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Full length article

Transfers in an aging European Union

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A B S T R A C T

Population aging and longevity can pose challenges to the sustainability of fiscal budgets. This is of particular concern in Europe's rapidly aging welfare states offering generous social support programs for the elderly. Still, there are differences in the pace of ageing and the generosity of welfare states. We use public tax and benefit age schedules from the National Transfer Accounts project to estimate the impact of population aging on fiscal budgets of single countries and their implications for potential transfer flows in between European Union countries. We show the positive impact of changes in the economic life cycle by working longer and the impact of migration on the redistribution of transfers across Europe. We illustrate the crucial role that demography plays in deepening and reinforcing the fortunes of European finances.

1. Introduction

The European Union has grown significantly over the past decades. It attracted new member states, intensified regional cooperation and deepened the economic and political integration. A number of countries even engaged in a strong permanent commitment introducing the Euro as their common currency. The ongoing integration processes challenge the member states but also the union itself. A central challenge for the future European economic development and prosperity are the changing population age structures of its member states. Over the next decades, they will change significantly with serious consequences for the EU stability. The focus of this paper is to assess the importance of these demographic changes for future European public finances. One could argue that due to diverging demographic destinies the EU could be torn apart as demography reinforces economic differences (Goldstein and Kluge, 2016). Countries with unfavorable age structure for the decades to come, such as Southern or Eastern European countries, already face the biggest economic challenges today. Their rapid aging process will put more pressure on public finances and the future of a joint European endeavor. We use age specific tax and benefit profiles from the National Transfer Accounts project for all EU countries to analyze how the EU countries are affected by aging when they cope with aging themselves versus engaging in a harmonized EU transfer union. For the two scenarios, we estimate country-specific fiscal

shortfalls for future decades. This thought experiment is meant to approach the implications of aging for the European Union from a demographic perspective. It is an outlook on different pathways the European Union could take in the future rather than an actual policy advice. In addition, we estimate the net present values of prime age adult intra-EU migrants. We show the impact of changing economic age profiles such as working longer, a promising setscrew (Vogel et al., 2013; Bloom et al., 2011; Börsch-Supan et al., 2014) for the budget of aging countries.

Although, population aging is a common experience of all European Union member states, there are significant differences across the continent. In general, European citizens can expect to live long lives and in western European welfare states, every second girl born today can expect to celebrate her 100th birthday (Christensen et al., 2009). These advancements in longevity together with sub replacement fertility rates in most countries lead to an increase of the elderly population across Europe. Between 2014 and 2050, the share of the EU population aged 15 or younger will decrease from 15,6% to 14,8%, while the share of the elderly (65+) will grow from 18,9% to 28,5% (Eurostat Population Projections). If the improvements in life expectancy continue in the future, Europe will experience a doubling of the share of population aged 80 and older, from 5,3% to 11,1% in the same period. However, population aging proceeds at a very different pace across the 28 EU member states. Fig. 1 shows the old-age dependency ratios for the EU

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Fig. 1. Old-age dependency ratios across Europe, 1st variant (population 65 and over to population 15–64 years. Source: Eurostat 2015).

countries in different clusters.¹ The graphs show the population in the age group 65 and above in relation to the working age population (ages 15 to 64). In the first panel, we find the old countries. These countries

¹ The weakness of relying on fixed age brackets is well known for old-age dependency ratios. More recent demographic indicators that are based on prospective and remaining life expectancies show more favorable demographic trends (Sanderson and Scherbov, 2010) but do not explicitly refer to the population in working ages. Economic activity by age, as another important information, is also not included in the pure dependency ratios. In this respect, economic support ratios would provide more information (Hammer et al., 2015; Prskawetz and Sambt, 2014). However, Prskawetz and Sambt (2014) show that also support ratios decline across European countries, given the current age profiles of effective consumption and labor income.

are older than the EU28 average throughout the period of observation. Countries in this category include Germany, Italy, Greece and Portugal and two already older Eastern European countries, Bulgaria and Latvia. Among these countries, fertility fell below replacement level already decades ago and continues to remain low. At the same time, there is variation in life expectancy levels across the EU. Life expectancy at birth is above age 80 for both sexes in the old member states. In contrast, life expectancy is with 74.9 and 74.3 years comparatively lower for Eastern European countries, such as Bulgaria and Latvia. The second panel in the upper right corner shows the old-age dependency ratios for countries that are younger than EU28 average in 2015 but will increase to values above average in 2060. Except for Spain and Cyprus, this cluster includes only rapidly aging Eastern European countries. Here, fertility fell to a lowest low after the Fall of the Iron Curtain in the

1990s and thereafter. At the same time, life expectancy increased, but the gap to the West could not be closed (Mackenbach et al., 2013). The lower left panel shows countries that are and remain younger than the EU28 average. This cluster includes Ireland and the UK, Austria, Luxembourg, Belgium and the Netherlands. The last panel shows countries that are older than the EU28 average today and will be younger in 2060. Here, we find France and the Scandinavian countries. In all lower panel countries, fertility is above 1.5, in some countries it almost nears 2, thus the populations do not age as rapidly as compared to the upper low fertility panel. With more than 80 years, life expectancy at birth is high among these member states.

The graphs show that country specific fertility and mortality trajectories affect member states quite differently. Founding states like Germany and Italy but also countries from the southern enlargement during the 1980s and the new member states that joined the European Union in the 2004 and 2007 enlargements will face increased demographic pressures. It becomes apparent that these are not only the countries with struggling economies today (except Germany) but they will also be the ones to expect the least favorable demographic developments in the coming decades. In addition to their current problems, they are increasingly losing parts of their demographic future by intra-EU migration. This benefits economically successful member states that may alleviate their demographic pressure by attracting migrants in the working ages. A study by Wilson et al. (2013) exemplifies the importance of overall migration for the net replacement rates of cohorts born after 1972 in old and new EU member states. They show that in the majority of countries the number of children born out of a cohort is not enough to replace this cohort.² However, economically successful western European countries attract young migrants and are able to grow or avoid fast shrinkage despite of sub replacement fertility. The opposite holds true for Eastern European countries. Outmigration decreases their replacement levels below the one that is given by fertility only. These intra-EU migration flows are partially a result of the free movement of labor principle of the European Union. Comparability of education degrees, entitlements to social benefits and anti-discrimination regulations aim at increasing the mobility of EU citizens. They facilitate the outmigration especially of young well educated individuals leaving their economically weak home countries. The age and education component aggravates the situation in the sending country, where mainly the elderly are left behind and government revenues drop while expenditures increase. Higher investment in human capital can absorb the negative growth implications of population aging and with longevity human capital accumulation achieves a higher pay off (Ehrlich and Lui, 1991; Boucekine et al., 1997; Zhang et al., 2003; Blackburn and Cipriani, 2002; Cuaresma et al., 2014). The problem would be that the older countries invest an increasing share of their public finances into human capital that they then lose to other economically prosperous countries that can harvest the revenues.

Our study is far from being the first to investigate the impact of population aging on public finances. Some scholars advocate the positive long run effects through increasing longevity itself (Ehrlich and Lui, 1991; Barro and Sala-i Martin, 2004) or increased savings and higher investment that can lead to increases in economic growth (Kalemli-Ozcan et al., 2000; Chakraborty, 2004; Zhang and Zhang, 2005; Kunze, 2014; de Freitas and Martins, 2014) and demographic dividends (Bloom et al., 2003; Mason and Lee, 2006). Still, there are case studies and cross-country comparisons that stress the demographic challenges and scrutinize national efforts to face them as large transfer deficits arise in the future (Mason et al., 2015). A major focus of the economic literature has been on the impact of population aging on public finances (Fichtner, 2018) and especially social security expenditures. These studies show that the generous welfare provision becomes increasingly

unsustainable under current conditions. The major concern regarding older populations are entitlements to higher pension payments (Bongaarts, 2004; Jimeno et al., 2008; Börsch-Supan et al., 2003; Tabata, 2015; Bouchet et al., 2017) or increased demand for health and long-term care spending (Schulz et al., 2004; McGrail et al., 2000; Anderson and Hussey, 2000; Jenkner and Leive, 2010; Breyer et al., 2015; Howdon and Rice, 2018; Murphy et al., 2017). In recent years several EU member states reacted to these alarming outlooks. Reform approaches in the pension system range from automatic balancing mechanisms (Germany, Spain, Sweden) over the prolongation of contribution periods and working lives by linking retirement age to life expectancy developments (e.g. Denmark, the Netherlands or Portugal) to sustainability factors linking benefits to life expectancy (e.g. Finland, France, Poland) (European Commission, 2015). Despite these efforts, there is relatively little focus on the potentials of the EU dealing as a whole with its demographic future. The reluctance of EU member states to give up control over their social policy domains might be a major reason for this. Approaches to deepen social integration are rather spillover effects or driven by the EU institutions.

Our analysis focuses on the costs of aging for the EU member states itself and for a hypothetical transfer union. We consider two sources of imbalances that require thoughtful solutions: 1) migration and 2) the generosity of the country-specific welfare system. The first imbalance arises from the free movement of people across Europe. Individuals can work in a different country than where they were educated or retire. Becker and Murphy (1988) argue that a political equilibrium for intergenerational transfers can be reached in case the state provides free education and at the same time old age pensions. The investments of parents or countries in their offspring would be rewarded by higher pensions. Such an intertemporal intergenerational contract is undermined within the framework of the European Union as member states are due to the free movement of citizens unable to enforce their country-specific intergenerational contracts which can either result in a collapse of the intergenerational contract or an underinvestment in human capital. The second case would be especially harmful for low fertility countries that are especially in need of more productive human capital. Studies find that older individuals are not less productive per se (Börsch-Supan and Weiss, 2013), still this tremendously depends on the investment in human capital made (Lutz and Scherbov, 2004; Prskawetz et al., 2008; Lee and Mason, 2010; Vogel et al., 2015; Cuaresma et al., 2014). In an attempt to become the most productive region in the world as already laid out in the Lisbon Agenda in 2010, cutting human capital investment seems highly unattractive. The second imbalance results from the generosity of the transfer system itself. Many countries provide generous old age, health and long-term care provision that will be on trial with a decreasing number of people in workforce ages. Here, there need to be limits to benefits or an acceptable cooperative agreement otherwise low fertility countries externalize their ageing costs to high fertility countries. This also refers to the moral hazard problem that transfers within EU countries could alleviate pressure to conduct a sound and responsive fiscal policy for selected countries. The limits to benefits and migration to countries providing a high level of social security are of major importance.

2. Data and methodological approach

We estimate results for the two scenarios: 1.) the fiscal impact of population aging on each member state and 2.) on transfers in a more integrated union. We take into account that countries benefit and suffer differently from intra EU migration and increased longevity.

In our analysis, we use country-specific population age profiles, as well as age utilization schedules of public transfers for single EU countries. The demographic information comes from the Eurostat population projections with the base year 2013 for 31 European countries including all EU28 countries. Here, we use the main scenario of the version EUROPOP2013 for our forecasts which follows a convergence

² There are a few exceptions for countries who experience a fertility increase between different cohorts, e.g. Eastern European countries during the 1970's.

assumption for all EU countries. According to these assumptions, fertility will increase in countries with currently low average numbers of children but will decrease in member states with high fertility.³ The EUROPOP projections provide the information on future population counts for all EU countries by sex and single year of age until 2080. We restrict our analysis to the period from 2020 to 2050, the year when the population aging across Europe starts to slow down (see Fig. 1). In addition to the population estimates, we use age profiles for inner-EU migration to account for gains and losses of transfer giving and receiving age groups. Migration numbers between EU member states by age, sex and nationality are also available in the Eurostat database (European Commission (2016), <http://ec.europa.eu/eurostat/de/data/database>).

The main economic age profiles are the estimates of government revenues and expenditures by single years of age of the National Transfer Accounts (NTA) project (Lee and Mason, 2011). The theoretical roots are given by Samuelson (1958), Diamond (1965), Lee (1994), Bommier and Lee (2003). The aim of the project is to improve our understanding of the generational economy. To date, the network comprises more than 50 countries, among them now many European countries, offering data for comparative analysis. The results show how people at each age produce, consume, share resources, and save for the future in a respective country. Therefore, the NTA framework provides valuable insights for the macro-economic effects of age changes within a population. This is of particular interest in aging societies where mainly public finances are pressurized as a decreasing number of producers has to care for an increasing number of consumers. Especially European countries that afford extensive welfare programs for vulnerable age groups face increased pressure. We use the NTA estimates for public expenditures and revenues by age to investigate the impact of demographic change on the different countries and eventual transfer flows between them.

Fig. 2 shows the country-specific government revenues and expenditures by age for selected European countries for the year 2010. We use country-specific estimates as well as a unified EU schedule and show the impact of different degrees of “demographic” integration on European transfer flows. The comparative NTA data for the EU28 countries is provided by the AGENTA project and can be found via www.dataexplorer.wittgensteincentre.org together with a detailed description how the estimates are constructed (Istaitieh et al., 2017). The country estimates are based on EU level microdata such as the European Union Statistics on Income and Living Conditions (EU-SILC) and the main source to estimate the age distribution of private consumption variables is the Household Budget Survey (HBS). The European System of Accounts serves as an anchor to ensure national representativity. For the average profile we use the results of the EU population average which refers to a representative individual in the EU countries included. Thanks to the researchers of the AGENTA project, the age profiles are all publicly available and ready to use for comparative analysis. The AGENTA database does not provide information for the Netherlands and Malta. For these countries we simply take the average NTA25 profile.

The profiles are normalized to the average labor income of a prime age adult (age 30–49) in the respective country to allow for comparability. We see very interesting differences but also similarities across Europe that are important for country-specific future demographic developments. In all countries, the working age population shoulders the major share of the tax burden. Still there are countries like Hungary, Slovenia or Spain where the old pay less taxes, while in others, namely Germany, Sweden or France, the elderly still contribute half the taxes of a prime age adult. The more the elderly (the growing share in an aging

population) contribute to public finances the less the country obviously has to fear population aging.

Also the government expenditures vary greatly across Europe. While we find elevations in the profile for the young (mainly expenditures for education) and old (expenditures for public pensions, health and long-term care), the magnitudes differ significantly. In Eastern European countries and Spain, we find that per capita expenditures to an elderly individual add up to about 60% of a prime age adult's income. Germany, UK or France have higher per capita values adding up to 80% of a prime age adult's income. In the Scandinavian countries, Austria or Italy the values for the oldest old even near the average income of a prime age adult. The higher the transfers for the elderly, the higher the expected future costs when these age groups are growing relative to younger ages.

For our excursus in which individuals across Europe work longer, we shift the productive periods to higher ages, extending these by two or five years. We only do this for the average scenario using the population average of NTA Europe for all countries. We stretch the unified age profile between age 60 and 62 or 60 and 65 respectively, depending on the scenario. We assume that the values of revenues and expenditures for a 60-year-old individual hold true until the age of 62 or 65, respectively. Thereafter, we allow for the decrease in public revenues and increase in public benefits (due to pensions). 65 is the common statutory pension age, when individuals across Europe currently tend to exit the labor market (in most European countries, individuals leave the labor market lower ages than 65). Consequently, the tax schedule is shifted in a way that elderly pay higher taxes for 2 or 5 years, respectively. In case individuals work longer they are no more benefit recipients but rather generate public revenues. Thus, even minor changes can have a big impact on the population level.

All results are expressed in fiscal shortfalls for each country. Fiscal shortfalls are determined by applying the country-specific tax and benefit schedule to the country population and estimate the missing amount of taxes in the future (in some cases, taxes are sufficient to finance the future benefits, then the shortfall turns negative). So we multiply the age profiles with the number of individuals in this age group and sum up revenues and expenditures for future years for each country. This approach exclusively takes into account demographic changes. We are aware of the fact that this is a highly hypothetical scenario that does not account for policy adjustments or behavioral changes. Still, the bandwidth how EU countries are affected by demographic change is in itself very interesting and can be base for future research.

3. Results

3.1. Country-specific fiscal shortfalls in the future

Fig. 3 shows the fiscal shortfalls for all the EU28 member states in 2050. The panel on the left uses the country taxes and benefits profiles for the single countries while the panel on the right uses the EU countries age-specific NTA mean. The country profile, additionally to the demographic differences, takes into account the level of taxes and benefits in the respective country. In both cases, each country faces its own demographic destiny and the country-specific shortfalls are reported.

By using the country profiles, on average, the gap between taxes and benefits in 2030 adds up to around 8% and increases to 16% in 2050. The bandwidth in fiscal shortfalls is considerable. Mainly, Southern and Eastern European countries and Germany face increasing shortfalls in the long run. The largest gap between collected taxes and benefits arises in Slovakia, Slovenia, and Romania and amounts to 25%–30%. Mainly, the Scandinavian EU member states but also Western European countries have comparatively low deficits. Their gap between collected taxes and benefits only amounts to around 10% in 2050.

The results for country-specific fiscal shortfalls differ only slightly

³ The EUROPOP2013 forecasts (main scenario and four alternative variants) and more detail on underlying assumptions and methodology are available at <http://ec.europa.eu/eurostat/web/main/home>.

Fig. 2. Government revenues (red) and expenditures (blue) by age across Europe. Note: The values are normalized to the average labor income of a prime age adult (age 30–49) in the respective country. Source: National Transfer Accounts database. Source: National Transfer Accounts database of the AGENTA project (www.dataexplorer.wittgensteincentre.org).

Fig. 3. Fiscal shortfall for EU28 countries in 2050. Country NTA profiles used for the respective country (left panel), average EU NTA profile used for all countries (right panel). Source: National Transfer Accounts database of the AGENTA project, own calculations.

from the deficits that we estimate with the mean NTA profile for the available NTA Europe countries (see Fig. 3, right panel). The underlying age profile affects the country order or magnitude of shortfall only slightly. Using the mean NTA age profile of taxes and benefits for all EU28 countries, decreases the EU average shortfall in 2030 to about 6.5% and to 14% in 2050. The values and differences between countries are comparable to the amounts using country schedules. The countries that are worst off are Southern and Eastern European countries, while Western European and Scandinavian countries witness much more favorable budget gaps. Here, Greece, Portugal and Spain witness the highest deficits amounting to around 20%. Countries with the lowest deficits are Luxembourg (4%), followed by Belgium, Sweden, and Denmark (around 10%).

The differences in fiscal shortfalls due to changes in the age structure vary considerably across Europe. While younger countries face tax shortages of around 10%, rapidly aging countries will face tax shortages of much bigger magnitude of around 20%–30%. Although we find differences depending on which age profiles we use, the major driver is the age composition of the population. We find no significant differences on country order clusters or the order of magnitude of missing taxes between the two panels. This indicates that the fiscal shortfalls vary mainly for demographic reasons.

3.2. Transfers between countries in an integrated European Union

Transfers between EU countries are an interesting thought experiment and politically discussed in a European transfer union scenario. To estimate the transfers in between countries to equalize fiscal shortfalls induced by population aging we assume, that all countries raise their taxes by 16% until 2050, which would be the case if all countries pay in together in the country setting. Then we allow transfers between younger and older countries to make up for the difference across countries. The country results are given in Fig. 4. The graph on the left shows the surplus or deficit using the country profiles, the graph on the right shows the amount of transfers using the mean NTA schedule for all countries. The values are expressed in percent of 2015 GDP of the respective country.

Using the country profiles, the high fertility countries Sweden,

Finland, Denmark and France or Belgium would generate a substantial surplus if they raised their taxes by the EU-wide mean of 16%. These countries would contribute around 4% (expressed in GDP 2015) to the common EU fund. Low fertility countries such as Slovakia, Spain and Greece would not have sufficient funds even after raising taxes by 16%. These countries would benefit in the order of 4% of their GDP 2015 values. Using the average NTA tax and benefit profiles, the magnitudes would be smaller, amounting to around 2% of GDP 2015 values for giving countries and 3% of GDP 2015 for receiving countries.

The total amount of redistribution would add up to about 150 billion euros in 2050. For comparison, the current EU budget amounts to the same amount, representing around 1% of the EU8's gross national income. The question remains, why such a transfer union could be fair and high fertility countries would support low fertility countries in the long run. One argument could be, that with the free movement of people across Europe, low fertility countries will suffer from further outmigration of young skilled individuals and lose them to prosperous countries which will enforce demographic fortunes.

3.3. How working longer changes fiscal shortfalls

Individual country's policy interventions are also promising to ease the burden of population aging. Fig. 5 shows the results of fiscal shortfalls when the mean NTA profile is extended by 2 (left panel) and 5 years (right panel) leaving all other things equal. This has strong implications for all countries across Europe.

The EU average of fiscal shortfall by only working 2 years longer shifts from 14% to 10.5%. A minor change in the age profiles at older productive ages reduces fiscal shortfalls significantly. The country order only changes slightly, still all countries benefit greatly from the shift. The Greek shortfall drops from 22% to 16.5% or the Latvian gap drops from 20% to 16%. The second panel in Fig. 5 shows the even more advantageous shift of extending working life by 5 years. Here, the EU-wide average in fiscal shortfalls drops to 4%. Even the demographically least favorable countries face no higher deficits than 10%. Scandinavian countries and Belgium could balance their taxes and benefits without further adjustments.

Fig. 4. Transfers between EU countries in as percentage of 2015 GDP using country NTA profiles (left) and average NTA Europe profiles (right). Source: National Transfer Accounts database of the AGENTA project, Eurostat database, own calculations.

3.4. Migration across Europe and potential implications

Migration waves, among other reasons, tend to flow from economically weak regions or countries to areas, where individuals expect better prospects for life (Hagen-Zanker, 2008). We have to distinguish between migration from outside the EU and migration within the EU. Although international migration is not expected to solve the European labor market problem, the expected gain for Europe can be substantial (Brücker, 2002) but out of scope of this analysis. Here, we are more interested in within-EU migration as this distorts European age and transfer structures more severely. Within EU working migration means

lost investments in education and lost taxes for the sending countries and fiscal alleviation for the recipient countries. Some countries could also benefit from the outmigration of unemployed individuals due to lack of economic opportunities in the sending countries but even in this case the investment in human capital is lost for the sending country. The problem may aggravate when intra-EU migrants return to their home countries and may benefit from health or retirement provisions at older ages.

This has already happened in the past. During the economic and financial crisis 2008/09 and thereafter huge streams of young skilled migrants left Southern Europe to find gainful employment in more

Fig. 5. Fiscal shortfall for EU28 countries, extending working life by 2 and 5 years. Mean NTA profile used for all countries stretched by 2 or 5 years. Source: National Transfer Accounts database of the AGENTA project, own calculations.

Fig. 6. Percentage loss of population by age group and number of net migrants, Spain 2013. Source: Eurostat Database.

affluent EU member states in Northern or Western Europe. As an example, we show the age profile of net migration for Spain for the year 2013 (Fig. 6). We consider within-EU migration only. For the year 2013, emigration exceeds immigration and the loss is substantial in younger age groups. Between age 25 and 35, net outmigration adds up to 2% of the respective age groups. As a comparison, East Germany suffered from outmigration rates right after the Fall of the Iron Curtain of 3.7% and between 1% and 2% thereafter (Heiland, 2004). This resulted in a substantial loss for East Germany and does so in Spain. Losing 1–2% of prime age tax payers makes a significant difference for public budgets.

To estimate the loss for public budgets, we use the tax and benefit schedule for Spain by age and investigate the gap resulting from outmigration. The benefits that the outmigrants would receive in total for all age groups add up to 2.7 billion euros that the government saves in 2013. The tax loss adds up to 3.9 billion euros for all age groups. Major losses are due to the outmigration of young skilled individuals in the age of 25–40. This is the age when young Spanish individuals turn from net recipients to net contributors. Losing these age groups is especially harmful to public budgets as it remains unknown when and if these individuals return. Looking at the Spanish budget gap in the near future, the gap amounts to 15 billion euros in 2020 applying the current tax and benefit schedules. So the loss of 1.2 billion euros due to outmigration would add another 8% to the budget gap. This is a high amount estimated for a year when Spain suffered from massive outmigration. Still, it shows the potential impact, within-EU migration can have on public budgets.

As stated above, countries where the within-EU migrants move to in their 20s and 30s, save the costs of education and other youth related costs. They receive a well-educated working age individual that can engage in the free European labor market. Given comparable education across Europe the gains for the receiving country can be substantial. Lee and Miller (2000) find for the US that admitting only high-education immigrants of young working ages could be fiscally highly beneficial. In contrast to the budget gap in a particular year, one could also calculate the net present value of a 25-year old Spaniard to show the impact of outmigration. Discounting future taxes and benefits with a rate of 3%, we estimate the net present value of a 25-year old Spaniard amounting to 60,000 euros. For a 30-year old the present value amounts to 51,000 euros and a 35-year old still has a net present value of 32,000 euros. The economically weak EU member states that lose their young population, lose future tax payers that will spend their highest tax paying ages abroad. In case, the migrants return to their home country at older ages, this even worsens the balance for the home country. We find variation in the net present value of migrants depending on their country of origin, still all net present values in the ages where individuals predominantly emigrate are positive (see Table 1). We show a

Table 1

Net Present Value of migrants from different EU countries by age (for ages 25, 30, and 35) in euros. Source: NTA tax and benefit schedules, authors own calculations. Note: Malta and the Netherlands are missing in the NTA Europe Database and are computed using the mean NTA profiles. The results do not account for country specific survival probabilities or health status. We provide averages for an individual living up to age 90 in the respective country.

	NPV 25	NPV 30	NPV 35
BE	136.047	117.241	79.818
BG	11.526	9.074	5.154
CZ	39.543	32.791	18.850
DK	145.810	135.468	107.877
DE	87.682	78.462	54.925
EE	34.048	25.384	13.756
IE	67.303	62.121	43.821
EL	55.403	44.832	19.624
ES	59.685	51.166	32.069
FR	127.135	109.928	82.290
HR	70.048	60.818	41.824
IT	99.097	87.189	59.920
CY	62.206	56.388	37.761
LV	26.240	20.714	12.254
LT	25.321	20.941	14.742
LU	152.427	130.772	89.860
HU	29.232	21.961	11.508
MT	70.048	60.818	41.824
NL	70.048	60.818	41.824
AT	107.328	82.559	45.993
PL	25.265	18.427	5.567
PT	52.991	42.275	26.189
RO	10.763	6.517	53
SI	54.079	45.076	25.155
SK	16.592	8.129	2.850
FI	106.884	98.853	76.764
SE	128.858	134.152	125.320
UK	89.727	80.033	59.170

detailed snapshot for Spain only, but the narrative equally applies to other Southern or Eastern European countries expected to lose a substantial fraction of their young and skilled workforce due to bleak demographic and economic prospects.

4. Discussion

Our analysis investigates the impact of changing age structures across Europe on fiscal shortfalls. We use National Transfer Account data for tax and benefit schedules by age for the European countries, to assess the differences in public budget gaps. Our methodological approach is demography driven and shows the effect of age structure changes rather than providing exact economic forecasts for a specific country.

First, as a starting point, we quantify the impact of age structure changes on fiscal shortfalls for each country in 2050. This reflects the current situation where each member state deals with its own population pressure without specific involvement from the EU level. We find that the Southern and Eastern European low fertility countries will experience the highest public budget gaps in the coming decades. In contrast, Northern and Western European countries experience only moderate increases in public budget deficits.

Second, we show the effect if member states engage in an integrated transfer union. In such a scenario, the EU-wide tax rate would increase by about 16% until 2050. To put this into perspective, OECD taxes increased from 25.5 to 35.2 % of GDP in the period 1965–2000, an increase in the tax burden of more than one-third. In 2014, total tax revenue as % of GDP amounted to 49.6% in Denmark or 45.0% in Belgium as the member states with highest taxation. The idea to form a demographic transfer union across Europe sounds little promising of winning a majority. But looking a bit closer into today's transfers, to Greece for example, it is argued that this is a first step into such a union.

The first rescue package in 2010 included support that amounted to 110 billion euros of which 73 billion really flowed to the Greek economy. That amounts to 32% of Greek GDP in 2010 and is a substantial transfer.

Thirdly, by focusing on intra-EU migration streams we give an example of why the solidarity between member states might be reinforced. This refers to the motivation of a high fertility country to help a lower fertility country to ease its demographic burden. The older countries for example shoulder lower investments in human capital or other youth related costs. A reason to pool demographic risks could be that the younger fertile countries will attract the young from older countries aggravating their demographic problem. A kind of solidarity exchange could exist to make up for this beneficial transfer that is discussed in this paper. More European integration might even be publicly supported (Striessnig and Lutz, 2016). An additional motivation, why demographic risks could be shared is the problem to enforce the intergenerational contracts in each country whenever people have the possibility to move across Europe. So individuals might pay contributions in a different country than where they later claim benefits. Origin based social security contributions or a more integrated European Union could help to prevent this problem.

Another potential solution often discussed given the immense demographic variation in Europe, that coincides with the weaker economic performance of Eastern and Southern European countries, is a two-speed European Union. The EU28 countries already today have difficulties to proceed at the same speed and demographic developments will reinforce the differences. Accession talks with countries in the Balkans will eventually enlarge the European Union. The degree of cooperation varies already across Europe. For example, the 19 member states that share the Euro coordinate budget policies more closely. This shows that it would not be necessary to proceed at the same speed and that a two-speed European integration might be a feasible option. The downside of this solution is that it excludes the wealthy and young Scandinavian countries and the United Kingdom which will leave the EU in the next years. To include the United Kingdom in our analysis might be perceived as a shortcoming as it decreases the relative amount of intra-EU transfers that would be channeled between member states. When we exclude the United Kingdom from our analysis, the EU-wide tax raise needed to cover expenditures in 2050 would increase from 16% to 18%. It remains unclear which parts of the United Kingdom will cut their ties with the European Union and which regulations will apply for the access to the EU single market. Given this uncertainty, we decided to include the UK in our analysis.

A limitation of our analysis is that we use constant age profiles over time. We do not account for productivity growth, changes in preferences or the effects of anticipated future political interventions. Still, we believe that our results offer valuable information on the impact of demographic change on the EU member states. We use tax and benefit schedules for a specific country and the results would be biased in case we witness major changes in the relative age shares. Potential distortions will be explored in future research.

We also show results with manipulated tax and transfer schedules. We estimate the fiscal shortfalls across Europe if we extend the productive period by either 2 or 5 years. This has a beneficial impact and could reduce fiscal shortfalls for many European countries to values of much smaller magnitude. Many European governments are already pushing retirement to higher ages. Under the EU's Open Method of Coordination which serves as an initiative to cooperate and coordinate social political efforts among member state, there is the chance to establish such non-binding standards. Several studies including this analysis show the significant impact that such political interventions on the individual economic lifecycle and how they can help to ease fiscal tightening (Sinclair et al., 2013; Vogel et al., 2015).

The demographic developments will likely reinforce the economic differences across Europe. Given the free movement of people and the strong ties and transfers between European countries, it will be

necessary to take these demographic differences increasingly into account. With the European Union seeking for new narratives to prevent further centrifugal forces for the European idea population aging has to be taken into account.

Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at <https://doi.org/10.1016/j.joea.2018.07.004>.

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