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Disaggregated National Transfer Accounts by Education and Family Types for Spain, UK, Austria, and Finland

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ABSTRACT

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Keywords: Education, Demographic Change, National Transfer Accounts

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This paper is part of the WELTRANSIM project (PCIN-2016-151), a project of the Horizon 2020 Joint Program Initiative More Years, Better Live's second joint transnational call entitled Welfare, Wellbeing and Demographic Change: Understanding Welfare Models (weltransim.eu). The paper uses data from Eurostat, Cross-sectional EU-SILC UDB, 2011 and HBS 2010. We herewith acknowledge data provision for EU-SILC and HBS by Eurostat and the European Commission, respectively. We also acknowledge all institutions and statistical agencies that provided data we used in our estimations. Authors thank Meritxell Solé for technical assistance in the earlier phase of the project, and Risto Vaittinen and Marian Fink for providing consumption data for Finland and Austria respectively.

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1. Introduction

Ageing is one of the main challenges that current societies must face in the near future. Changes in population age structure will force to re-think some social structures created under very different demographic conditions. Tackling this challenge successfully requires rigorous analyses of the generational economy (Lee and Mason, 2011), in order to understand how different generations interact in economic terms. Societies are conformed by individuals of different ages and, in consequence, with different economic behaviour, interacting among them. For example, children need to consume, but they are not able to produce the necessary resources to finance that need. Something similar occurs on the other extreme of the lifecycle with the elderly. In the middle, during working ages, individuals keep their need to consume, but they can also earn income, mainly through the labour market. Overall, it is clear that there is a need for mechanisms to redistribute resources along the lifecycle. Those mechanisms are mainly three. First, the markets, which allow, for example, for savings (from working to retirement ages). Second, the family, which redistributes resources from adults to children, or even to the elderly. And finally, the public sector, which has also the power (very important in those countries with a strong welfare state) to reallocate resources from those individuals who earn income and can pay taxes, to those who have no earnings (the elderly, children or some working-age individuals with no jobs, for example), and thus, receive public transfers (retirement pensions, family or unemployment benefits, among others). It is worth noting that the three aforementioned reallocation devices allow not just for intertemporal (markets), but also for intergenerational redistribution (family and public sector).

Overall, the generational economy studies all these economic relationships among different generations living together, and how they could be affected by eventual changes in societies' age structure, as the ongoing ageing process. In this respect, National Transfer Accounts (NTA) entail a substantial progress in the data availability. NTA is a methodology (UN, 2013) that adds the age dimension to National Accounts system indicators, producing, as a result, a thorough estimation of family transfers. It started in the beginning of this century as an international project led by the Universities of Berkeley and Hawaii, and which currently involves more than 80 countries.

NTA is a rich dataset containing valuable information to evaluate intergenerational redistribution, and to understand how resources are produced, consumed, saved and shared by different generations living in a specific moment. It provides per capita (and aggregate) age profiles for the main economic variables in a given period: consumption (both public and private), income (from labour and from assets), savings and transfers, consistent with National Account aggregates. As mentioned above, the focus of standard NTA is on age, but some extensions of the initial method considering additional dimensions further enrich the scope for microanalysis. For example, the addition of non-market activities to the age profiles through time transfers (National Time Transfer Accounts, NTTA), allows for a complete picture of how resources are produced and shared among different generations (Donehower, 2018). A significant part of economic resources is generated and consumed aside markets and, hence, not captured in the National Accounts system. Time-use surveys conducted in many countries along the last decades allow for the identification and quantification of these activities. In this regard, differentiating data by sex becomes crucial for a thorough understanding. Typically, women participate less in the labour market and thus have a lower contribution to national income. However, they deal with the most important part of the non-market activities, which are an additional and significant source of income and thus, of wellbeing.

Another example of NTA extension is the estimation of age profiles disaggregated by level of education (Hammer, 2015; Abio et al., 2017), which gives the chance to evaluate the impact of the educational transition that most countries faced in recent decades, simultaneously to the ageing process. Using NTA by level of education, Rentería et al. (2016) found that the improvement of education in Spain could significantly offset the negative effect of population ageing in this country.

As a result of AGENTA, a research project financed by the 7th Framework Program of the UE carried on between 2014-2017, nowadays homogeneous and comparative estimations of NTA and NTTA by sex are available for 25 EU countries referred to year 2010. For the moment, NTA by education is only available for some specific countries and not homogenized.[2] In the WELTRANSIM project, we extend the NTA methodology to consider, together with the disaggregation by sex and level of education, a new dimension: family structure. This way, we aim at providing the necessary data for a comprehensive analysis of both inter and intragenerational distribution, taking into account, besides sex and education, the organization of individuals through family structures. We are particularly interested in looking at the differences in age profiles according to two characteristics: couple formation (couples versus singles) and parenthood status (parents versus non-parents), in both cases keeping the disaggregation by sex and level of education. In this way, we intend to better understand how these three dimensions (sex, level of education and family structure) interact in the wellbeing of individuals and, in the end, of society as a whole.

This paper presents the profiles of the WELTRANSIM project for four selected European countries: Austria, UK, Finland and Spain. Selection is not random but aimed at the purpose of having at least one country representative of the four welfare state regimes usually differentiated in the literature.[3] Austria represents the Continental or conservative model, where the institutions follow the traditional norms and family plays a central role. In the UK, the Anglo-Saxon or liberal welfare state regime prevails, where the main role is given to the markets, while public sector acts from a subsidiary perspective, guaranteeing only a social minimum for those in need. The Nordic or social-democratic welfare model is represented by Finland, which promotes full participation and employment and ensures protection at the highest standards for everybody, regardless of past contributions. It also has a more active role in fostering gender equality. Finally, Spain is an example of the so-called Mediterranean model, with an extended role of the family, but with important gaps in protection, which focus mainly on old age.

The rest of the paper is structured as follows: Section 2 briefly describes the standard NTA methodology, the data needs and the methodological decisions taken in order to further disaggregate it simultaneously by sex, level of education and family type. Section 3 presents the estimated NTA age profiles disaggregated by sex, level of education and family structure. The results for the WELTRANSIM profiles are analysed and compared to those obtained for the same countries in AGENTA, differentiated only by sex. Finally, Section 4 concludes and proposes further extensions of this work.

[2] See the AGENTA webpage (http://www.agenta-project.eu/en/index.htm) in order to obtain detailed information about the project, and the AGENTA data explorer to access the NTA and NTTA data (http://dataexplorer.wittgensteincentre.org/nta/).

[3] See Spielauer et al. (2020d) and Istenič et al. (2019) for a discussion of the welfare state regimes classification. The traditional typology with only three regimes (Continental, Anglo-Saxon and Nordic) was initially established by Esping-Andersen (1990), and it was later completed to consider Mediterranean countries differentially (Ferrera, 1996).

2. Methodology and data

This section gives a brief summary of the standard NTA methodology and accounts for the methodological issues involved in disaggregating NTA profiles beyond age and sex.

2.1 Standard NTA methodology

The National Transfer Accounts method (UN, 2013) is designed to estimate age profiles of the main economic variables consistently with the System of National Accounts (SNA). The method starts from the following identity:

$$YL + YA + TGI + TFI = C + S + TGO + TFO \quad [1]$$

where *YL* and *YA* are labour and asset income, respectively; *C* is consumption; *S* is savings; *TGI* and *TFI* represent public and private transfers received, respectively, and *TGO* and *TFO* represent, respectively, paid public and private transfers. This way, the left-hand side of Equation [1] stands for income sources, while the right-hand side reflects uses. Reordering terms, the basic NTA identity is obtained:

$$C - YL = (TGI - TGO) + (TFI - TFO) + (YA - S) \quad [2]$$

Equation [2] shows that the difference between consumption and labour income, named as the lifecycle deficit (*LCD*), must be financed through the three sources on the right-hand side: net public transfers (*TG*), net private transfers (*TF*), and/or asset reallocations (*RA*). This equation holds either for the whole economy or a specific age.

NTA estimations involve a complex and exhaustive process, exploiting different micro datasets to obtain individual (per capita) profiles. Each variable is not estimated as a whole but decomposed into different categories. For example, consumption is firstly divided into public and private, and different categories are also distinguished and estimated separately in each case (education, health, and other consumption). Labour income is estimated separately for employees and self-employed, obtaining a different age profile in each case.

In the case of transfers, it is worth recalling that NTA provides additional data to that collected by National Accounts aggregates. In particular, NTA distinguishes between public and private transfers, which, at an aggregate level should tend to zero, but become crucial from an age perspective. Total net public transfers in a given economy, at the aggregate level, are the difference between those received (inflows) and paid (outflows) by individuals to and from the government, respectively. Disaggregated by age, transfer inflows and outflows become essential to understanding how the public sector redistributes resources among ages by collecting taxes and contributions (mainly from working ages) and giving transfers (mostly to economic dependent ages). NTA estimates age profiles for different categories of taxes and contributions paid by individuals (*TGO* in Eq. 2) as well as transfers received (*TGI*), both in cash (different types of pensions, family benefits, etc.) and in-kind (health, education, and other).

With respect to private transfers, at the aggregate level (for the whole economy) they again tend to be zero, because some individuals receive while others give (only the balance with the rest of the world remains). However, again the age profiles provide valuable information about how resources move among different generations. The method estimates age profiles for private transfers occurring inside the same household (intra-household) and between different households (inter-household).

Standard NTA methodology systematically introduces age in economic variables, while some countries have obtained the age profiles also differentiated for women and men. This methodological improvement was consolidated in the AGENTA project, where

comparable estimations for 25 EU countries in 2010 were obtained, further disaggregated by sex. Moreover, AGENTA adapted the standard NTA methodology to the specific characteristics of microdata availability in European countries (Istenič et al., 2016). As our estimations refer to four European countries previously considered in AGENTA (Austria, Finland, Spain and the UK), and for the same year (2010), we start from this specific methodology and extend it in order to obtain estimations further disaggregated, simultaneously, by level of education and family type. Therefore, AGENTA estimates can be used as a benchmark for comparison. We follow the same methodology and use the same sources of data whenever this is feasible.

2.2 Building disaggregated NTA profiles by sex, education and family type

As mentioned earlier, WELTRANSIM adds two additional dimensions to the disaggregation of NTA profiles by age and sex provided by the AGENTA project: level of education and family type. A few studies have estimated NTA profiles attending to the level of education (Hammer, 2015; Rentería et al., 2016, Abio et al., 2017). Gál et al. (2020) estimate NTA profiles for parents and non-parents at working ages and obtain an indicator of the transfer cost of parenthood. They find that on average for 14 EU countries, parents provide 1.9 times more transfers (including time transfers) than non-parents. To our knowledge, this is the first study providing NTA age profiles disaggregated by sex, level of education and family type, simultaneously. We distinguish three different levels of education: low-educated corresponds to levels ISCED 0-2 of UNESCO classification (individuals with no more than compulsory education); medium-educated corresponds to ISCED 3-4 (those with secondary, but not tertiary education); finally high-educated corresponds to ISCED 5-8 (tertiary education). Regarding family type, we attend to two characteristics: partnership (singles versus individuals living in a couple) and parenthood status (parents versus non-parents).

An important methodological issue that we need to bear in mind is the difficulty in reconciling the cross-sectional nature of NTA estimations with the longitudinal nature of the lifecycle. Age (and sex) profiles for a specific year reflect resource reallocations among the different cohorts living together in that moment. Although estimated for a given year, they also try to grasp how resources are transferred longitudinally along the lifecycle. This question is always present when building NTA profiles, but it takes on particular relevance when incorporating further disaggregation than age and sex. It creates some methodological issues that need to be tackled when building NTA disaggregated by level of education and family type. First, to estimate NTA profiles by education, the question arises as to whether children need to be classified according to their own education level, as in Hammer (2015) and Rentería et al. (2016), or according to their parents' education (Abio et al., 2017). Each option has its advantages and shortcomings, and it will be more suitable depending on the purpose of the analysis. The profiles by education level we show in the results section follow the latter approach and include children in their parents' home with their parents' education level. Nevertheless, in the projections developed using microWELT (Spielauer et al. 2020a), the age profiles used reflect the expenditure of the actual level of education individuals are aiming at.

Second, to estimate NTA by family type, it is necessary to consider that family structure is not constant along the individual lifecycle. Hence, the profiles we obtain disaggregated by family characteristics are reflecting different periods of the lifecycle. Moreover, the way household surveys are constructed does not always allow for a correct differentiation of the individual family characteristics we are interested in: partnership formation (distinguishing individuals living in a couple from singles) and parenthood status (differentiating parents from non-parents). In particular, the surveys do not permit knowing who a parent is and who is not after a certain age, when eventually kids have

left home (surveys only ask for people living in the same household). This problem can appear at any point in life for divorced parents not co-residing with their children, but is especially strong as people age and children leave home. To overcome this problem, we have used the Survey of Health, Ageing and Retirement in Europe (SHARE), containing information on parenthood status, irrespectively of household composition for population 50+. From the information contained in SHARE, we have derived an imputation method that allows us to identify parenthood status from age 60.[4] Unfortunately, we could not apply this estimation to the UK, as this country is not reported in SHARE.

Attending to all the dimensions of the disaggregation performed in this study, individuals are classified according to their age as follows:

- Children up to 16 years old are considered to be dependent children. They are all assumed to be enrolled in education and are classified into three groups conditional on the level of education of their parents. If they have two parents with different educational levels, we take the highest level of the two. For this group of dependent children, we do not distinguish by sex.
- Young adults from 17 to 25 years old can be classified into different groups depending on their enrolment status. If they are enrolled in education, they can belong to the previous group of dependent children, as long as they live with their parents and they are not in a couple or are parents themselves. If any of these three conditions is not fulfilled, they are considered as independent students, in which case we cannot distinguish them by educational level (since we lack information about their parents' education and they have not yet completed their own education). For all enrolled young adults, dependent or not, we do not distinguish by sex either.
- Young adults (aged 17-25) who are not enrolled in education are classified according to their gender, their own education level, and their family type. We consider four family types depending on partnership status (single or in a couple) and on parenthood status (with or without dependent children). In the case of single parents, we opted for combining males and females in the same category due to the low representativeness of this family type for males.
- The rest of adults (ages 26 to 59) are classified in the same way as non-enrolled individuals in the age group 17-25: by gender, by own education level, and by family type, where again single parents are not distinguished by sex.
- Elderly people include individuals from age 60, who are classified by sex, education level and family type. In this case, parenthood status refers to whether the individual has ever been a parent or has remained childless during his/her life. In the case of the UK, we do not differentiate old people by parenthood status due to the lack of data.

Table 1 summarizes the different types of individuals distinguished, and for which we estimate NTA profiles. Overall, considering the different characteristics, 25 types of disaggregated NTA age profiles are obtained. Four of these profiles are for (children and young adults) students up to age 25, without disaggregation by sex, and the other 21 are for adults aged 17+.

Figure 1 shows the distribution of the population by family type in the four countries analysed, obtained from EU-SILC. Finland presents the lower number of singles at young adult ages, while Spain has the highest. The proportion of parents at working ages is

[4] In particular, the probability of being a parent is estimated in SHARE using as explanatory variables income, education level, partnership status and age group. Using the estimated parameters, being a parent is predicted in EU-SILC, using a control algorithm to ensure that the reported status is not contradicted. For details, see Saroglou et al. (2021).

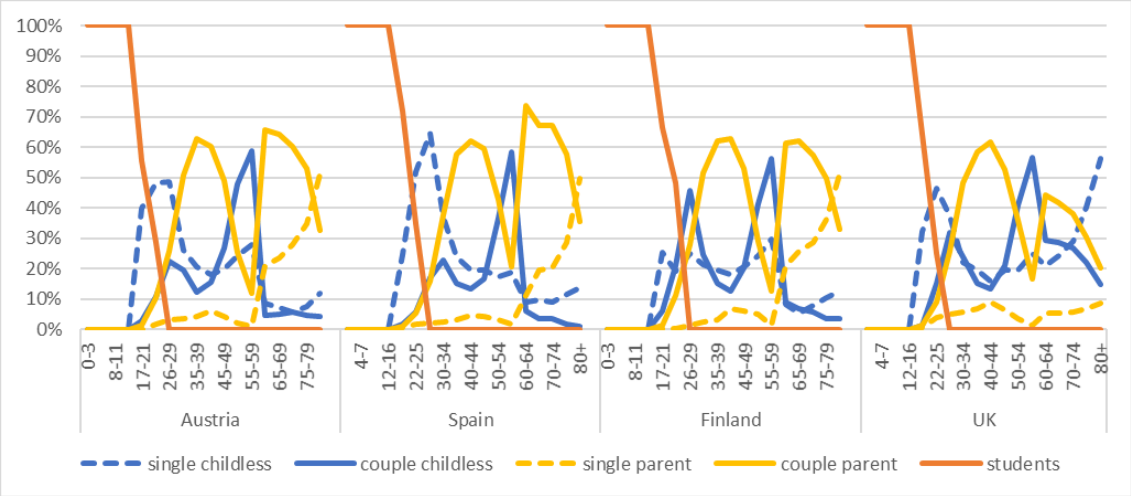
similar across countries.[5] The presence of single parents at childrearing ages is higher in the UK followed by Finland, whereas it is less visible in Spain.[6]

Table 1. Classification of individuals by age, education level and family status

Type of individual	Education level	Ages
Dependent children	(Their parents:) Low, Medium, High	0-25
Independent students	Unknown	17-25
Single men, childless	(Own:) Low, Medium, High	17-80+
Men in a couple, childless	(Own:) Low, Medium, High	17-80+
Men in a couple, parent	(Own:) Low, Medium, High	17-80+
Single parents (men or women)	(Own:) Low, Medium, High	17-80+
Single women, childless	(Own:) Low, Medium, High	17-80+
Women in a couple, childless	(Own:) Low, Medium, High	17-80+
Women in a couple, parent	(Own:) Low, Medium, High	17-80+

In the following we describe how age profiles disaggregated by sex, level of education and family type are constructed, indicating the main deviations from the procedure used in AGENTA (only disaggregated by sex). It is important highlighting that an additional challenge we need to face is the increasingly smaller number of observations as more dimensions of disaggregation are introduced. For that reason, we opted for merging age in five years groups from age 30 on. For the youngest, however, we take the age groups that correspond to the main education periods (0-3, 4-7, 8-11, 12-16, 17-21). The last group, 80+, includes ages 80 and above. We took a careful consideration of outliers and groups of observations with a small sample size. In addition, as in AGENTA, we reduced the random variation by using Friedman's Super Smoother,[7] which also takes into account the sample size to smooth profiles.

Figure 1. Population by age groups and family type



Source: Authors' estimations from EU-SILC

[5] The drop in parents in a couple at ages between 45 and 60 (and the corresponding increase in childless couples) in all countries is due to the definition of parents that we are using: up to age 59, an individual is considered a parent if he or she has dependent children living at home. From age 60, the definition of parenthood refers to ever having had children.

[6] The distribution of parents and non-parents aged 60+ in the UK is only fictitious, as we cannot distinguish old individuals by parenthood status in this country because it is not reported in SHARE, as explained above.

[7] See Luedicke (2015) for an explanation of this method.

AGENTA mainly employs two data sources to estimate the age and sex distribution of aggregate NTA variables, both from Eurostat: the harmonized Household Budget Survey (HBS), used for private consumption[8] and the European Union Statistics on Income and Living Conditions (EU-SILC), to estimate the income-related variables. In this paper, we generally use the same data sources as in AGENTA; however, to estimate the disaggregated profiles for private consumption we rely on national consumption surveys of the countries we analyse. National surveys usually include more detailed information, particularly at the personal level, and for all the age groups (HBS data are reported for 5-years age groups only). Both EU-SILC and national HBS contain enough information on the respondent's characteristics both at the individual or household levels so that average per capita profiles by education level and family type can be estimated.

Table 2 describes the list of NTA variables for which we obtain age profiles. Variables in the first column are the main variables that appear in Equations [1] and [2] above. The next columns show the decomposition of these main variables into more disaggregated ones. In the case of public transfers (*TG*), the total or net amount corresponds to the difference between transfers received (or public transfer inflows, *TGI* in the equations) and transfers paid to the public sector (public transfer outflows, *TGO*). For the rest, variables in the left are always the sum of its components appearing below and to the right in the following columns. The last column shows the source from which the age profiles have been estimated for the corresponding variable. For example, private consumption (CF) is decomposed into three categories: education (CFE), health (CFH) and other (CFX), and the age profiles for these three variables are obtained from the (national) Household Budget Survey.

Variables whose profiles are obtained from EU-SILC include labour income, in-cash public transfers, taxes on asset income, returns to capital from own-occupied housing and inter-household private transfers. Of these variables, only labour income and some in-cash public transfers (pension benefits, unemployment benefits, health cash and education cash) are reported at the personal level. The rest of the variables are reported at the household level and then allocated to household members using the standard NTA procedures.

Regarding public consumption (equal to in-kind public transfers), we need to recur to other data sources, as neither HBS nor EU-SILC provide information. Data on public education expenditure and enrolment by education level from Eurostat and UNESCO are used to obtain a disaggregated profile of public expenditure in education (CGE) by enrolment status and by education level. We assume that up to age 16, everyone is enrolled in education (except for early ages when education is not mandatory, for which we use the enrolment rate provided by Eurostat). For ages 17 to 25, we obtain different profiles for enrolled and non-enrolled individuals. Public education expenditure by age is assigned only to enrolled individuals, according to enrolment shares in each level and to their family status (whether they are dependent or independent children). In the case of dependent children, we obtain a separate profile for those who have low, medium, and high-educated parents. For ages above 25, we estimate a profile by age and education level using the aiming population at each level of education (see Appendix A for more details).

In the case of public consumption of health (CGH), there is no available information that allows to estimate a disaggregated profile by level of education and family type. The exception is Spain, where we could disaggregate public consumption of health by level

[8] In the case of Austria, the profiles are derived from the national consumption survey, as this country is not present in HBS by Eurostat.

of education, using national administrative data (provided by INE[9]) on the share of coverage of health public services by education, sex and age group. For the other three countries, the profile of public consumption of health is estimated using gender and age-specific shares taken from AGENTA.

Table 2. List of NTA variables and source of their profile

Variable name				Variable description	Profile
YL				Labour income	
	YLE			Labour income, earnings	EU-SILC
	YLS			Self-employment labour income	EU-SILC
C				Consumption	
	CF			Private consumption	
		CFE		Private consumption, education	HBS
		CFH		Private consumption, health	HBS
		CFX		Private consumption, other than education and health	HBS
	CG			Public consumption	
		CGE		Public consumption, education	Eurostat/ UNESCO AGENTA/ INE-Spain
		CGH		Public consumption, health	
		CGX		Public consumption, other than education and health	
			TGSOAII	In-kind public transfers, social protection, old age	TGSOAIC
			TGSUII	In-kind public transfers, social protection, unemployment	TGSUIC
			TGSFII	In-kind public transfers, social protection, family and children	TGSFIC
			TGSHII	In-kind public transfers, social protection, housing	TGSHIC
			TGSDII	In-kind public transfers, social protection, sickness and disability	TGSOAIC
			TGSXII	In-kind public transfers, social protection, miscellaneous	---*
			TGXII	In-kind public transfers, other consumption	---*
TG				Public transfers (net)	
	TGI			Public transfers, inflows (received)	
		TGIC		Public transfers, inflows, cash	
			TGEIC	Public transfers, inflows, education, cash	EU-SILC
			TGHIC	Public transfers, inflows, health, cash	EU-SILC
			TGSOAIC	Public transfers, inflows, old age social protection, cash	EU-SILC

[9] *Instituto Nacional de Estadística* (Spanish National Institute of Statistics).

Variable name				Variable description	Profile
			TGSUIC	Public transfers, inflows, unemployment, cash	EU-SILC
			TGSFIC	Public transfers, inflows, family and children, cash	EU-SILC
			TGSHIC	Public transfers, inflows, housing, cash	EU-SILC
			TGSXIC	Public transfers, inflows, other social protection, cash	EU-SILC
			TGXCI	Other public transfers, inflows, cash	---*
		TGII	= CG	Public transfers, inflows, in-kind	
	TGO			Public transfers, outflows	
		TGF		Taxes	
			TGFYA	Taxes on asset income	EU-SILC
			TGFYL	Taxes on labour income	YL
			TGFC	Taxes on consumption	CF
			TGFX	Taxes, other than on consumption, labour and asset income	---*
		TGP		Social contributions	
			TGPYL	Social contributions on labour income	YL
			TGPPEN	Social contributions on pensions	TGSOAIC
		TGX		Other current transfers	---*
TF				Private transfers	
	TFB			Private transfers, inter-household	EU-SILC
	TFW			Private transfers, intra-household	NTA
YA				Asset income	
	YAF			Private asset income	
		YPF		Private property income	
			YMF	Private interest	TGFYA
			YPFX	Other property income	TGFYA
		YKF		Private capital income	
			YKFH	Returns to capital from own-occupied housing	EU-SILC
			YKFB	Returns to capital from mixed income	YLS
			YKFC	Capital income from corporations	TGFYA
	YAG			Public asset income	TGO
S				Savings	
	SF			Private savings	NTA
	SG			Public savings	TGO

*A uniform profile by age is assumed.

Some variables for which an age profile could not be estimated from available data are assumed to have the same profile of another related variable for which it could be

estimated. It is the case of taxes on labour income (TGFYL) and on consumption (TGFC), social contributions (TGPYL and TGPPEN), private interest paid and received by households (YMF), other property income (YPFX), capital income from corporations (YKFC), return on capital from mixed income (YKFB), public asset income (YAG) and public saving (SG). The last column in Table 2 reports the pre-estimated age profile that is used in each case.

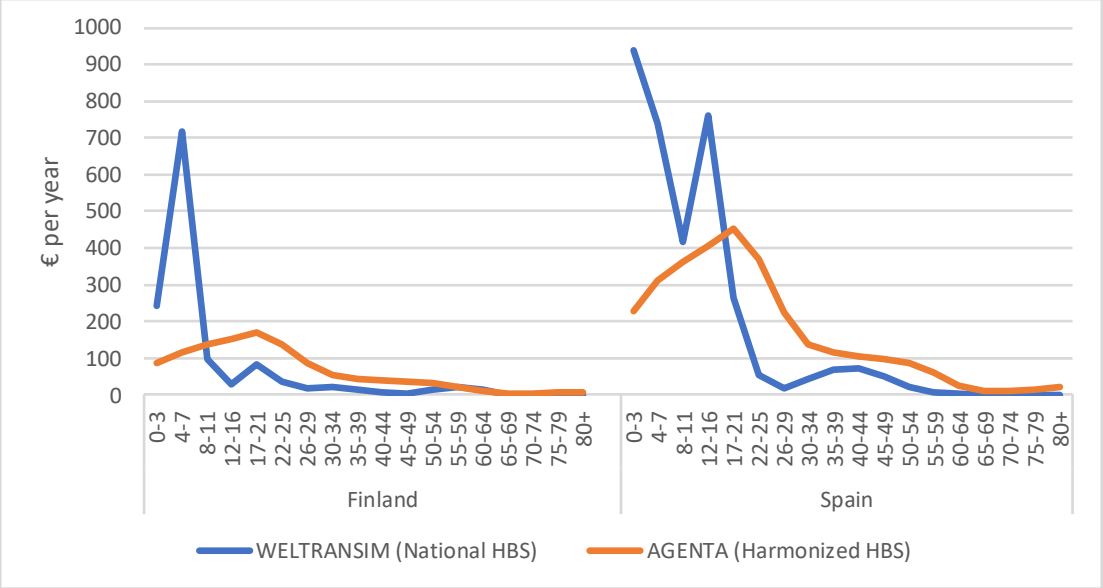
There is another group of variables for which we could not estimate an age profile: in-kind public transfers other than education and health (TGSII and TGXII), other public transfers received in-cash (TGXCI), other taxes (TGFX) and other current transfers (TGX). We assume that these expenditures are uniformly distributed across age, sex, education and family type.

Intra-household private transfers (TFW) and private savings (SF) are not estimated from external data but obtained following the NTA methodology. Intra-household transfers are estimated indirectly as the difference between age-specific disposable income and consumption, which have been calculated previously. Private saving is estimated as the final balancing item in NTA, obtained using Equation [1].

We depart from AGENTA –obtaining a different profile by age– in the following cases:

- Consumption of private education (CFE) in Finland and Spain: due to lack of data in the HBS for these two countries, the average profile for EU countries with available data was used in these cases to derive the AGENTA profile. On the contrary, we have estimated the profile using the national survey on consumption instead, and we have decided not to smooth it in order to keep the information on real age differences. Figure 2 shows the comparison for each country and Appendix B details the procedure employed in each case and provides additional explanations.

Figure 2. Per capita age profiles of consumption of private education in Finland and Spain obtained in AGENTA and this study (WELTRANSIM model)



Sources: AGENTA profile from AGENTA data explorer (http://www.agenta-project.eu/en/dataexplorer.htm); WELTRANSIM profile from authors' estimations

- Public consumption other than education and health (CGX) in Spain. This variable includes two categories: individual consumption (which can be allocated to the beneficiaries of public programmes) and collective consumption (including

consumption of public goods, which cannot be allocated by age). In Spain, due to data limitations, AGENTA used an average profile of EU countries for this individual consumption part of CGX. However, given that sickness and disability in-kind, which is the main component of individual public consumption inside CGX, is negligible in Spain, we decided to keep a flat age profile for this variable, assuming all public consumption included in CGX is collective consumption and is shared equally among all individuals regardless of their age.

- Inter-household transfers (TFB) in Spain. In this case, the aggregate controls for inflows and outflows in AGENTA were estimated from SNA data, adding a more complete aggregate for outflows. In Spain, these aggregates are much higher than the corresponding inflows and outflows obtained from EU-SILC, from which the age profiles are estimated. This was not a problem for the non-disaggregated age profile in the AGENTA project, but when disaggregating it by education and family type, it turns out that there are significant differences in this kind of transfers by family type, single parents being the largest beneficiaries of inter-household transfers received. Hence using the same aggregate controls than in AGENTA resulted in huge non-realistic profiles of this kind of transfers received by single parents. Thus, we opted for keeping the value of inter-household transfers given (outflows) as reported in EU-SILC and adjust only inter-household transfers received (inflows), which are typically underreported in the survey,[10] in the required amount to ensure that the aggregate for net transfers is the same as in AGENTA. Although the scale is quite different, the shape is similar, going in the same direction at the different stages of the life cycle (being positive for working ages and negative at old ages).

3. Disaggregated NTA profiles

Figures 3-12 show the main disaggregated NTA profiles obtained for Austria, Spain, Finland and the UK. We have included only the key variables for illustrative purposes, but the profiles for more disaggregated variables are available in the microWELT website.[11] To ease comparability across countries, all variables are normalized, dividing their value by the average per capita labour income at ages 30 to 49 in the corresponding country, as usual in NTA. From now on, we will refer to this concept as YL 30-49. The figures also include at the end the aggregated or total profile, which corresponds to the per capita average age profile for all men and women not distinguished by education level or family status.

When looking at the figures, one should bear in mind that single parents are not distinguished by sex, due to the low representativeness of this type of family for men and for some age groups. In fact, on average more than 85% of single parents with dependent children are women in the countries considered, and in the case of single fathers they represent only around one percent of the male population at ages 17-59. Note also that dependent children are distinguished by their parents' education level but not by sex, while independent students are neither distinguished by sex nor by education level.

Labour income (Figure 3): the first thing that can be observed is that labour income is higher for men, as it has been well established in the NTA and other literature strands. This is due to the difference in wages of fully employed men and women and due to the differences in labour market participation and employment rates of men and women. It

[10] This is the same adjustment method used in AGENTA. The first NTA Manual (UN, 2013) detailed four different methods to adjust TFB depending on data availability and the degree of underreporting.
[11] For example, all types of consumption are included in a single variable in Figure 4, but specific profiles for each type of private and public consumption have been calculated.

is also well known that labour income increases with education, as can be seen in the figure. Finland is the country where we observe lower differences in labour income by sex and education level, while UK is the country with the highest differences, highlighting the role of the welfare state regime in the observed countries.

Looking at family types, fathers tend to have higher income than childless men in Austria and Finland, while this is true only for medium educated men in Spain and for high educated men in the UK. In the case of women, the opposite occurs: mothers have lower labour income as compared to childless women in all countries, the difference being lower in Spain and Finland, and higher in Austria. These observations suggest a lower labour market participation of women, and especially of mothers, even if high educated. Indeed, in Austria there is a high percentage of women working part-time, especially after a child is born. In all countries, men in a couple have higher labour income than single men, while this is not necessarily true for women, depending on parenthood status and the country.[12] In general, but especially in Spain and Finland, women have more similar labour income by family type than men for all education levels.

In the case of students, we observe that labour income is lower for those with high educated parents (except in the UK), probably due to a lower participation rate linked to education decisions.

Consumption (Figure 4): both private and public consumption are included in this figure. Differences in consumption are smaller than differences in labour income in all dimensions (sex, education and family type). Spain is the country with the highest differences in consumption by education level, whereas Finland is the country with the smallest differences. A pattern that is common in all countries is that parents have lower consumption than non-parents, especially at working ages. This is consistent with the fact that they share part of their private consumption expenditure with their children. Comparing singles and couples, we see that in Austria singles have in general higher consumption (the difference increasing by age). This can be explained to some extent by economies of scale (some expenditures are shared when living in a couple). However, this does not happen in the other three countries. Overall, differences in consumption by family type reflect variations in private consumption, as public consumption is not distinguished by parenthood nor partnership status. In the case of dependent children, there are differences by education level, which are due both to private consumption and public expenditure on education.

Life cycle deficit (LCD) (Figure 5):[13] As a result of differences in the labour income and – to a lesser extent– consumption age profiles, the LCD differs substantially across all dimensions. It can be observed in the total profile that the LCD is negative at most working ages, meaning there is in fact a life cycle surplus as labour income exceeds consumption during that period of life of the representative individual. Focusing on the disaggregated profiles, we observe that, in the low education group, single men have practically no surplus along their life cycle, and the same is true for women, both singles and in a couple. In general, surpluses at working ages are higher for men in a couple than for single men (due to higher labour income), and higher for fathers in a couple than for childless men (due to lower consumption), with a few exceptions in Spain and the UK. For childless women, those in a couple have higher surpluses if middle or high

[12] The kink that can be observed for young adult ages in the labour income profile is due to the fact that at ages 17-25 the adult profiles only include individuals who are not enrolled in education, while this is not the case from age 26 on. Enrolled young adults are included either in "dependent children" if they live with their parent(s) or "independent students" in case they don't.

[13] Recall that the LCD is defined as the difference between consumption and labour income.

educated in Austria and Finland, while the only mothers in a couple with a surplus are the high educated ones in all countries, and also the middle-educated ones in Finland.

In all countries, the highest surpluses are achieved for fathers in a couple. In Austria, these reach 0.5, 0.8 and 1.3 times *YL 30-49* respectively for low, medium and high educated men when they are in their 40s. For women, the differences by education level and family type are lower. In Austria, the highest surpluses for women are achieved for single mothers: medium educated single mothers reach as much as 25% of *YL 30-49*, while high educated ones reach 0.65 times *YL 30-49*.

In Spain, the highest surpluses for men reach similar values than in Austria except for single childless men, who have less surplus if medium or high educated. Spanish high educated mothers in a couple have larger surpluses than in Austria and from an earlier age, due to higher labour income. In Finland, the differences in LCDs by sex are less pronounced, coherent with a more active gender equality policy. In the UK, the LCDs are higher for low and middle educated groups, but for high educated men in a couple the LCD reaches the lowest minimum of all countries, of more than 1.8 times *YL 30-49* in the case of fathers.

It is also worth mentioning that the (positive) LCD at old ages, which starts at age group 60-64 in the aggregated or total profile, appears earlier for single men (as compared to men in a couple) in all countries. As discussed earlier, they have lower labour income and, in some countries, higher consumption (especially at older ages), having a higher difference between consumption and labour income throughout their life course.

The LCD for dependent children with low and middle educated parents has an inverse U-shape in Austria and the UK, which can be explained by the lower public expenditure on education after age 16 in Austria and 12 in the UK. In these two countries, for children with high educated parents, the LCD stays relatively high at older ages due to their lower labour income. Independent students aged 17 to 25 have also a positive and substantial LCD, of around 50% of *YL 30-49* (somewhat higher in Spain and lower in Finland).

Public transfers: ***a) received (inflows)*** (Figure 6): at working ages, parents receive higher transfers from the public sector, because they receive family and children related allowances, which are quite similar across education levels and sex. This pattern can be clearly observed in Austria and Finland, but much less in Spain and the UK, reflecting differences in the generosity of the welfare states in this respect.

Single parents are the main group receiving unemployment benefits in Austria and Spain. Low educated single parents are the highest beneficiaries of this kind of transfers in Austria (reaching around 10% of *YL 30-49*, while in Spain this happens for middle educated single parents (with more generous benefits and/or higher unemployment rates, achieving more than 20% of *YL 30-49*). These benefits are much lower in Finland (due to higher employment rates) and especially in the UK (due to lower social benefits from the less generous welfare state in this country).

At old ages, pension benefits are the main in-cash public transfers received, and these are increasing by education level and are much lower for couples in the case of women, probably due to their lower labour income earned during working ages. These benefits are less generous in the UK. In Finland, interestingly enough, public transfer inflows at old ages are not lower for women in a couple, consistent with their higher labour market participation accomplished by full employment policies.

b) paid (outflows) (Figure 7): taxes and social contributions paid to the public sector are higher for men and increasing by education level (both for men and women). Looking at the total profile of public transfer outflows, we see that at working ages Finland is the

country with the highest outflows and the UK with the lowest. These differences arise from the level of redistribution underlying the welfare state in each country. At old ages, UK is the country with the highest outflows and Spain with the lowest.

Among family types, men in a couple have the highest outflows in all countries, and the gap with respect to single men is lower in Austria (although in Finland high educated men have a similar amount of outflows regardless of their partnership status). Mothers in a couple have the lowest outflows, consistent with their labour income profiles.

In general, the profiles of public transfer outflows are more heterogeneous by family type than the corresponding profiles of inflows. The stronger differences in outflows reflect the ones observed above for labour income, although they might also be due to differential tax allowances related to parenthood status.

c) Net public transfers (Figure 8): the resulting net public transfers are always negative for men at working ages (except for low educated young men in a couple in the UK), and their magnitude changes substantially across education levels. Finland is the country for which there is a higher difference between net public transfers for low and high educated men at working ages, followed by Austria. Finland is also the country where taxes, social contributions and public transfers are larger, as can be observed in the total or aggregated profiles of inflows and outflows. Thus, this country seems to have a more effective redistributive policy.

Men in a couple usually have lower net public transfers than single men at working ages (except in Austria, and in Finland for the highest educated), which results from higher taxes and social contributions paid from their higher labour income. For women, the profiles for mothers are generally above those of childless women at working ages (with some exceptions in Finland). In Austria, single women at old ages receive higher net public transfers for all education levels.

At old ages, net public transfers are generally higher in Finland and lower in Spain and the UK in all dimensions (sex, education level and family type).

We observe lower differences among family types in Finland, followed by Austria for men and by Spain for women. In the case of independent students, net public transfers are always positive, and these are higher in Spain, followed by Finland; and lower in Austria and the UK (due to public education policy). In the case of Finland, the higher public transfers could explain the observed pattern of young adults leaving home earlier, while the extended role of the family in Spain seems to outweigh the high amount of public transfers for young adults in this country, who stay far longer at home.

Note also that when net public transfers are positive, that is for children and for the elderly, these transfers are more generous for the elderly than for children, as can be observed in the total or aggregated profile. This pattern is stronger in Finland, which has lower net public transfers to children. Looking at the disaggregated profiles, this may not happen for low educated women in a couple in Austria and Spain, who seem to receive lower net public transfers at old ages.

Private transfers (Figure 9): for any sex and education level, net private transfers are always the highest at young ages. This may seem obvious as children only receive (they do not give) transfers, so net private transfers are always positive for them. But looking only at transfers received by age (i.e. private transfer inflows) we see that the amount of these transfers is always higher for children than for adults and the elderly. Spain is the country with the highest amount of private transfers received by children, ranging from between 15 and 34% of *YL 30-49* for children of low educated parents, to 33-58% of *YL 30-49* for children of high educated parents. This is in line with late emancipation patterns

of young people in this country. Independent students aged 17-25 also have positive private net transfers, which again are more generous in Spain, followed by the UK, and less generous in Finland. As has been explained above, in social democratic countries like Finland the public sector takes care of children mainly visible in labour income and family transfers.

For single childless men and women, net private transfers – which include intra and inter-household transfers – are usually close to zero. The exception are some men at working ages who are divorced or separated and give inter-household transfers to their ex-partner, usually a single mother.[14] Intra-household transfers are obviously inexistent for this (single childless) family type. In the case of childless couples, net private transfers are negative for men and positive for women. This is due, on the one hand, to the household head assumption of standard NTA, which implies that inter-household transfers and some of cash transfers mainly go to the household head, who is usually a man. On the other hand, it is also due to the higher labour income for men but not so high differences in consumption between men and women.

For this same reason a similar pattern can be observed for fathers in a couple, with negative net transfers, but in this case with much higher absolute amounts, due to the transfers given to children in addition to the spouse. With respect to mothers in a couple, in Austria and the UK they have a surplus along their life course (meaning they are net receivers of private transfers). This results from large differences in labour income by sex in these two countries, although for different reasons: in Austria this is true because in conservative countries the traditional role of the family is highly emphasized – implying there is a huge part time employment for women; In the UK this is because of gender inequality in the labour market, resulting in substantial differences in earnings for men and women. In the case of Spain, high educated mothers in a couple have negative net private transfers at ages 30-59, and in Finland this happens at all education levels, due to full employment policies and accentuated gender equality in this country, which is possible as the state provides generous transfers for families with children.

In all countries single parents are net givers of private transfers during working ages, having the typical U-shape, but from age 60 onwards they have zero net private transfers, when they live on their own and no longer have dependent children to take care of. However, low and medium educated single parents in Finland are net receivers of private transfers at young ages.

Net private transfers given, which are the highest for fathers in a couple in their 40s, are higher in Spain followed by the UK, and are lower in Finland. Looking at the aggregate profiles of transfers given and received, we observe that during working ages both types of transfers are higher in Finland, but when computing net transfers they are similar than in the other countries, which is the same that happened with public transfers. Again, this reflects the presence of a high level of income redistribution in Finland.

It is interesting to observe how the amount of net private transfers received at old ages falls short of transfers received by children, contrary to what happened with public transfers. This can be seen also if we look only at private transfer inflows, i.e. transfers received without subtracting transfers given. Women who live in a couple always receive more than men, which is partly due to the household head assumption and partly to the higher differences in labour income by sex with respect to consumption, but these positive amounts are always lower than the ones received by children.

[14] According to our definitions, if not living with dependent children, individuals are considered childless (since we cannot identify whether they are parents from the survey).

Total net transfers (Figure 10): looking at the aggregate profiles of total net transfers, they show a similar size in the two dependent life cycle stages in the four countries, being a little lower for children in Finland and for the elderly in the UK. However, private and public transfers have quite different sizes: while net public transfers are higher for the elderly, net private transfers are higher for children. This fact has been previously observed in the NTA literature (Patxot et al., 2012; Gal et al., 2017), and the NTA profiles by family type obtained give a deeper account of it.

Looking at the disaggregated profiles, we see that fathers in a couple are the ones with higher negative total transfers (public and private) during working ages in all countries, followed by childless men in a couple. The differences between childless women and mothers in a couple are much lower, indicating that parents in a couple contribute more than childless couples in providing for transfers to the dependent population.

Children and independent students receive higher total transfers in Spain, while the elderly receive higher net transfers in Finland and lower in the UK.

Private asset income (Figure 11): it is usually higher for men in a couple (due to the household head assumption), and more clearly for the high educated group. The patterns in this variable are less clear among family types. As expected, the aggregated or total profile is increasing by age until 60-70 years of age. In general, it is substantially higher for the UK (where it increases more along the lifecycle) and lower for Finland. This difference is coherent with the higher protection received from welfare state transfers in social democratic countries like Finland, while in liberal welfare states (UK) individuals rely more on markets – so asset income is high, whereas pensions are low.

Private saving (Figure 12): As in the case of asset income, the patterns are quite unclear. The most visible one is that saving is higher for high educated men, especially for couples. Single parents have negative savings in Spain and the UK. In the latter case, this is consistent with lower transfers received due to a less generous welfare state and the lower extended role of the family. In Spain, this occurs despite the larger public transfers received by single parents, due to the higher private transfers that single parents give to their children, for which they need to take loans and hence dissave.

In Finland, single childless individuals have the lowest savings regardless of education. This can be explained by a lower need of precautionary savings at later ages given the expected transfers they will receive from the welfare state.

In the case of young adult students (ages 17-25), private saving is negative and the dissaving is larger in the UK and Austria, which are the countries with a lower coverage of education from the public sector at these ages.

4. Summary and conclusions

In this last section we provide a short summary of the main results obtained when disaggregating NTA profiles by sex, education level, and family type, followed by a discussion of the role of different welfare state regimes, and ending with the main limitations of the analysis and a discussion of further work.

From a gender perspective, as expected, average labour income is higher for men than for women due to the gender gap in participation, employment rates and wages. Since consumption patterns are similar by sex, women have lower life cycle surpluses (or even deficits sometimes) at working ages. Net public transfers are also higher for women than for men, due to lower outflows (women pay less taxes and social contributions given their lower labour income). Regarding private transfers, women receive more transfers than

men and give less, resulting in a profile above the corresponding for men. Private asset income and private saving are also higher for men than for women. These results are reinforced by the household head assumption in the estimation of NTA profiles, which implies that some components of household income (like public cash transfers and interhousehold transfers) go to the household member with higher income, usually a man.

The results with respect to education levels also follow the expected pattern. Higher education levels imply higher labour income, higher total consumption, and lower life cycle deficits (or higher life cycle surpluses), as the differences in labour income exceed those in consumption. Public transfers received increase with education at old ages (as higher educated individuals receive more generous retirement pensions), while taxes and social contributions (i.e., public transfer outflows) increase with education during the whole lifecycle. Overall, net public transfers are lower the higher the education level, reflecting income redistribution. Net private transfers are more pronounced the higher the education level, reinforcing the pattern of public transfers and generating a declining profile of total net transfers by education level at a given age. Private asset income and savings are increasing with education.

Now we turn to the results regarding family types –the main novelty of our analysis– and relate all the socioeconomic dimensions to the welfare state regimes. Men in a couple have higher labour income than single men, leading to lower life cycle deficits, lower net transfers, higher asset income and higher private saving. Consumption is lower for parents than for childless individuals, consistently with the fact that parents share part of their private consumption expenditure with their children. As a result, parents have lower life cycle deficits (or higher surpluses) that are transformed in private transfers given to their children. Regarding total net transfers, fathers in a couple have the highest negative transfers (public and private) during working ages in all countries. In fact, parents provide a larger contribution in terms of transfers paid or given to take care of the dependent population, in particular of children.

Finland, representative of the Nordic or social-democratic welfare state model, is characterized by promoting social protection together with full participation in the labour market and having high employment rates. Public policies in this country tend to ensure protection at the highest standards for everybody independently of past contributions. These characteristics are reflected in the derived disaggregated NTA profiles, where we observe low differences in labour income by sex and education level and a high level of public transfers received and of taxes and social contributions paid. Finland has the highest inflows and outflows of public and private transfers, meaning that, with respect to other countries, on average individuals pay and at the same time receive more transfers; but the resulting net amount of transfers received is similar to the other countries considered. Finland has the highest differences in public transfers by education level, reflecting a high redistribution of income. It is also the country with the highest transfers to the elderly (especially public transfers) and with the lowest private asset income, in line with the more generous transfers expected at old ages.

Finish parents receive generous public transfers in the form of family and children related allowances. Regarding labour income, fathers earn more than childless men but the gap by parenthood status for women is much lower than in other countries, which is due to full employment policies. These policies also explain that women at old ages receive higher pension benefits, closer to men's, as compared to the other countries.

Austria represents the Continental or conservative model, where the institutions follow the traditional norms and the role of the family is important. Public transfers are generous,

especially family and children related allowances, although public education after age 16 is low as compared to Finland or Spain. In Austria, fathers have more labour income than childless men, while mothers have much lower labour income with respect to childless women, due to a high presence of part-time employment for mothers. For this reason, mothers who live in a couple are net receivers of private transfers.

In Spain, representing the Mediterranean model, the extended role of the family achieves the most central consideration, but the welfare state is characterized by significant gaps in protection, being focused especially at old ages. Private transfers are the highest in this country, and these are directed mostly to children. Family related allowances from the public sector are less important, leading to a higher participation of mothers in the labour market.

In the Anglo-Saxon or liberal welfare state regime the main role is given to the markets, and the public sector acts from a subsidiary perspective, guaranteeing a social minimum for all citizens. This is reflected in the profiles obtained for the UK, with large differences in labour income by sex and education level, leading to the highest variation in life-cycle deficits and to mothers in a couple being net receivers of private transfers during their whole lifetime. Public transfers are less generous, including retirement pensions. Therefore, private asset income is higher, to compensate for the lower transfers, and the elderly need to rely to a great extent on their savings.

Besides being interesting in itself, the analysis developed in this paper has several applications. First, it puts together different comparative EU data sources identifying gaps to be filled in order to be able to investigate the impact of the welfare state on income redistribution, both at intra and intergenerational levels. In this respect, it constitutes an extension of the NTA methodology exploring the potential of estimations at the micro level. Second, the cross-sectional profiles obtained can be used to estimate the lifetime contribution of individuals to their families and to the public coffers (see Spielauer et al., 2020d). Third, the disaggregated profiles obtained can improve the results of projection models investigating the impact of ageing on the sustainability of the economy and the welfare state transfers (see Spielauer et al., 2020c,d). Indeed, provided that the disaggregated profiles differ from the aggregated ones, this analysis turns out to be relevant to properly evaluate the expected changes in the composition of the population among these dimensions (including sex, education level, enrolment status, partnership and parenthood status). Finally, our analysis contributes to the literature on welfare models by directly measuring the degree of familiarization of the welfare models. Interestingly, our disaggregated profiles by parenthood status explain the size and direction of public and private transfers observed previously in NTA. While total net transfers show a similar size in the two dependent life cycle stages, net public transfers tend to be higher for the elderly, and net private transfers for children, although significant differences remain among countries.

Further research is needed in this direction to complement this analysis with disaggregated National Time Transfer Accounts (NTTA) and a refinement of the household head assumption. This would allow having a comprehensive view of the role of the welfare models in gender equality and investigating the extent to which the size of the welfare state and the role of the corresponding redistributive policy counteracts the impact of explicit or implicit measures of family policy.

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Appendix A: Disaggregated profiles for public education expenditure

To obtain disaggregated profiles of public education by enrolment status, parents' education level and own education level we use the following data:

1. Total public expenditure on education in year 2010 (from Eurostat).
2. Share of expenditure at each level of education (with respect to total public expenditure on education) in 2010 (from UNESCO).
3. Number of students by ISCED level and by age in 2010 (from Eurostat). Ages are by single years from 3 to 29, and by the age groups 0-2, 30-34, 35-39, 40+. For the latter 3 groups, the number of enrolled by single years of age is obtained using the Adult Education Survey 2011 from Eurostat.
4. Population – aiming education: obtained from EU-SILC, taking into account the level of education reported in the survey, and calculated for the whole population by age.
5. The level of education currently attended by individuals aged 16+ who are enrolled in education (which is reported in EU-SILC).

From (1) and (2) we find the amount of public education expenditure (CGE) at each education level. Dividing each one of these by the total number of enrolled in the corresponding level from (3), we find the expenditure per student at each education level, from now on (6).

For the first 4 age groups (ages 0-3, 4-7, 8-11, 12-16) we obtain an average profile of CGE by age using (3), (4) and (6). We first obtain the total amount of expenditure by age using (3) and (6) and then divide by (4) to find the per capita profile. The per capita expenditure by age obtained is not equal to (6) for several reasons:

a) It is a (weighted) average of the per capita expenditure at different levels of education where individuals of the corresponding age group are enrolled.
b) Although school enrolment for children up to 16 years old is mandatory in the four countries[15], the total population by age in (4) does not correspond exactly to the total number of enrolled by age from Eurostat (3). Total population is higher and hence the obtained profile is lower than (6).
c) In the early ages when education enrolment is not mandatory (age group 0-3 in all countries and also age group 4-7 in Finland) the total number of enrolled by age from (3) and total population by age and education level from (4) are not even close. Hence what we obtain is an average for all individuals in the corresponding age group regardless of their enrolment status.

For individuals aged 17-25, we can obtain a profile of CGE by age, own education and education level of the parents using (5). This is done in three steps:

a) We assign public education expenditure at ages 17-25 only to individuals who are enrolled in education (according to EU-SILC). Hence all individuals in age groups 17-21 and 22-25 who are not enrolled in education are assigned 0 public education expenditure regardless of their sex, education level and family type.
b) We obtain the average profile by age group and own education level of enrolled individuals at these ages from (6).
c) We use (5) to obtain the percentage of enrolled in education levels 1, 2 and 3 by education level of the parents (only in the case of dependent children; for non-dependent children, we do not have this information). Table A.1 shows these percentages in the four countries.

[15] The initial age of mandatory education differs across countries.

We use these percentages to obtain the CGE profile by age and parents' education, taking into account enrolment in one's own education (we weigh the profiles by age and own education level obtained in (b) with the shares of enrolment at each education level from the previous table for each type of student, according to the education of their parents if they are dependent children).

Note that for non-dependent children enrolled in education we don't know parents' education so we can only obtain a profile by age (taking into account enrolment in own education).

For individuals aged 25+, we do not distinguish between enrolled and not enrolled and we obtain an average profile by age and education level by dividing the total amount of expenditure by age and education level using (3) and (6) by total population by age and education level from (4).

Table A.1. Percentage of enrolment at each education level by education level of the parents and for independent students.

		children with low educated parents				children with medium educated parents				children with high educated parents				non-dependent students			
		AT	**ES**	**FI**	**UK**	**AT**	**ES**	**FI**	**UK**	**AT**	**ES**	**FI**	**UK**	**AT**	**ES**	**FI**	**UK**
ages 17-21	Low	0	18.4	0	6.9	1.5	10.7	0	1.8	0.5	2.9	0	0.4	0	19.4	0	1.9
	Medium	60	43.2	92.9	62.1	56.4	39.0	96.5	72.6	41.9	31.8	91.3	65.2	23.9	22.2	47.6	30.8
	High	40	38.4	7.1	31.0	42.1	50.3	3.5	25.6	57.6	65.3	8.7	34.4	76.1	58.4	52.4	67.3
	Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**
ages 22-25	Low	0	4.8	0	11.1	0	1.7	0	4.4	0	2.1	0	0	0	5.5	0	4.9
	Medium	25	19.0	50	0	7.1	7.5	40.9	13.0	3.8	5.0	14.9	10	5.6	27.8	14.2	21.3
	High	75	76.2	50	88.9	92.9	90.8	59.1	82.6	96.2	92.9	85.1	90	94.4	66.7	85.8	73.8
	Total	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Source: own calculations.

Appendix B: Private expenditure on education in Finland and Spain

B.1. Private expenditure on education in Finland

The Finish consumption survey provides data on private expenditure on education (CFE) disaggregated into three categories: day-care services for children (or pre-school care), textbooks and education expenses. The latter is in turn classified into three sub-categories according to the level of education: up to lower secondary (level 1), upper secondary and post-secondary non-tertiary (level 2), and tertiary education (level 3).

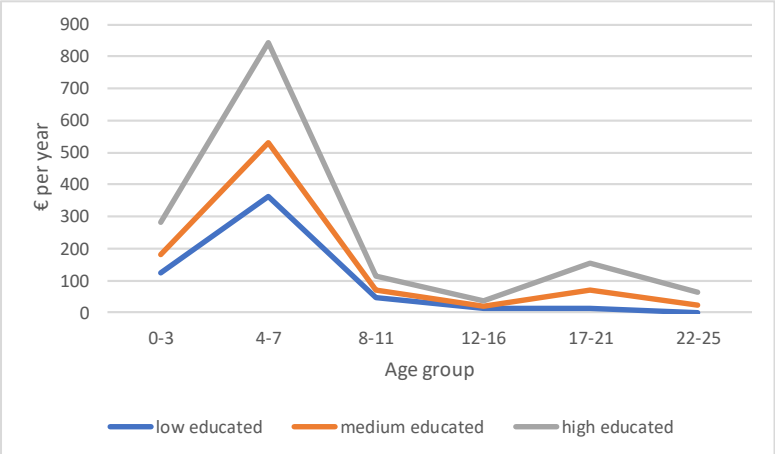
The largest category of CFE in this country is by far pre-school expenditure, which is mainly aimed at children between 3 and 6 years old, but also to some extent at younger ages. Note that school starts at age 6-7 in Finland. Pre-school care is mainly provided as public services. These are not free of charge, but they are heavily subsidised. We distribute this category of expenditure among household members using a regression on the number of young children by single years of age.

The rest of education expenditure, not having a clear pattern by age, is assigned by regression to all age groups in the household.

Figure B.1 shows the resulting age profile of CFE by education level of the parents. Private expenditure on education in Finland is mainly concentrated at age group 4-7, when pre-school care is most important. Above these ages, school is mandatory for children, and household expenditure on education is very small. This is explained by the wide coverage of the public education system in this country.

It is worth noting that public day care fees in Finland (for pre-school services) depend on income, and they are larger for higher income households. This is consistent with the results in Figure B.1, where CFE is higher the more educated (and hence the more income) the parents are.

Figure B.1. CFE profile by education level of the parents in Finland



Source: own calculations.

B.2. Private expenditure on education in Spain

The Spanish national consumption survey (EPF), unlike the Finish one, has information on the enrolment status of each household member[16]; this provides an additional information that can be used to obtain a more accurate profile for CFE. Private education expenditures in the survey are also classified by the level of education. Hence,

[16] In fact, this information is only available for individuals older than 15 years old and as long as the enrolment situation is exclusive (for example, if an individual is both working and studying, only the first situation is reported in the survey and s/he will appear as non-enrolled). However, since school is mandatory up to 16 years old in Spain, we assume the enrolment status of all children up to 16 is positive. One additional problem is that we don't know whether enrolment is in public or private education.

we can assign each type of education expenditure to the household members that are enrolled in the corresponding level according to their age. In order to do so, we assume that per capita expenditure is the same for all enrolled household members of a certain age. Education expenditures that do not correspond to any particular level of education are assigned in a second step by regression.

Similarly to the Finish case, two other types of expenditure are included in CFE: textbooks and day care services for children. We assign the latter to children using a regression where the explanatory variables are the number of children in the household by single years of age. For the former, we further distinguish between high education textbooks and other textbooks. The first are assigned to enrolled household members who are at least 18 years old, while the rest is added to the non-classified education expenditure and regressed on the number of household members by age group.

As can be observed in Figure 2 (from Section 2.2), private expenditure on education in Spain is concentrated at very young ages, when public education is barely present (up to 3 years old), and to a lesser extent at secondary school ages (12 to 16). After age 16, the age profile derived from the national survey falls drastically and is always below the AGENTA profile.

Figure 3. Disaggregated NTA profiles of labour income

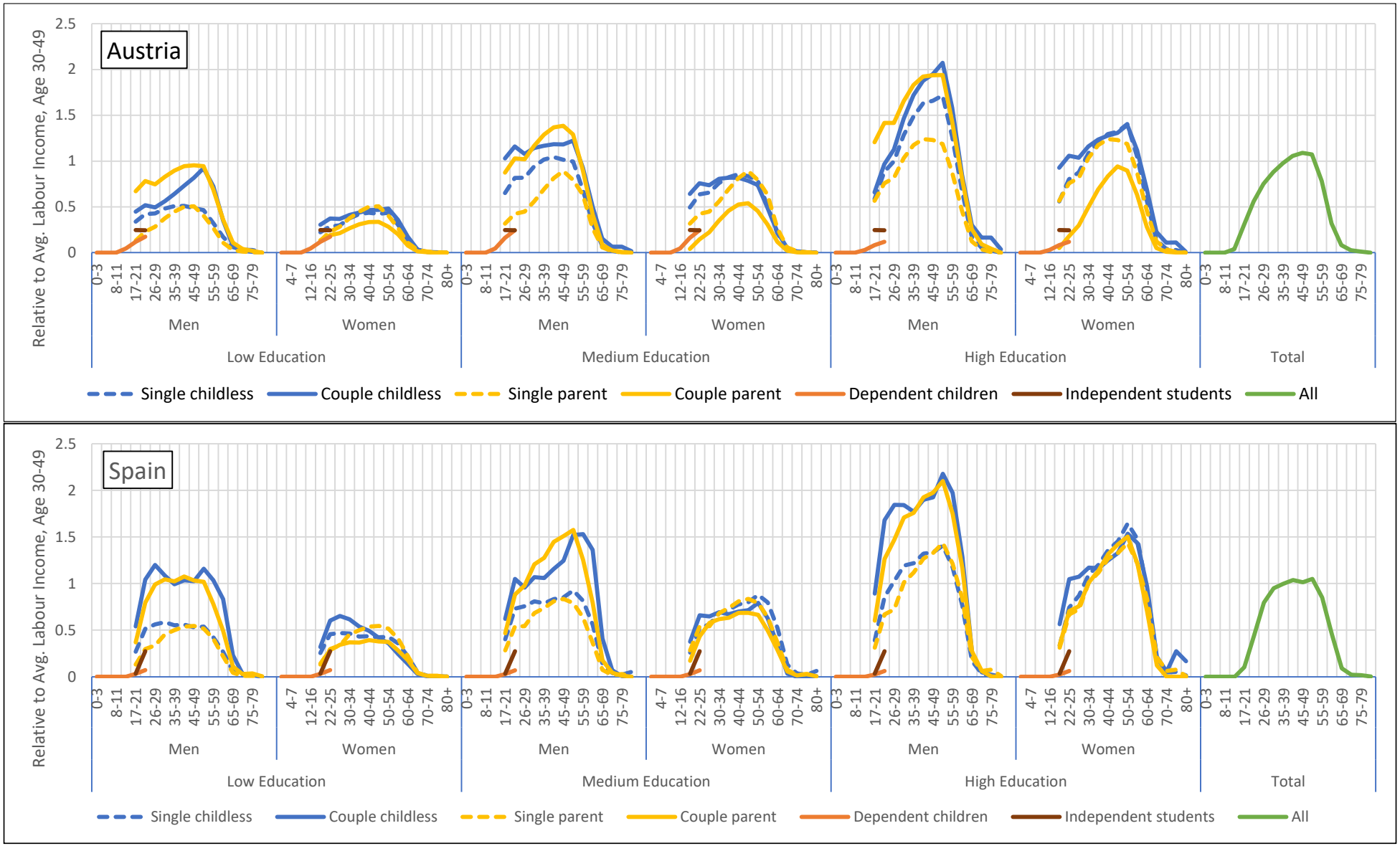


Figure 3 (continued). Disaggregated NTA profiles of labour income

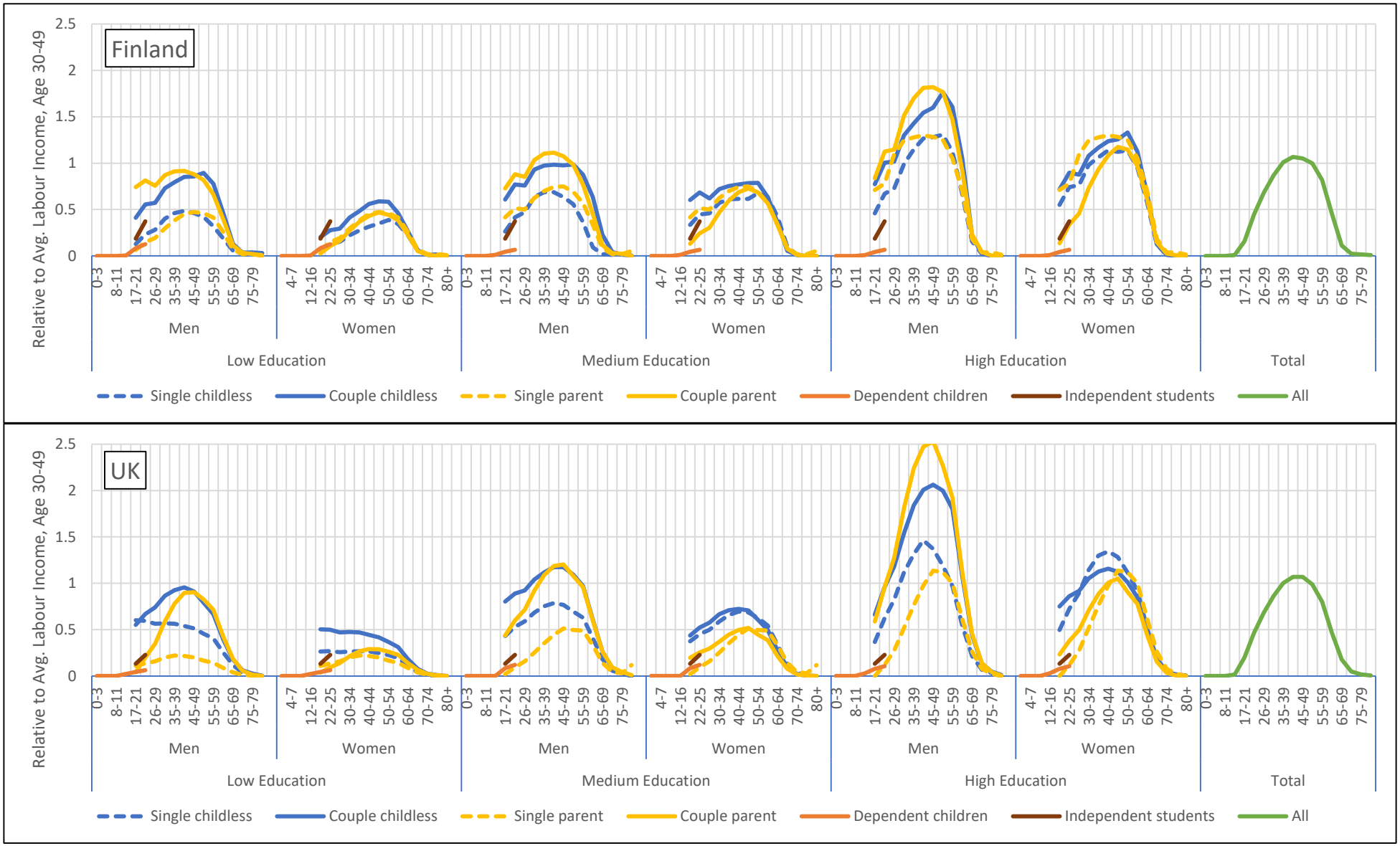


Figure 4. Disaggregated NTA profiles of consumption

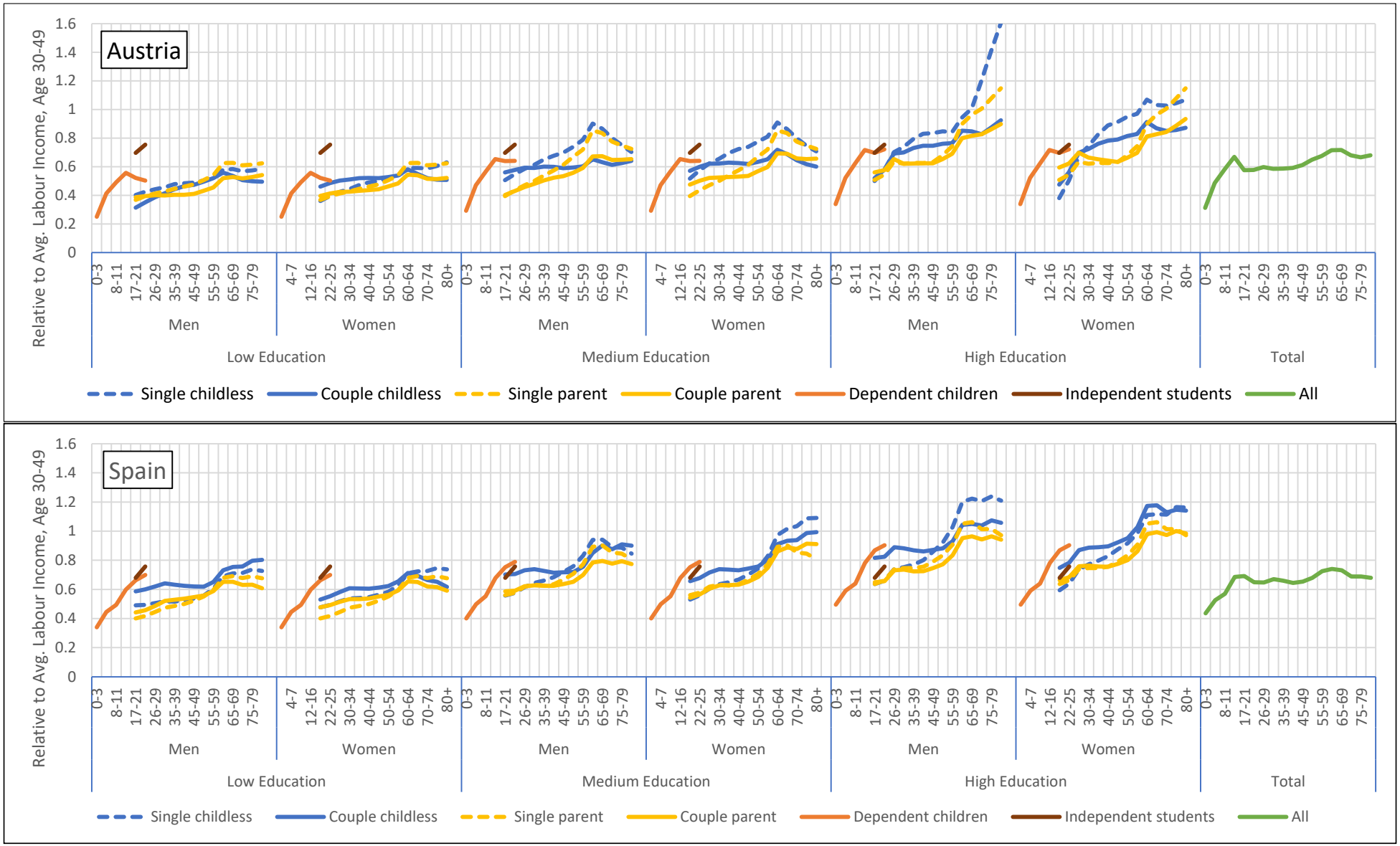


Figure 4 (continued). Disaggregated NTA profiles of consumption

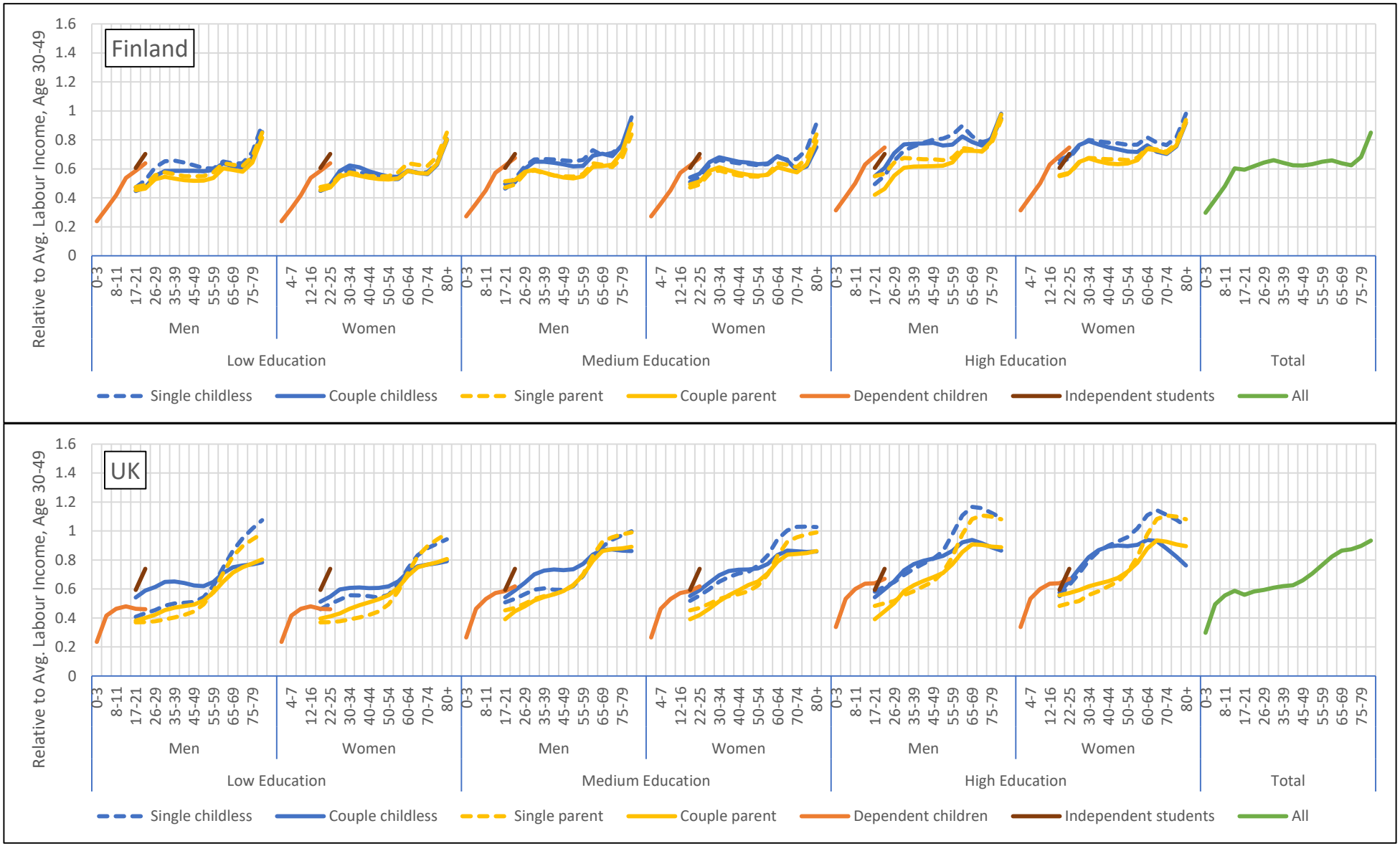


Figure 5. Disaggregated NTA profiles of life cycle deficit

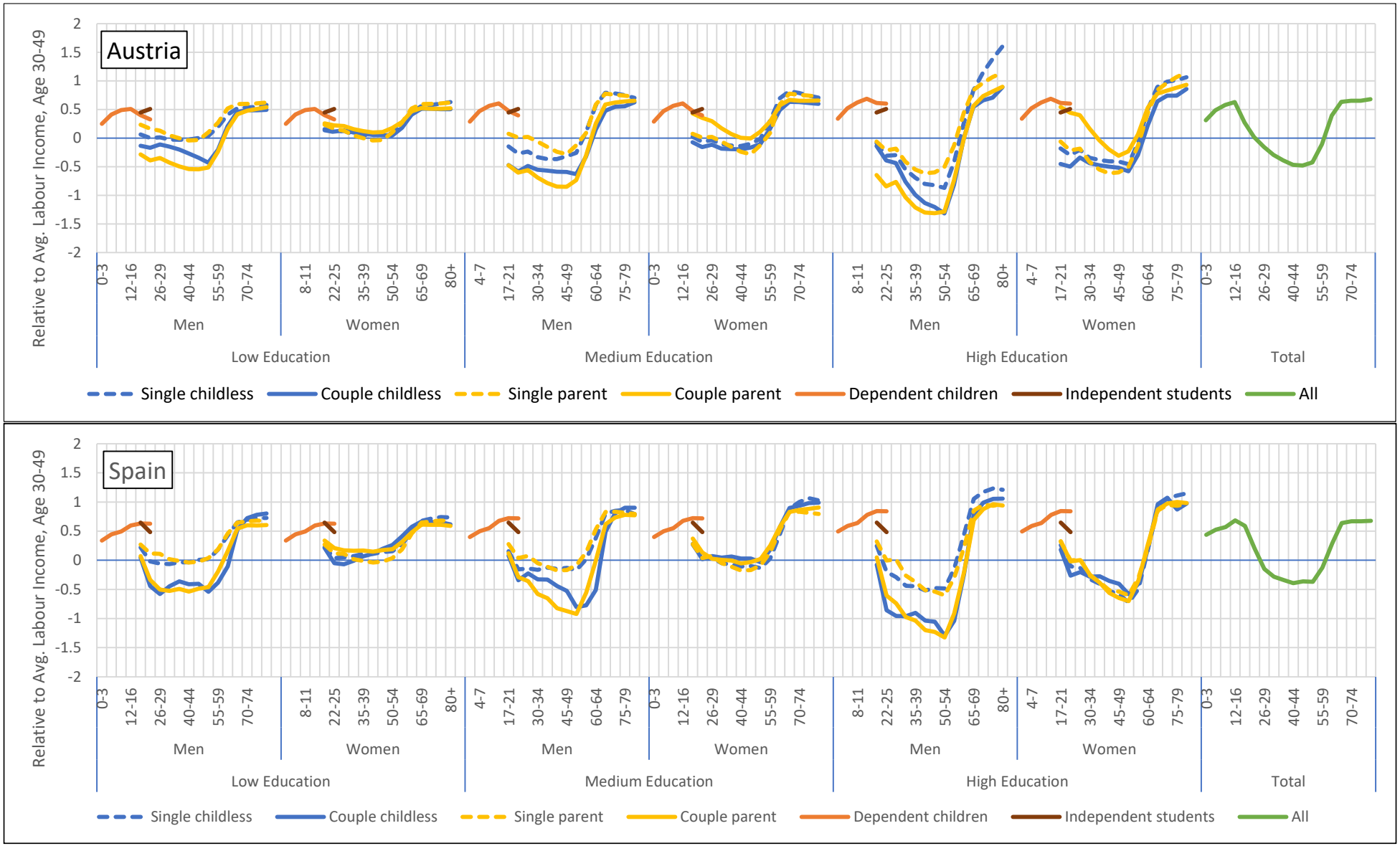


Figure 5 (continued). Disaggregated NTA profiles of life cycle deficit

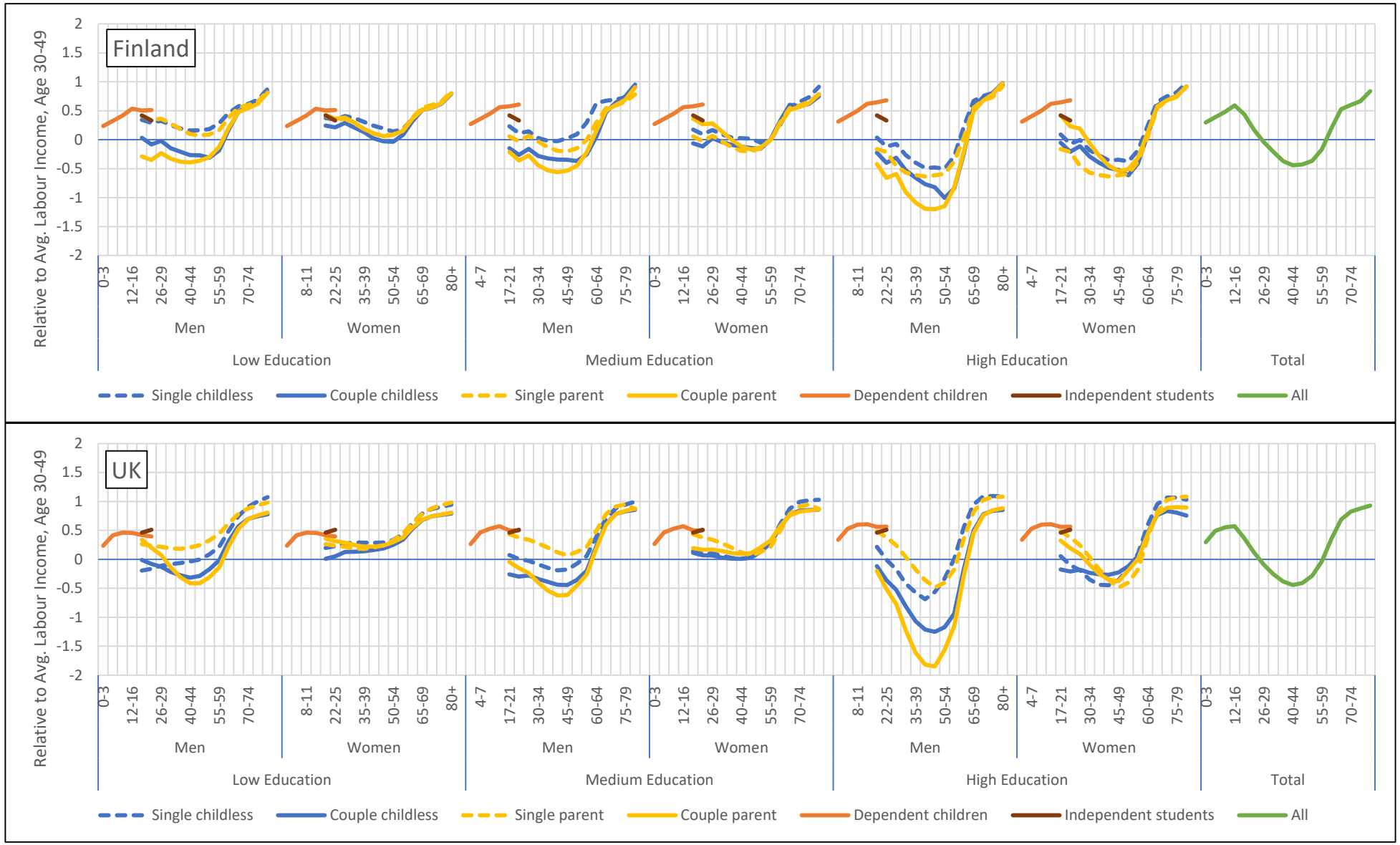


Figure 6. Disaggregated NTA profiles of public transfer inflows

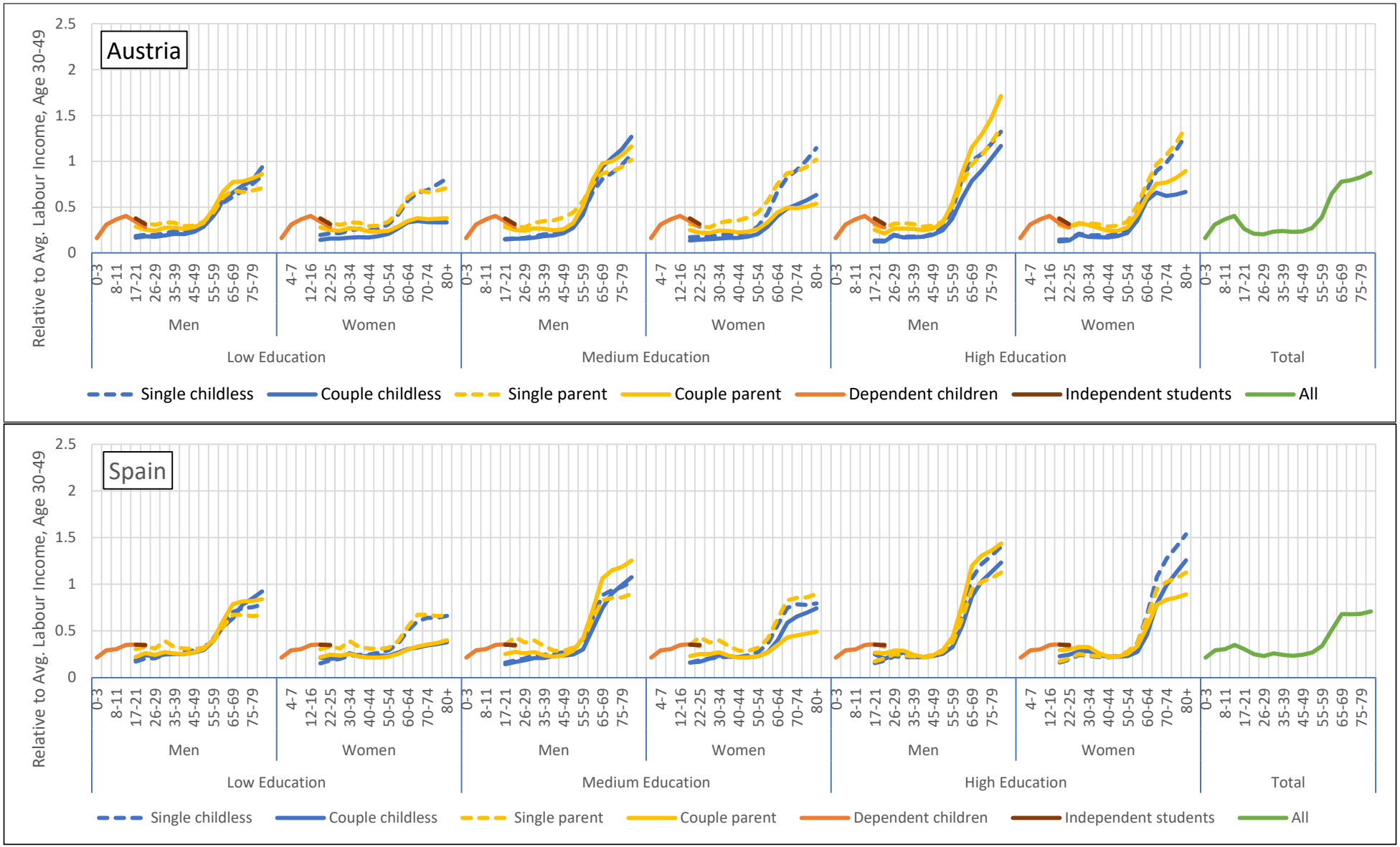


Figure 6 (continued). Disaggregated NTA profiles of public transfer inflows

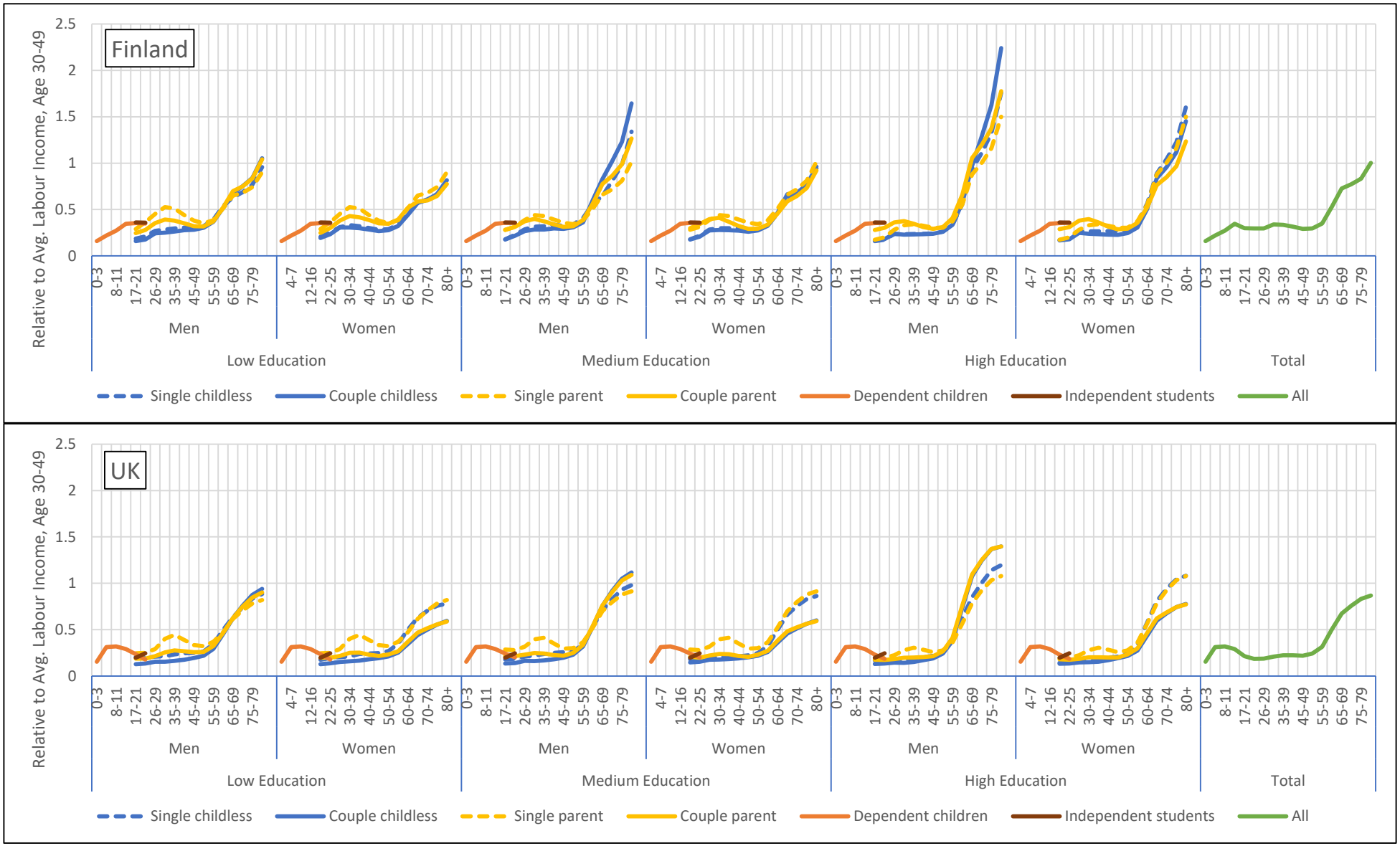


Figure 7. Disaggregated NTA profiles of public transfer outflows

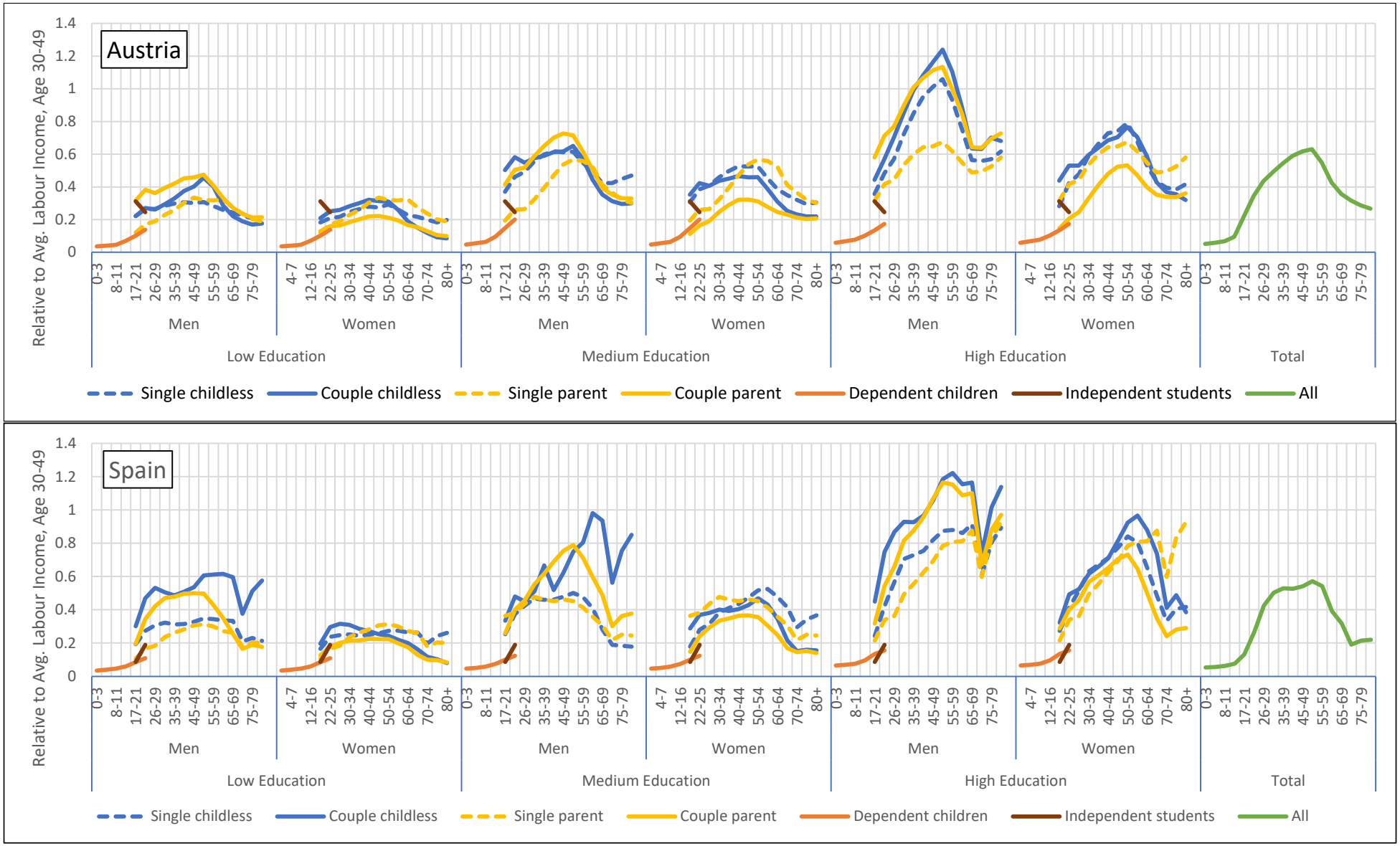


Figure 7 (continued). Disaggregated NTA profiles of public transfer outflows

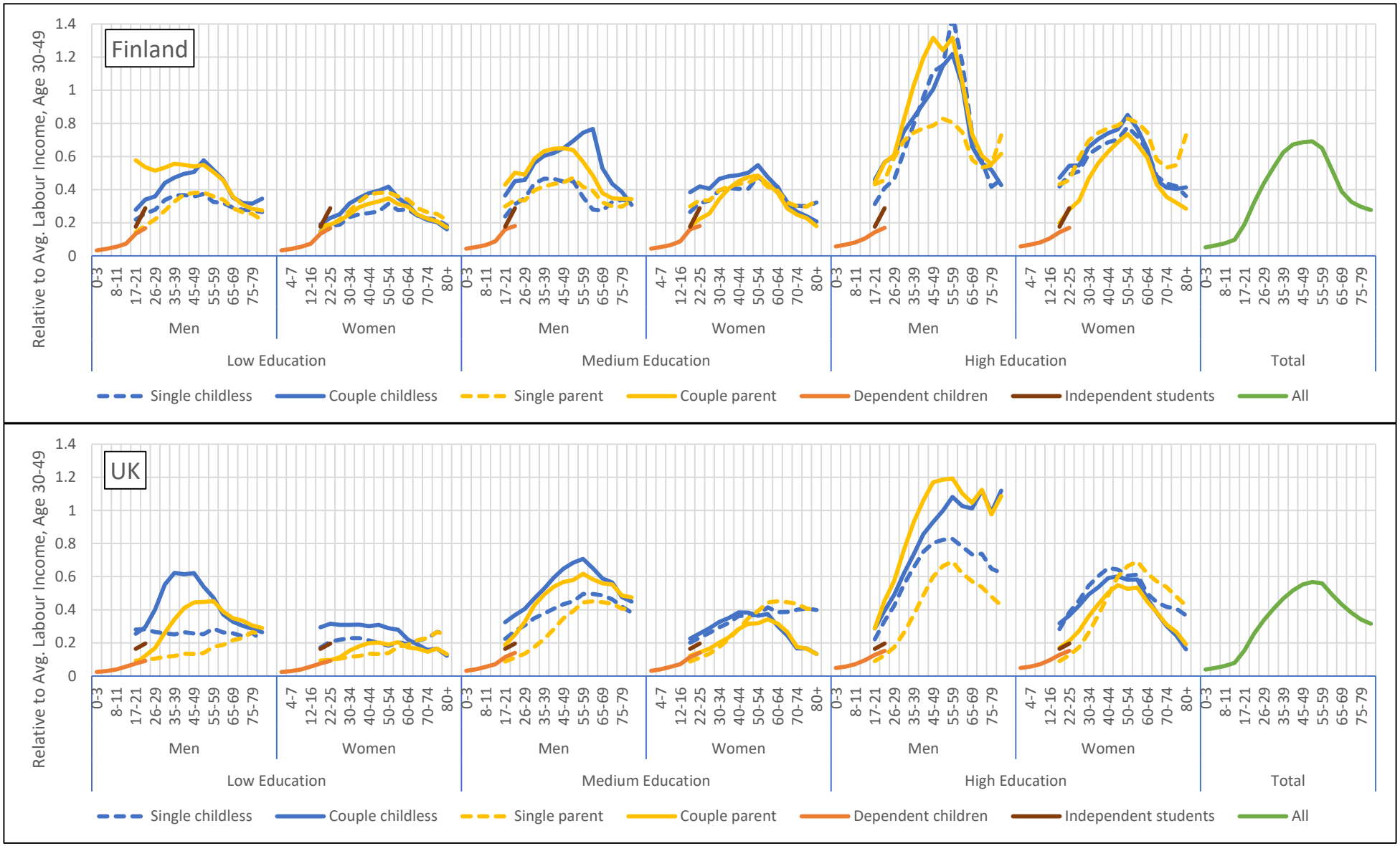


Figure 8. Disaggregated NTA profiles of net public transfers

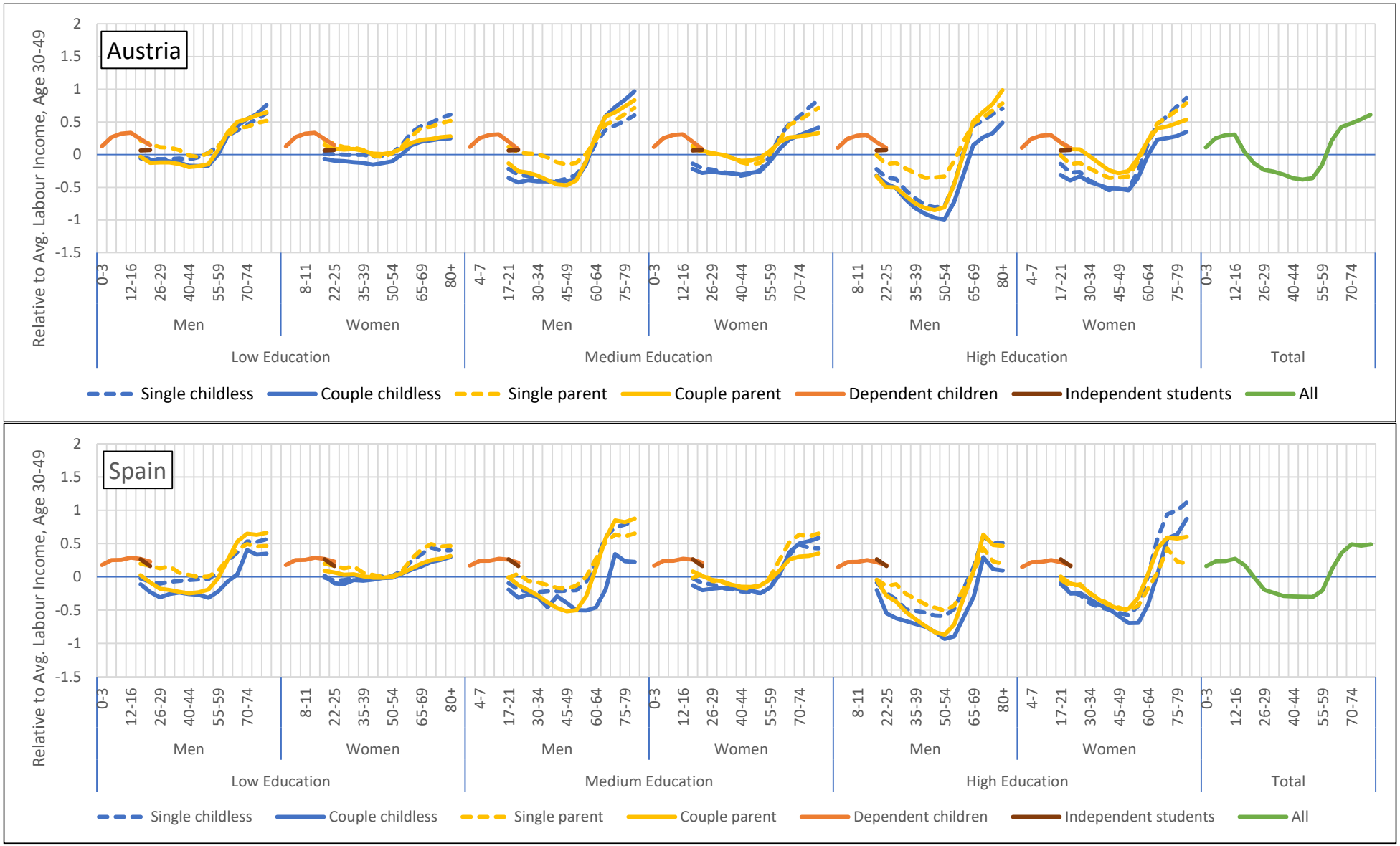


Figure 8 (continued). Disaggregated NTA profiles of net public transfers

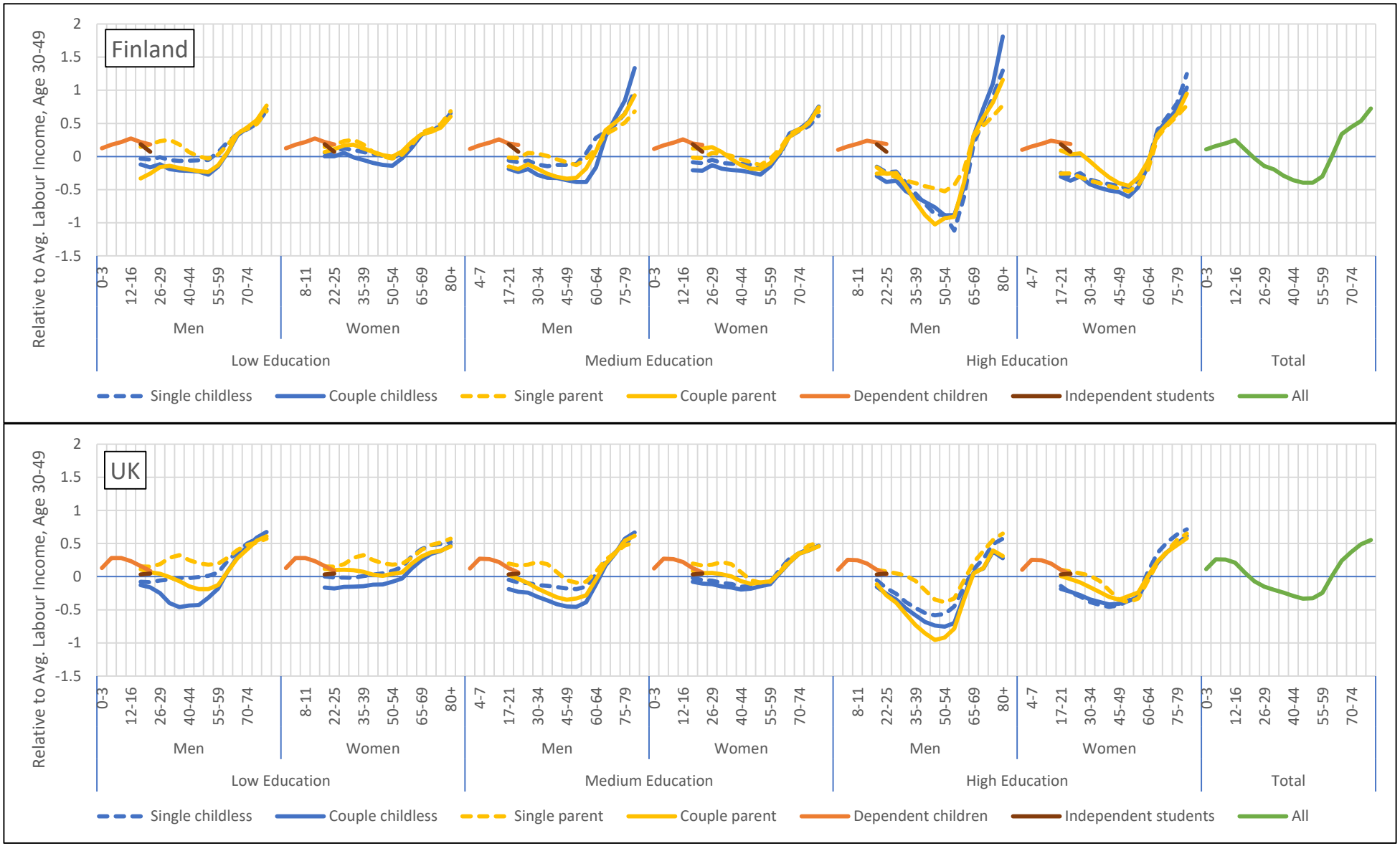


Figure 9. Disaggregated NTA profiles of net private transfers

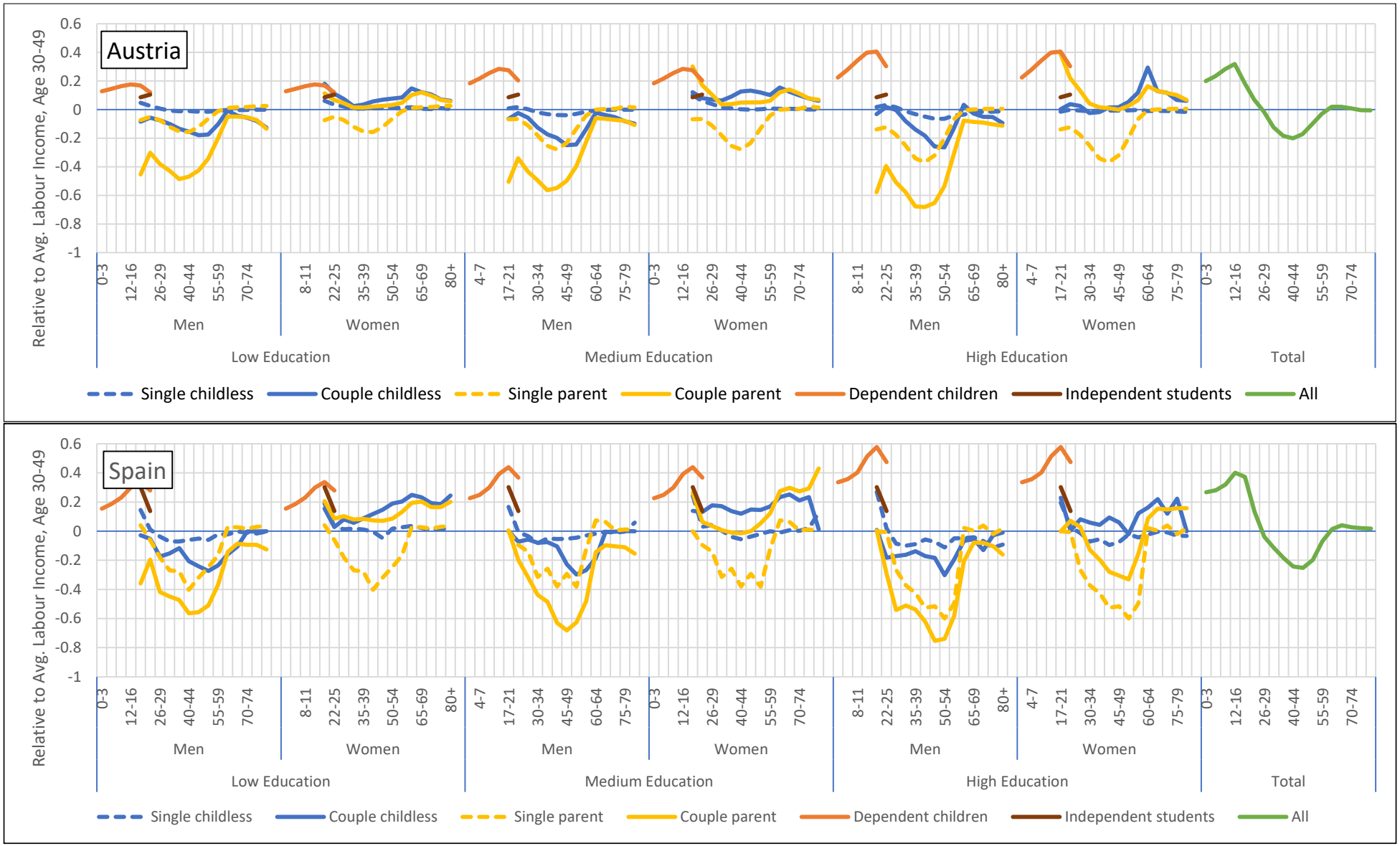


Figure 9 (continued). Disaggregated NTA profiles of net private transfers

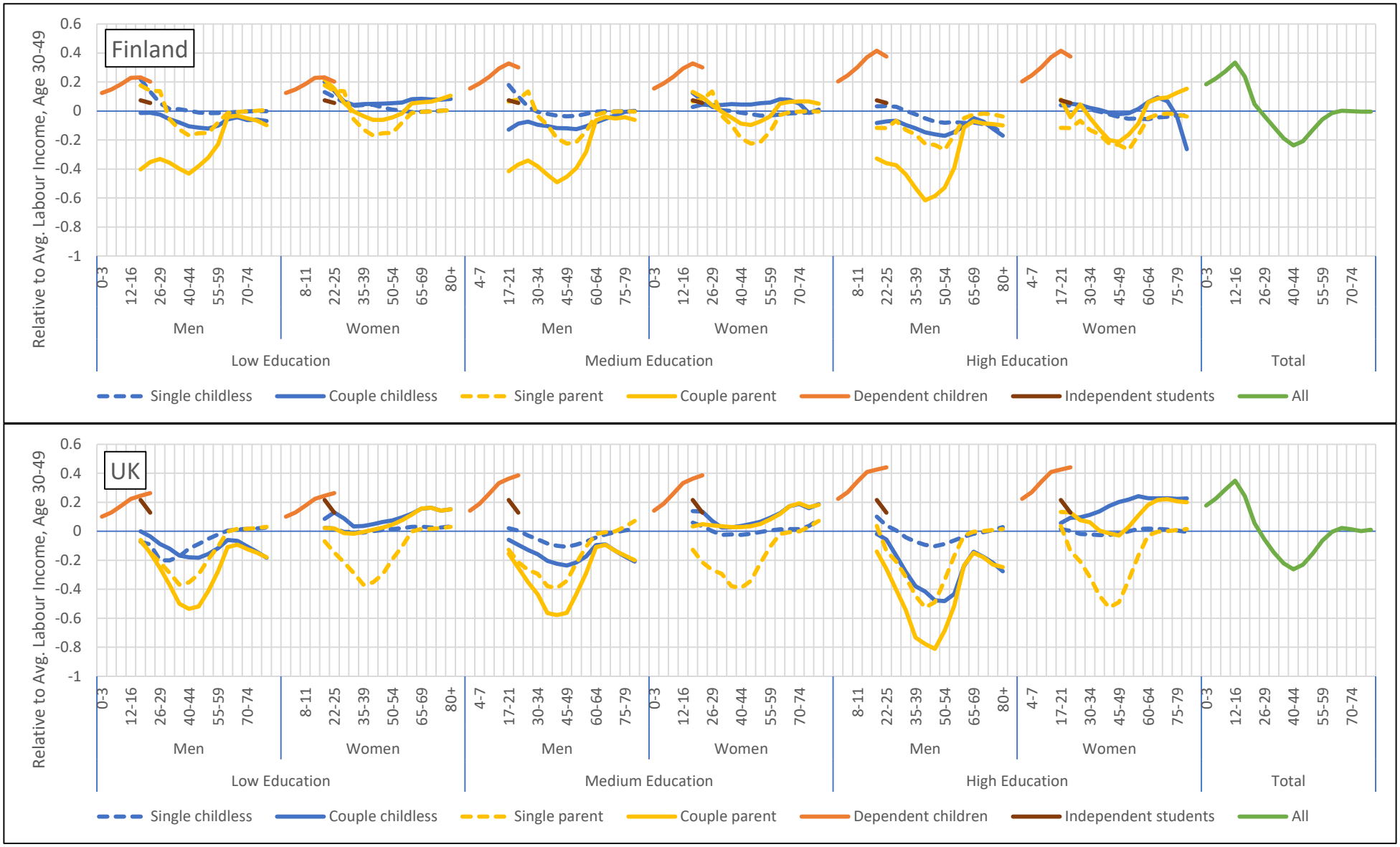


Figure 10. Disaggregated NTA profiles of total net transfers

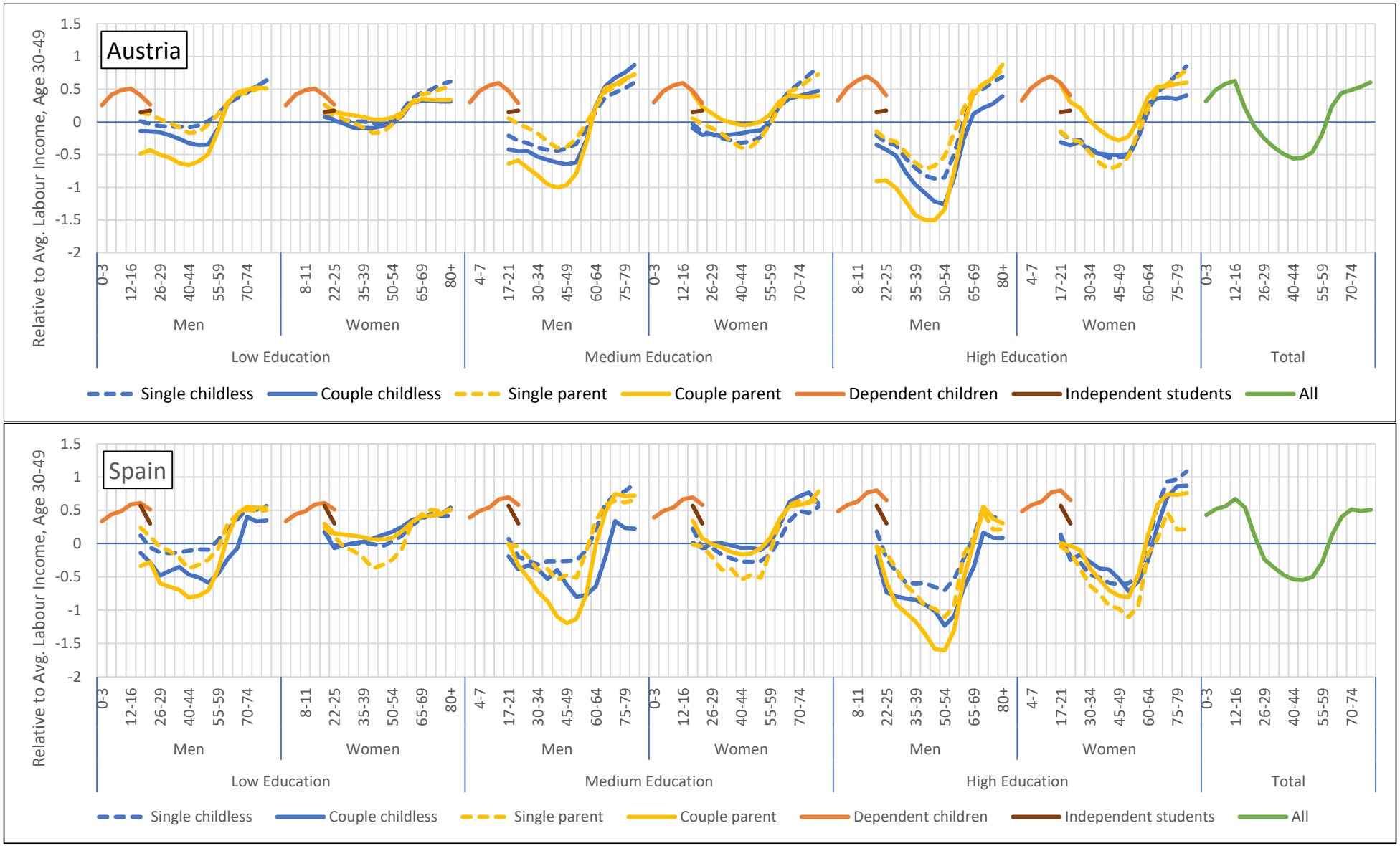


Figure 10 (continued). Disaggregated NTA profiles of total net transfers

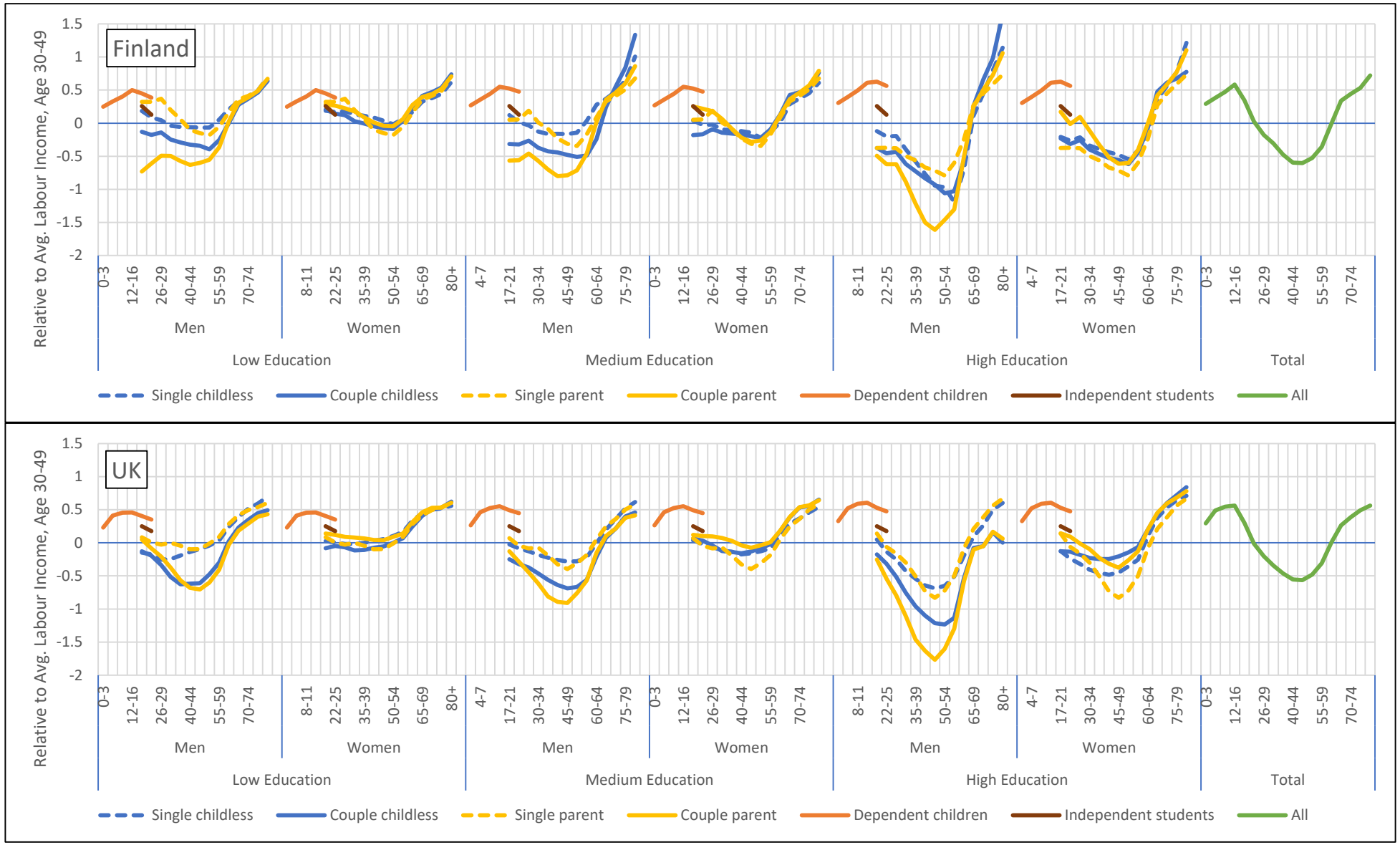


Figure 11. Disaggregated NTA profiles of private asset income

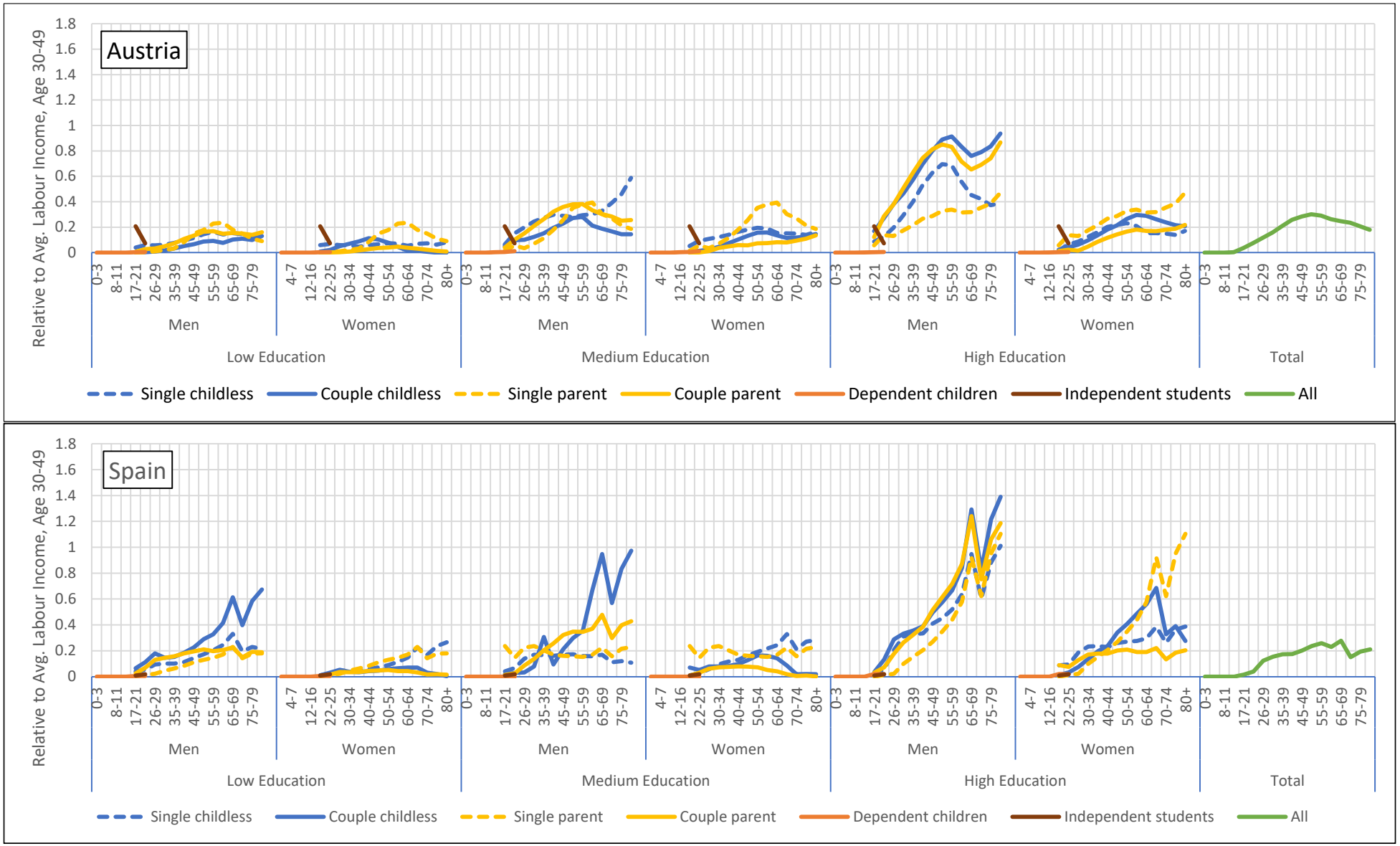


Figure 11 (continued). Disaggregated NTA profiles of private asset income

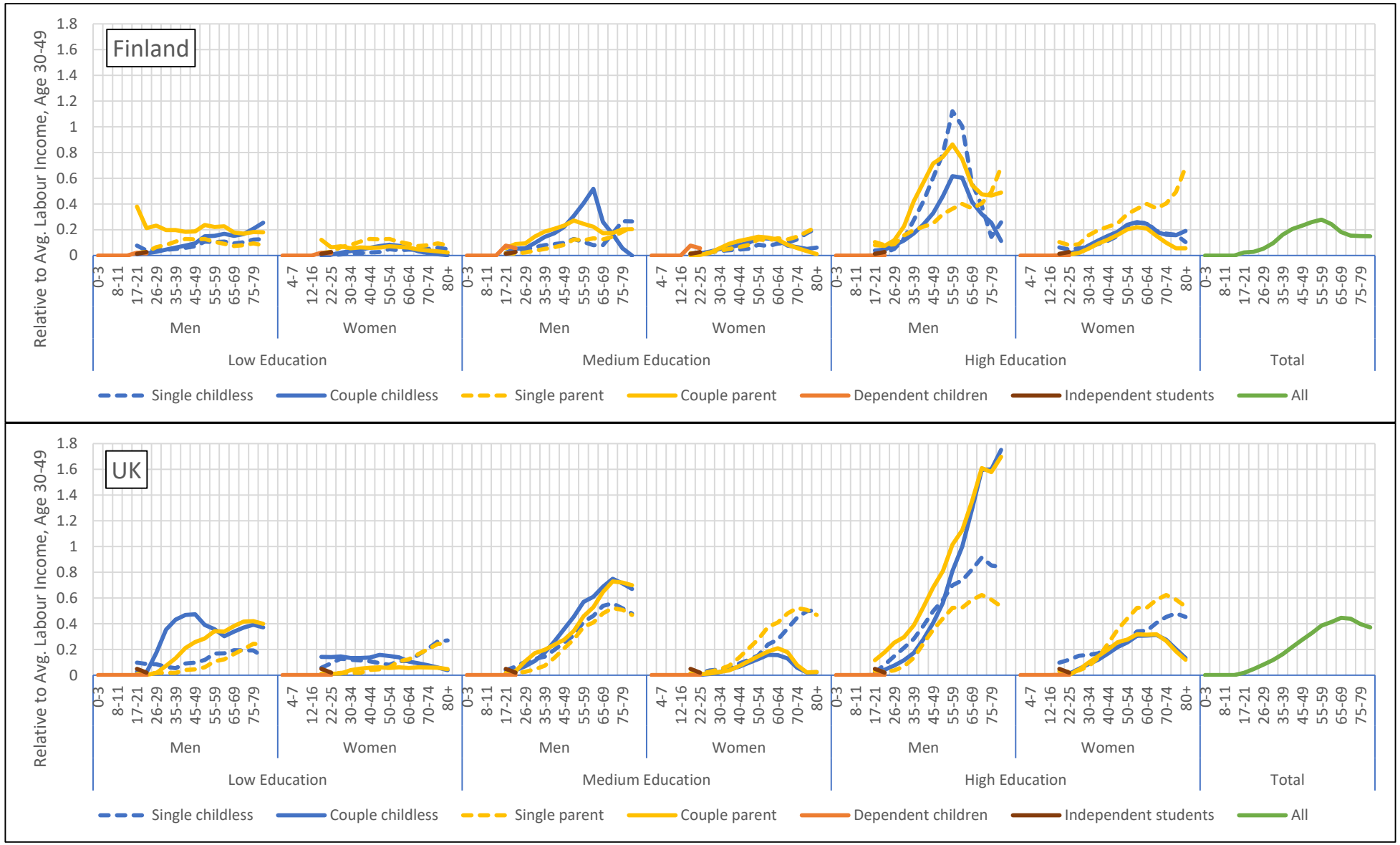


Figure 12. Disaggregated NTA profiles of private saving

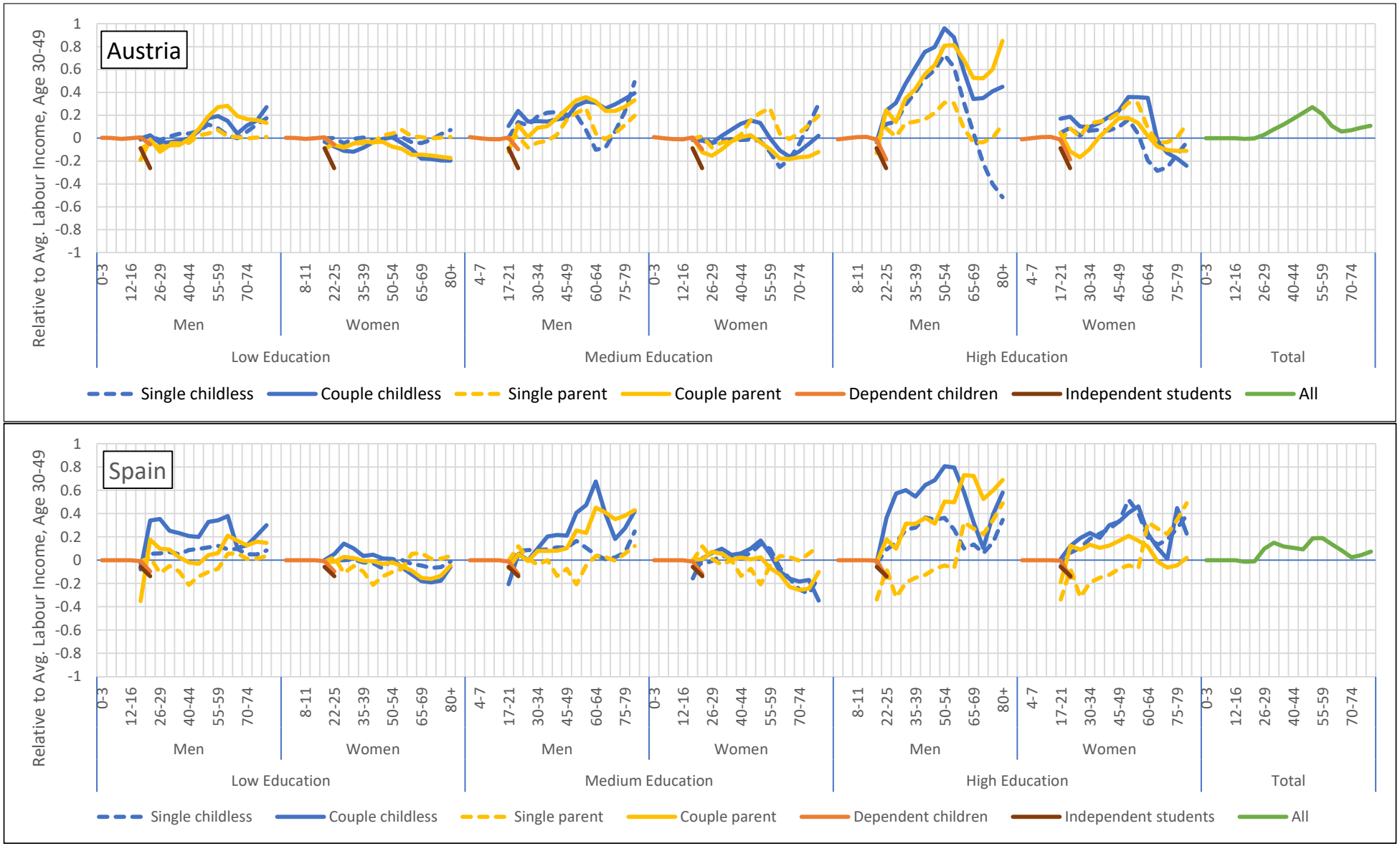


Figure 12 (continued). Disaggregated NTA profiles of private saving