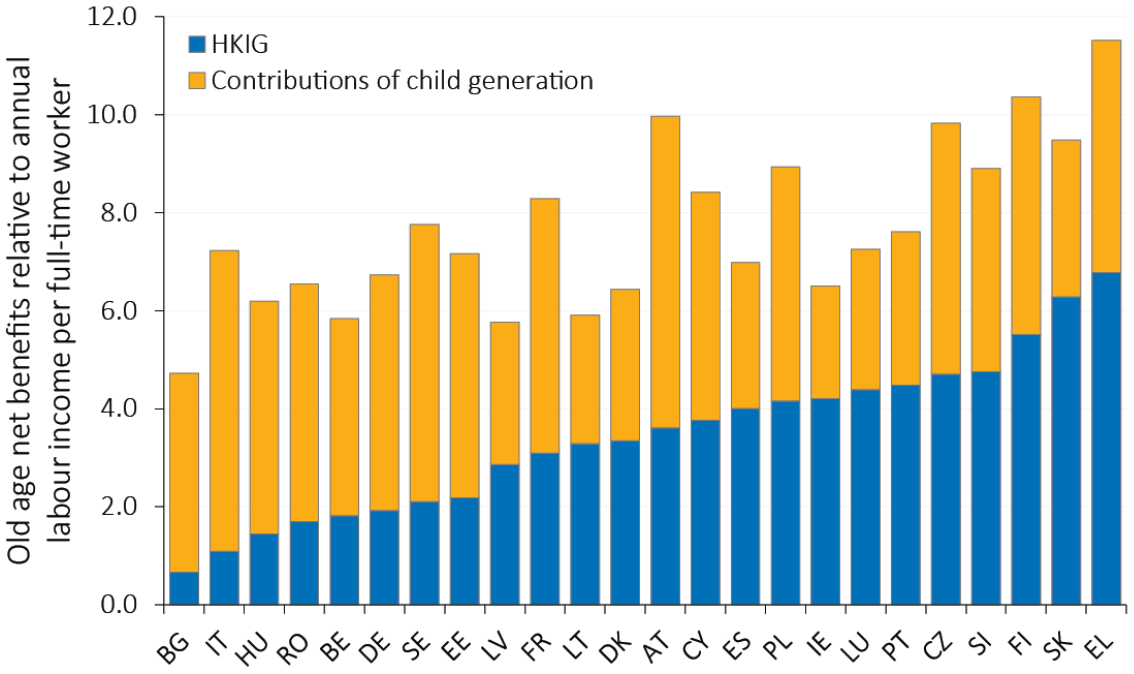
elderly persons in Italy and Hungary, and the high labour market participation rates of elderly people and comparatively high fertility in Sweden.

Our findings stress 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.

Figure 12: Projected old-age benefits of the 1950 cohort



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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2.8 WP8

Work package 8 (WP8), that was led by UB in collaboration with the partners OEAW-VID, LUND, IFFS, uses the NTA-NTTA data set created in work packages 1 and 2 and the OLG-CGE model developed in Work Package 5 for making **projections of the impact of population ageing under different scenarios, including alternative legal settings in some key variables**.

Background

Starting from the OLG-CGE model built in Work Package 5, based on the results of retrospective analysis (work packages 3 and 4), this work package develops reform scenarios taking into account the results of Work Package 7 on future trends of labour supply depending on health status and education and the set of indicators of sustainability and fairness developed in Work Package 6.

Given that the main challenge resulting from population ageing is the shortage of hours worked, the key variables in the scenarios are related to the work force. The model of Work Package 5 is developed for precisely that purpose, allowing for changes in labour supply through several channels, including endogenous changes in the labour supply by educational attainment. Given that time use is incorporated in the analysis, the evolution of paid and unpaid work is considered in parallel. We have considered scenarios of different ages at start of claiming retirement benefits, different evolutions of the educational attainment, and the impact of financing the future evolution of health care expenditures with different taxes (on consumption, on labor income, on capital income).

The simulations were executed on all countries for which an OLG-CGE model was developed in Work Package 5. The selection criteria for choosing additional countries was twofold. First, data availability, taking into account both current and retrospective data. Second, the type of country, especially the kind of welfare state arrangements so as to be able to have a better representation of European countries.

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The above scenarios are of vital importance to an understanding of how population ageing will impact various aspects of the welfare state. Another issue of interest is how taxation disparities between member states can be expected to influence both individual financial prospects as well as movement of individuals interested in maximizing their pension incomes. The reason for this is that design differences in pension systems within the EU could hamper work incentives and hinder free movement of workers, while at the same time result in "pension shopping", where individuals utilize the differences in pension designs to gain private financial benefits. In this work package, we intend to study some of Member States' incentive structures in pension designs and analyse whether they are sustainable in a free trade area such as the EU with an aging population. The focus is on labour supply and tax incentives and especially hindrances to increased employment and free movement of workers and retirees. Some problems linked to the lack of harmonization of the tax treatment of the pensions received, such as double taxation and double contribution to social security systems, may hamper mobility. Even though Member States are at liberty designing their systems, the variety of the different systems may prevent States' to stabilize their system independently and calls for some coordination.

Key outcomes of WP8

The key results have been summarized in two deliverables.

Deliverable 8.1 (Individual income tax on pensions, a decisive factor for mobile pensioners? The case of Sweden. http://www.agenta-project.eu/Jacomo/upload/publications/d8.1-submitted.pdf)

The aim of this study was to consider the institutional differences as a mobility hindrance for the elderly. More concretely, the individual income tax system is presented as a potential decisive factor to remain active on the labour market or not. From a public policy perspective, the economic decision to retire should be postponed until the latest possible moment. However, from a tax legal perspective, this decision is biased by the tax rules, which is even more obvious when a cross-border mobility dimension is present. The case of Swedish retirees moving out of Sweden has been used to illustrate this statement, as Sweden is a

high tax country, and has a vast network of tax treaties where rules differ to a large extreme, which may impact the decision to retire even more.

Using Sweden as a starting point, we studied the economic distortions with potential effects on retirement decision arising from the tax legal framework for pension rights of several member States of the EU. They originate in institutional differences between EU member States and the limited portability of pension rights in EU. Sweden is interesting as this country provides for a high welfare standard, financed primarily through one of the world's highest individual income tax rate (pension income is also taxed at the same rate). In order to keep up to this level of welfare, Sweden tries to avoid a situation where net-payers (high-income pensioners), capital and corporations leave the country.

The emigration pensioners means a loss of tax revenue for any State, for two reasons. Firstly, the State financed partly the constitution of pension rights inasmuch as part of the pension contribution was tax deducted by the employee and the employer. When pensioners stay in the same country, this financial burden is compensated by the taxes levied by the State on pensions, and this does not happen when they move out, unless an exit tax is levied on outgoing pensions. Secondly, the exiting pensioners may have a strong purchasing power during the first years of retirement, which will be lost for the exiting State. Indeed, the second and third pillars of the pension systems usually offer a maximum replacement of income during the seven to ten first years after retirement. This is the case for Sweden.

All in all, we have shown that the pensioners' migration does not seem to be a peripheral economic problem, as researchers tend to assume. From a public finance perspective, pensioners on the move pay taxes on their pensions in another State than where they worked, leading to tax base erosion in the State where they constituted their pension rights. States such as Sweden tend therefore to tax upon exit mobile pensioners, especially because the first retirement years are those with the highest income. However, within the EU, the right for pensioners to retire anywhere in the EU shall not be hampered by restrictive tax provisions or obstacles for the portability of their pension rights. Even though EU

law provides for both positive and negative integration of labour markets from tax and social security perspective, some obstacles to mobility still exist which result from the EU member States' institutional differences. How these domestic law provisions and bilateral tax treaties reconcile with EU law's requirement has also been addressed in this paper.

Work on Deliverable 8.2 (Final report on the effects of various reform scenarios on the public budget in ageing societies.) is still ongoing. This deliverable put together the reform scenarios developed using the Overlapping Generations Model described in Deliverable 5.5. First, a delay in retirement age has been simulated. Second, a simulation has been derived to control for the impact of an extension of education. Finally, we introduced a sensitivity scenario to analyse the impact of using different tax bases. In particular, starting from the tax structure observed in each county, we close the tax gap produced by an ageing population with different tax bases (income tax, capital tax and consumption tax). Differences are relevant as long as the age profile of taxes differs.

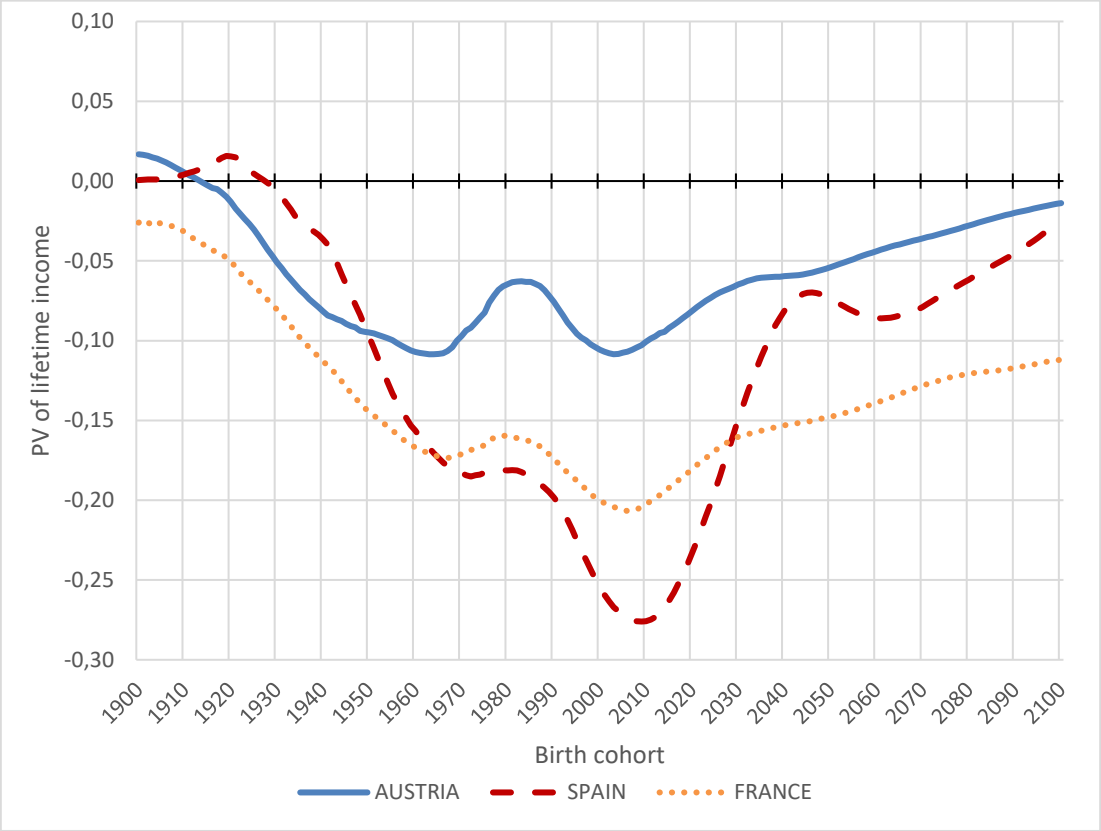
Selected Results

The OLG model developed in WP5 and the use of historical data on public transfers allows us to account for the net contribution of successive generations to public coffers, taking into account the necessary adjustment of taxes during the retirement of the baby boomers.

Figure 13 shows the present value at birth, weighted by the survival probability, of net benefits (which includes pensions, education and health care) received from the public sector for cohorts born in the period 1900-2100 in Austria, France and Spain. All values correspond to the benchmark simulation explained in Deliverable 5.5. Generations born at the beginning of the twentieth century are the ones with the highest values in all countries. In general, these cohorts abstained from funding the expansion of the public education system, while still having to contribute a relatively small amount to the health system. The initial positive values for Austria are due to the larger net benefits obtained from the education system. In the case of Spain, the initial cohorts benefitted from the introduction of the social security system, receiving a free lunch in terms of pension benefits

with no (or relatively few) contributions to the system. Despite having to pay net taxes for the health system, the combined net effect is positive. This also explains the positive values observed in Austria and Spain until the birth cohort 1920 and 1929 respectively.

Figure 13: Net present value at birth of public transfers



Cohorts born afterwards experience even lower net present values mainly due to the increasing cost of introducing and expanding the pension and health systems. The drop is larger in Spain because it is amplified by the rapid change in the population structure and by the expansion of the educational system. The downward tendency continues in all countries until cohorts born in 1965 (1970 in the case of Spain), after which there is a period of 15 years where the net effect increases because of the benefits received from public education, which outweigh part of the losses attributable to pensions and health care. Subsequent birth cohorts have decreasing net present values especially as a result of the considerable rise in lifetime-discounted social security contributions and the

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modest drop in corresponding pension benefits. These outcomes are less pronounced in France. The peak loss is achieved for the 2004 birth cohort in Austria, amounting to 11.2% of lifetime labour earnings. The analogous figures for the other countries are a loss of 18.1% for the 2006 birth cohort in France and a loss of 27.5% for the 2009 birth cohort in Spain. From then on, the relative gains in education and health benefits lead the way in the three countries, most notably in Spain, and the net impact of public transfers becomes less and less negative for each successive generation. The cohort born in 2100 suffers from net losses due to public transfers estimated to be 1.8%, 11.2% and 2.5% of lifetime labour income in Austria, France and Spain respectively.

Overall, our results indicate that the positive effect of public education never offsets the negative effects of public pensions and health care for generations born after 1929 in the three countries we focus on.

In the folowing we summarize the results of the reform scenarios developed using the OLG-CGE model developed in WP5.

1. DELAYING RETIREMENT

Overall, for any postponement of retirement, the old generations that are near the end of their working life at the time the policy is implemented suffer from windfall losses. Future generations – or those who are very young at the start-up of the reform – also lose from the delay in retirement, while young generations benefit, obtaining a higher net present value at birth as compared to the benchmark.

2. FIXED EDUCATION

In this case, the simulation scenario investigates the impact of increasing the educational attainment of future cohorts by fixing the educational attainment at the level observed for the cohort born in 1980. In all countries, some cohorts obtain net fiscal gains from this scenario (those born in the period 1997-2023 in Austria, until 1991 in France, and between 1996 and 2013 in Spain) but the positive effect is small. The reason for these benefits is that the effect of the lower taxes these generations have to pay for education dominates the effect of lower

benefits received. For previous generations it is the other way around. Future generations suffer the most important losses, which are higher in Spain and in France.

3. CHANGING THE TAX BASE FOR HEALTH

In this case, we investigate to what extent changes in the tax system from 2015 improves the results shown in Figure 13. The benchmark scenario assumes that the tax bundle in 2015 in each country is held constant from 2015 onwards. In the simulation scenarios it is assumed that public health care expenditures are fully financed by 2040 by only one tax.

The results seem to indicate that for all countries, there are large gains (i.e the present value of net benefits increases) for all generations if public health is financed exclusively through labour income. This result is explained by the fact that a tax on labour income depletes more capital per worker than a tax on consumption. As a consequence, the interest rate increases, which gives more weight to transfers received early in life (education), which increases net benefits, than later in life (pensions and health care), which reduces net benefits. Alternatively, if the tax base used to finance health is consumption, generations born between 1977 and 2023 in Austria gain as compared to the baseline. Similarly, the 1972-2028 birth cohorts in France and the 1969-2029 birth cohorts in Spain benefit from this policy scenario. The other generations losing are especially the future ones.

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3. Appendix

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The Scientific Advisory Board is composed of international experts in the topics covered in the project. Their task has been to assess the scientific achievements and to advise the project team on their work. The Scientific Advisory Board has helped for the visibility of the scientific outcome of the project.

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3.2 Publications

Publications in Scientific Journals and Books

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3.3 Meetings

The **Kick-off Meeting** of the AGENTA project was held at Austria Trend Hotel Ananas in **Vienna on 17-18 January 2014**. In addition to representatives of the partner organisations in the consortium, six members of the Scientific Advisory Board as well as one representative of the European Commission, i.e. Scientific Officer (Mr. Dominik Sobczak, DG Research & Innovation) participated in the meeting.

The Coordinator opened the meeting, followed by a presentation on issues related to the management of the project (communication, finances, reporting) by Lisa Janisch and Ani Minassian. In the second half of the morning session the first meeting of the General Assembly took place. The afternoon session started with the introductory talks of the founders of the National Transfer Accounts project Ronald Lee and Andrew Mason. The second part of the afternoon session was devoted to a brief introduction to the project by the coordinator, followed by a presentation by the Scientific Officer on “The EU research policy and social sciences and humanities – a historical perspective”.

The first day of the kick-off meeting ended with a session on project management, where the Coordinator gave a brief overview on the management structure of the project and discussed the involvement of the stakeholders, followed by a presentation by the Scientific Officer.

On the second day of the kick-off meeting the work package leaders introduced their work packages (tasks and deliverables), followed by a discussion. The kick-off meeting ended with a session on dissemination, where the Coordinator discussed the dissemination strategy, followed by a presentation by the Scientific Officer on this issue.

The **first AGENTA project meeting** was held at the **Faculty of Economics and Business at the University of Barcelona on June 08, 2015**. In addition to 39 representatives of the partner organisations in the consortium, 5 members of the Scientific Advisory Board that have been most relevant in the current stage of the project participated in the meeting. The aim of this meeting was to provide a

progress overview on the first 1 ½ years of the project, to discuss the current work including open issues related to data and methodology and to ensure the work from all partners is aligned.

The project meeting was opened by the Project Coordinator. The Second Meeting of the General Assembly took place, followed by a presentation on issues related to the management of the project (reporting) by Inga Freund and Lisa Janisch. The second part of the meeting started with a keynote by Professor Jonathan Gershuny, director of Oxford University's Centre for Time Use Research, who gave the keynote speech: “Gendered age-transfer national accounts: using time diary data comprehensively.” Presentations on the status quo for WORK PACKAGEs 1 to 5 followed. This project meeting was organized by the AGENTA Team at University of Barcelona (UB).

UB also organized a **workshop on June 9th, 2015 on “Modelling the sustainability of the welfare state using Overlapping Generations Models”**. The workshop mainly focused on large scale OLG models modelling welfare state transfers. In particular models capturing the interaction of demographic, labour market and educational transition were discussed. The keynote talk was presented by Alexander Ludwig from SAFE Research Center, Goethe University.

The **second AGENTA project meeting was held in Lund and Mölle from May 11-13, 2016**. In addition to 23 representatives of the partner organisations in the consortium, 6 members of the Scientific Advisory Board that have been most relevant in the current stage of the project, participated in the meeting. The aim of this meeting was to provide a progress overview since the last project meeting in Barcelona, to discuss current work and to ensure that work from all partners is aligned with the description of work.

The School of Economics and Business Administration at Lund University, together with the AGENTA team at LUND, organised a seminar on “Who pays for population ageing?” on the first day of the meeting. Scientific Advisory Board Member Ronald D. Lee gave a talk on ”What does Population Ageing Cost and Who Pays the Bill?” and members of the AGENTA Team (Alexia Fürnkranz-Prskawetz, Tommy

Bengtsson and Haodong Qi) gave a first insight to the preliminary findings in the AGENTA project. On the second day of the meeting, the Project Coordinator welcomed all participants. Presentations on the status quo for WORK PACKAGES 1 to 5 followed. The third day of the meeting started with the presentations of the current and future work carried out in WORK PACKAGES 6-7, followed by the third Meeting of the General Assembly. This project meeting was organised by the LUND Team at Lund University.

The **third AGENTA project meeting was held in Budapest from 9-10 March 2017**. In addition to 20 representatives of the partner organisations in the consortium, 4 members of the Scientific Advisory Board that have been most relevant in the current stage of the project, participated in the meeting. The aim of this meeting was to provide a progress overview since the last project meeting in Lund, to discuss current work and to ensure work from all partners is aligned with the description of work. In particular, the remaining deliverables and policy briefs were discussed, as well as the final set up and the dissemination strategy of the data explorer. The meeting started with discussions on respective WP-specific issues followed by the fourth Meeting of the General Assembly. The AGENTA partner HDRI organised an Open Session incl. presentations by the AGENTA SAB Members Ron Lee and Andy Mason as well as the AGENTA partners Alexia Fürnkranz-Prskawetz, Bernhard Hammer, Tanja Istenič and Lili Vargha, Róbert I. Gál on the first day of the meeting. On the second day of the meeting Presentations on WP 7 (Bernhard Hammer; Hippolyte d'Albis), WP 5 (Miguel Sanchez-Romero) as well as WP 8 (Concepció Patxot) were given. This project meeting was organised by the HDRI Team at the Central Statistical Office (Központi Statisztikai Hivatal).

The **final AGENTA conference** entitled "AGENTA Final Conference: Economic Consequences of Population Ageing and Intergenerational Equity" (incl. the "National (Time) Transfer Accounts Workshop") took place in **Vienna from 20-21 (22) November 2017**.

The conference was organised to disseminate AGENTA findings to the academia, to exchange information on the main topics addressed in AGENTA among

researchers as well as to bring researchers, stakeholders and policymakers together to discuss the challenges and to develop strategies toward adapting the intergenerational transfer systems to demographic changes. The Call for Papers attracted 69 submissions, of which 26 papers and 12 posters were selected for presentation (https://www.oeaw.ac.at/vid/events/calendar/conferences/agenta-final-conference/). Ronald Lee (University of California, Berkeley), who is one of the founders of the NTA as well as an AGENTA SAB Member, gave the key note lecture on "Macroeconomic Consequences of Population Aging: A Simple Model with NTA Inputs". The sessions addressed "NTA/NTTA data", "Public revenues and expenditures in a demographic context", "Intergenerational redistribution of resources", "Measures and indicators for intergenerational transfers: Sustainability and fairness" and "Labour force participation and retirement". Highlights of each poster have been presented on the stage directly before the respective poster session started.

The aim of the N(T)TA Workshop was to provide potential users of the European NTA data with information that is required to understand and interpret the data. The core-part of the workshop presented in detail how the European NTA data is built up. The first three presentations focused on the link between National Transfer Accounts and the European System of Accounts, the methods and data sources that have been used to distribute economic quantities to age and gender and details on the European National Time Transfer Accounts. After presenting how the data can be accessed using the AGENTA data explorer several applications were discussed. The afternoon sessions of the workshop dealt with details that are required for users of the data as well as measures of population ageing, with several measures being based on European NTA data.

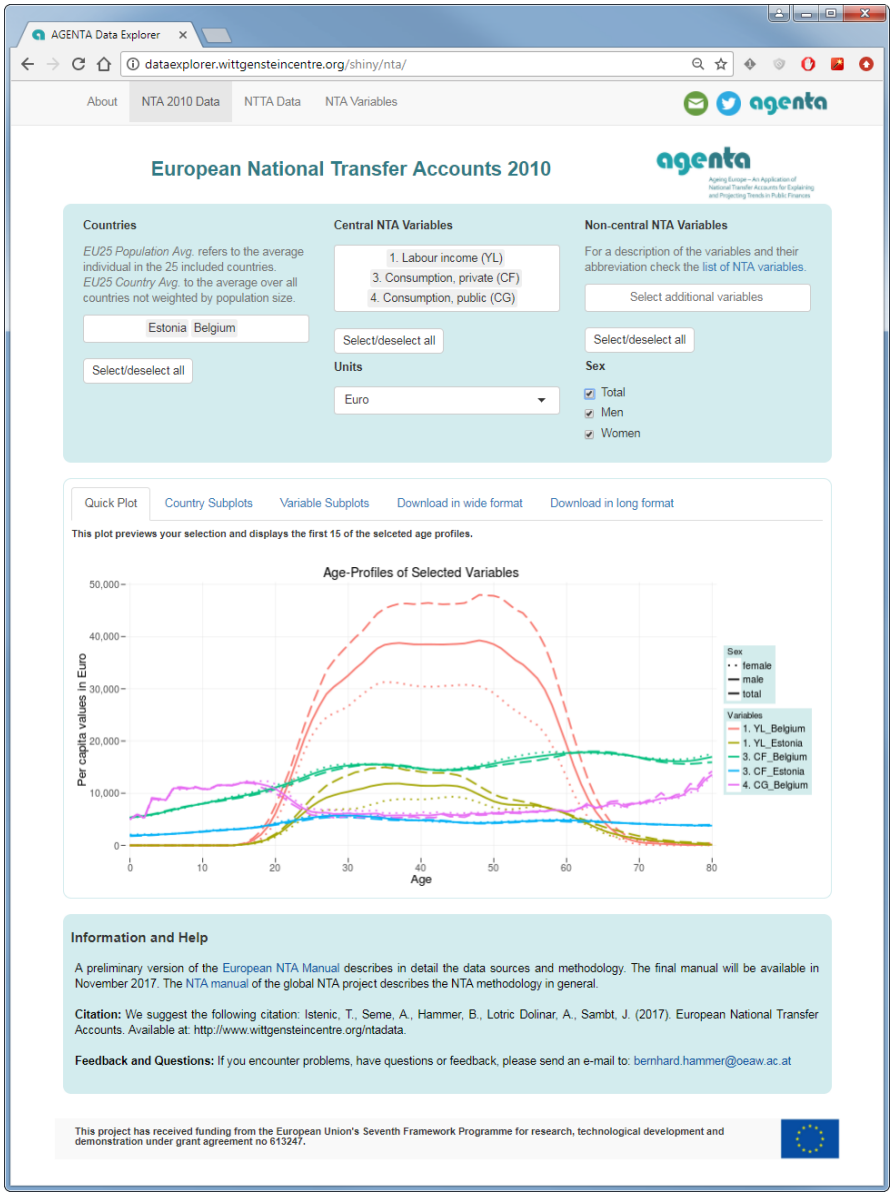
In total, 118 participants from 19 countries have signed in for the conference. Presenters were encouraged to submit their papers to the next issue of the Vienna Yearbook of Population Research dedicated to the topic of the conference: https://www.oeaw.ac.at/en/vid/publications/serial-publications/vienna-yearbook-of-population-research/. Presentations and pictures are available on the conference website: https://www.oeaw.ac.at/vid/events/calendar/conferences/agenta-final-conference/

3.4 Data explorer

European National Transfer Accounts Data Explorer

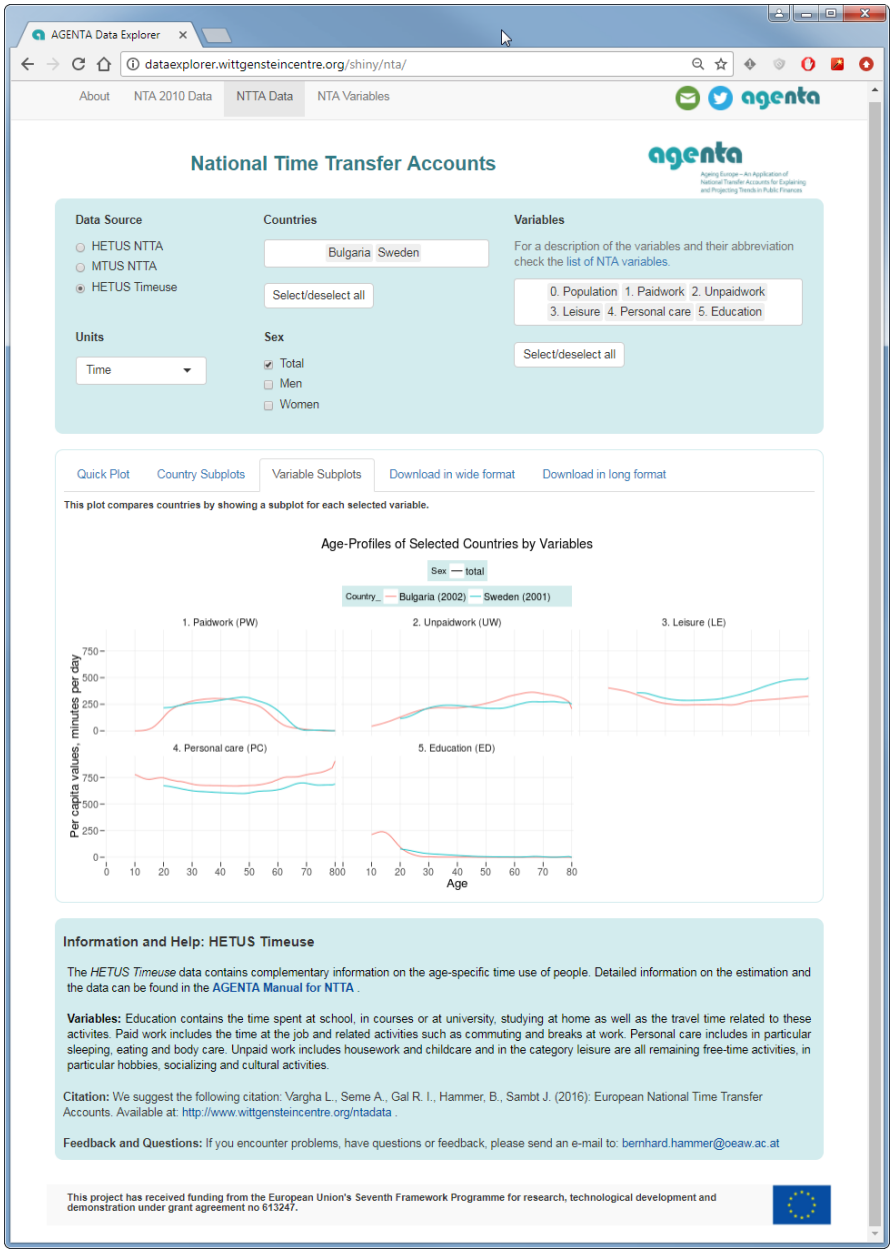
The European National Transfer Accounts data can be downloaded using the data explorer at http://www.wittgensteincentre.org/ntadata.

Figure: Screenshot of the National Transfer Accounts data explorer



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: Screenshot of the National Time 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.