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THE GENDER GAP IN PAID AND UNPAID WORK ALONG THE LIFE CYCLE: THE ROLE OF HOUSEHOLD ARRANGEMENTS

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Title: The gender gap in paid and unpaid work along the life cycle: The role of household arrangements

Abstract: We examined how men and women in Spain contribute to market and nonmarket production and share it among household members in various living arrangements, considering the role of partnership and parenthood status. Extending the National Transfer Accounts method, our results show that women produce more in the market at the beginning of the life cycle, but when they become a couple or have children, they focus on nonmarket production, widening the gender gap. Men have relatively stable market production whether they are fathers or not. Moreover, when living alone, men are able to produce the housework they consume. However, when they live together in a couple (without children), their household production decreases and their consumption increases at the expense of the transfers from their partner. Parenthood has a positive effect on men's care work, but overall, women spend more time on paid and unpaid work combined, regardless of living arrangements..

JEL Codes: J12, J16, J22

Keywords: National Transfer Accounts, unpaid work, gender, family

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1. Introduction

The current challenges the aging process poses can be traced to three main trends dating back to the last century. From an economic perspective, the extension of markets, globalization and technological progress has been the primary driver of economic development. In parallel with these changes is the steady improvement in life expectancy coupled with a decline in birth rates, which has altered the population's age structure in a slow but appreciable fashion. Growing democratization has also led to a series of social policies – including expansion of public education and state pensions – now collectively known as the welfare state. These three axes of development, although evolving at different paces, are closely interconnected.

Although the scale of interaction effects remains unclear, there is a common element at the center of the three axes: the change in gender roles and the corresponding adjustment in family structures. Improvements in economic conditions have affected family arrangements, which in turn have influenced demography. Shifting economic opportunities have led to increasing population concentrations in urban areas, which have affected a range of factors, including intergenerational living arrangements. Economic development has profoundly affected fertility and life expectancy, with feedback effects influencing economic (and population) growth. Technological change has increased the returns to education, and educating children for longer has increased the aggregate costs of education. As female education and labor market opportunities have improved, fertility rates have been depressed in the context of universal access to birth control (the opportunity cost of having children has increased). The welfare state's redistributive action has expanded to cover many of the costs private individuals previously covered, notably via (compulsory) public education, publicly provided health care, state pensions and other redistributive and social policies. As a result, welfare state transfers have substituted for family monetary and time transfers to a considerable extent.

The literature is growing on the interplay between the three axes of development and the role the women's revolution played, which remains in process.[1] Data availability is one of the main limiting factors in these efforts. The National Transfer Accounts (NTA) project started around 2000, aiming to contribute to that need, and in fact, it contains information on economic and demographic variables as well as the age composition of the welfare state taxes and transfers[2] and further extension to incorporate home production to account fully for the gender dimension. In short, the NTA imputes the System of National Accounts (SNA) by age. First, it imputes labor income and consumption (including private and public consumption) and computes the difference, which turns out to be a surplus of working-age people and a deficit of children and the elderly. Second, it measures the extent to which the surplus is allocated to the dependents' needs by means of government transfers (welfare state), private transfers (occurring mainly through the family) and asset-based reallocations (asset income and dissaving). As a result, the NTA breaks the SNA down by age and produces an otherwise missing estimation of family transfers. This method was extended to add gender, which led to identification of the need to introduce home production into the picture, thus eliminating the gender bias resulting from the exclusive consideration of the market economy. A parallel set of accounts was derived (National Time Transfers Accounts, NTTA) in a side project (Counting

[1] For the gender revolution see Esping-Andersen (2017). See also Doepke and Tertilt (2016) for a revision of the attempts to integrate changes in family structure in dynamic macroeconomic models.

[2] For further details, see the project webpage (www.ntaccounts.org).

Women's Work, CWW) to compute home production and consumption and the resulting time transfers.[3]

We developed an extension of the NTA-NTTA methodology by disaggregating the corresponding age profiles not only by gender but also by partnership, parenthood and household living arrangements. This is a natural extension of the methodology and a way to highlight a key element to understand the interplay between the three axes of development. With this analysis, we aim for a better understanding of men's and women's lifetime contribution to economic activity and to the whole economy, considering market and home production.

In previous works, researchers have disaggregated NTA or NTTA beyond age and sex. First, NTA estimates by education or income as a proxy for socioeconomic status were calculated.[4] More recently, researchers have attempted to consider the family dimension inherent to NTA explicitly. Gál et al. (2020) estimated NTA and NTTA profiles for parents and nonparents at working ages and obtained an indicator of the transfer cost of parenthood. Similarly, Hammer and Prskawetz (2022) obtained some partial NTA estimates for people with and without children, focusing on private transfers. Abio et al. (2021a) estimated NTA in Spain, distinguished by parenthood, partnership status and level of education. In that case, the objective was to project the impact of aging; therefore, the household structure is simplified to implement it in a microsimulation model considering only nuclear families. In this paper, we explore more deeply the household structure and compute NTA and NTTA. Moreover, as compared to Gál et al. (2020) and Hammer and Prskawetz (2022), we contribute to the literature by examining the whole life cycle and considering a more detailed classification of family types.

There is also a large body of parallel literature investigating the allocation of time, considering the household's structure. Sayer (2010) analyzed trends and gender differences in housework (excluding childcare) in nine countries using Multinational Time Use Survey data for the period 1960-2000 and limiting the sample to ages 20-49, focusing on the effects of marital and parental status, among other characteristics. Neilson and Stanfors (2014) investigated parenthood's impact on men's and women's time use across welfare state regimes in the 1990s. Rubiano-Matulevich and Viollaz (2019) analyzed time use data in 19 countries with various income levels and assessed the marriage and parenthood penalty on time use patterns over the life cycle. Chao (2022) investigated the difference in the housework gender gap among singles, cohabiters and married persons across time in the US. The closest papers in this literature are Apps and Rees (2005) and Anxo et al. (2011), who investigate time allocation by gender, controlling for the life stages in different countries, accounting for the presence of children in the household (and cohabitation in Anxo et al., 2011). In our case, the use of NTA-NTTA allows for a more complete measurement of the life cycle pattern of the gender gap by age, including the monetary and non-monetary parts, for individuals living in various household arrangements.

Overall, in this paper, we went further into the analysis of the economy from a gender perspective. We did so first by employing NTA-NTTA, accounting for the three resource allocation mechanisms available to generate welfare. Second, we extended the method, incorporating the role household arrangements play. Indeed, a thorough study of the gender economy implies accounting for those elements and a life cycle perspective. Individuals produce

[3] For a description of the CWW project, see https://www.countingwomenswork.org/.
[4] See Hammer (2015) for Austria, Abio et al. (2017) for Spain and Rentería et al. (2016) for an evaluation of the impact of the demographic and the educational transition in Spain and Mexico.

(and consume) differently in the market based on their age, their home production and the characteristics of their household. When they reach adulthood, some individuals decide to live alone or in a couple, have children or not, etc. We will show that these decisions become crucial for the gender economy because men's and women's roles in production depend critically on them.

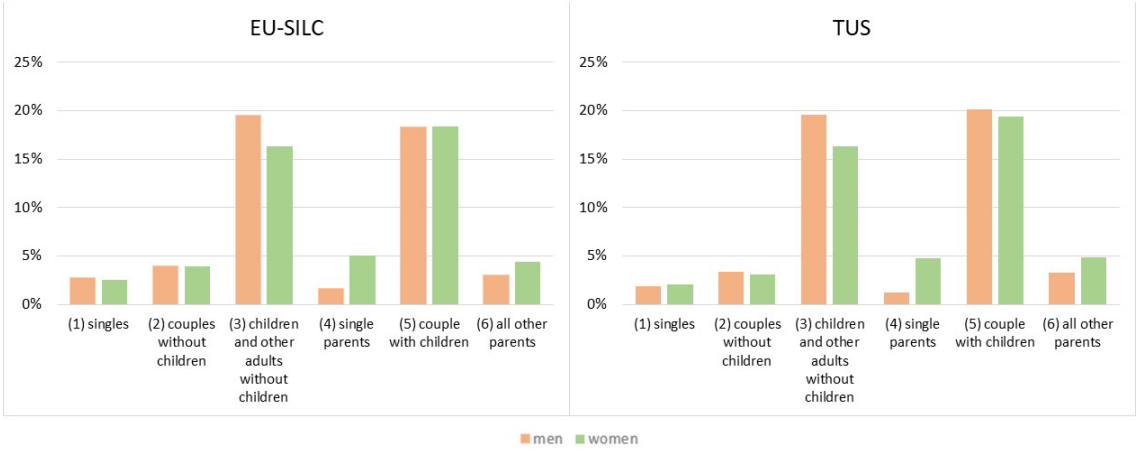
2. Methodology and data

In this section, we briefly describe NTA and NTTA methods and the data needed to obtain the estimations for Spain, our case study. As detailed below, our estimations refer to 2010 due to the lack of more recent data for nonmarket activities (the last Time Use Survey (TUS), the main dataset needed for NTTA, provides data for 2009-10). As aforementioned, we were particularly interested in adding a new dimension to the analysis, consisting of studying family structure's role in the division of labor and economic responsibilities between men and women. Therefore, we extended the NTA-NTTA results and the methodological framework to estimate age profiles of market and nonmarket activities not only by gender but also considering three additional characteristics: partnership status, parenthood status and household composition. In particular, we distinguished men and women who live on their own from those who live with a partner and those who live with their parents or with other adults in the same household. In addition, we differentiated between parents and nonparents in those three cases, thereby obtaining 6 individual types for each sex. Types 1-3 are groups of nonparents. Type 1 includes one-person households, Type 2 includes households in which two people live in partnership and Type 3 includes the rest of childless individuals (singles or in a couple and living with other adults (parents, grandparents, siblings, other relatives or nonrelatives)). It is worth noting that all children living with their parents who are not parents themselves are included in Type 3, and in fact, they account for most of the individuals in this category (around 90%). On the other hand, Types 4-6 include parents, depending on whether they live alone or with their offspring (Type 4), live with a partner (Type 5) and the rest (Type 6), which includes parents living with at least one member other than a partner and their children. Parents living in extended families (i.e., more than two generations living in the same household) are included in this type and represent 54% of this category.

The micro surveys we used allowed us to identify some characteristics of the individuals living in the household, including their age and sex. However, individuals are not asked whether they are parents. The parenthood imputation is then implemented as follows: the surveys contain information at the household level about the relationships among household members. This way, we identify parents as individuals living with any children of their own or with a partner who is reported to be a parent (we consider childless partners of biological parents as parents). At older ages (from age 50 on), we use another method because grown-up children tend to leave their parents' home and the number of parents is clearly biased downward with the previous criterion. In this case, we employ the imputation method Abio et al. (2021b) described, which is based on the Survey of Health, Ageing and Retirement in Europe. The method assigns parenthood status based on age, gender, partnership status, education and income, accounting for the marginal distributions obtained from Zeman et al. (2014) and Kreyenfeld and Konietzka (2017). This imputation method allows us to capture the parenthood dimension along the whole life cycle, unlike in Gál et al. (2020).

Figure 1 shows the population structure in Spain according to our individual classification, resulting from the EU Statistics on Income and Living Conditions (EU-SILC) and the TUS, the main micro surveys used, as detailed below in our NTA and NTTA estimations, respectively. As observed, the distribution in the two datasets is very similar. Most nonparents live in households with other adults, different from an eventual couple, most of them children living with their parents (more men than women in this category). In the case of parents, the most common household is that comprising a couple with children. There are more women in single-parent households and co-living with other adults.

Figure 1. Population composition by sex and household arrangement according to the EU-SILC (2010) and TUS (2009-10)



Source: Authors' elaboration

National Transfer Accounts (NTA)

NTA started in the early 2000s as an international collaborative project to build adequate data to analyze the generational economy. For that purpose, national accounts are disaggregated by age, allowing us to observe how resources are produced, consumed and shared by individuals of various ages living in the same period. Lee and Mason (2011) published the first comparative results for 23 countries. Today, more than 90 countries belong to the NTA network and have at least partial estimations for one year. The United Nations Population Division (UN, 2013) revised and published the methodology. In Europe, a Horizon 2020 project (AGENTA) produced comparable estimates for 25 countries referred to 2010.[5]

NTA starts with the following transformation of the basic national accounts' identity:

$$YL + YA + TG^{+} + TF^{+} = C + S + TG^{-} + TF^{-} \qquad [1],$$

where YL and YA represent labor and asset income, respectively; C represents consumption; S represents savings; TG represents public transfers and TF represents private transfers. Positive and negative signs in transfers indicate whether individuals receive (inflows, +) or pay (outflows, -) them. In the case of public transfers, flows go from the public sector to individuals or vice versa: negative TG are taxes and social contributions, and positive TG are benefits received as pensions, unemployment benefits, family allowances, etc. Private transfers take place among individuals of various ages and sexes. Those that flow within households are especially important (e.g., children receive significant numbers of transfers from their parents). Eq. (1) represents the

[5] AGENTA's NTA estimations are publicly available at http://dataexplorer.wittgensteincentre.org/nta/.

necessary equilibrium between income sources (on the left-hand side) and income uses (on the right-hand side). If we introduce age (a) and rearrange Eq. (1), we obtain the general NTA equation:

$$LCD^a = TG^a + TF^a + ABR^a \quad [2],$$

where LCD (lifecycle deficit) represents the difference between consumption and labor income for each age, a, in the observed period, which needs to be financed through (or devoted to) the three channels on the right-hand side: net public transfers (TG), net private transfers (TF) and inflows related to the asset market (asset income less savings), named asset-based reallocations (ABR).

NTA estimates require the use of various micro datasets to obtain individual profiles. Each variable in equation [2] is further decomposed into multiple components. For example, LCD, the difference between consumption (C) and labor income (YL), implies estimating public consumption and private consumption on the one hand and wages and self-employed income on the other. Moreover, public and private consumption are further disaggregated into categories (health, education and other consumption). The process is complex and requires a lot of information from various data sources. Specifically, two micro surveys contain the core data needed although other statistical sources or administrative data are also used. First, the EU-SILC provides most of the information related to income (including taxes and transfers received in cash). Second, the Spanish Household Budget Survey (HBS) contains data related to private consumption and expenditures. Consumption and some income variables are collected only at the household level, and data need to be individualized. The standard procedure in NTA methodology is imputing other consumption (i.e., expenditures on food, clothes, etc.) to household members, using an equivalence scale assigning a lower weight to children. Some specific types of consumption (health and education) are distributed using specific imputation methods or regression analysis.

Taxes, social contributions and cash transfers are taken from the EU-SILC and are mainly reported at the individual level. In-kind transfers (such as government expenditures on health and education) are not present in the survey data and need to be imputed using administrative and related sources on use by age and gender. Once this stage is completed, family transfers are computed. In particular, each household member's surplus is first calculated by subtracting individual private consumption from disposable income. Second, transfers from members in surplus are given to members in deficit. The resulting household's surplus (or deficit) is transferred to (or financed by) the household head, who is assumed to save (or dissave) the remaining resources.

In the standard NTA, there is only one household head (the main earner), who is the default recipient of household benefits, inter-household transfers and asset income. The first gender-specific NTA estimates kept this assumption. In this paper, to eliminate the gender bias and to capture money transfers inside the household more effectively, we have improved the procedure to estimate intra-household transfers by allowing saving for all adult members of the household with positive income. To that end, we changed the standard procedure in the following way: we distributed household benefits and inter-household transfers among all adults in the household; in the case of asset income, normally reported at the household level, we also imputed it to adults but in this case as a proportion of their individually reported current disposable income (i.e., labor income, pensions and unemployment benefits). We redefine disposable income by including asset income when computing private transfers. In this way, we

attempt to estimate more accurately the private transfers men and women give/receive, with women now being net recipients of private intra-household transfers to a lesser extent as their disposable income increases. Overall, this procedure leads to more consistency although our results are not much different from those based on the traditional NTA assumption of the household head.

Once the individual profiles have been estimated, they need to be adjusted to match the macroaggregates the National Accounts provide, ensuring consistency between NTA and SNA estimations. It is worth noting that in some specific cases, due to the detailed disaggregation pursued, the profiles are obtained with a small number of observations and the results need to be taken carefully. This is the case with single fathers younger than 40 and the oldest men (aged 75+) in Type 3. Moreover, due to the individual classification strategy, the 0-19 age group is almost completely included in Type 3 (which includes children living with their parents).

National Time Transfer Accounts (NTTA)

NTTA are an extension of NTA because they compute the productive activities taking place alongside the markets but still contribute to economic well-being. Donehower (2019) provided the general methodology, which proposes using the third-party criterion to identify unpaid productive activities (Reid, 1934) (i.e., activities that can be delegated to another person paying a certain price). For example, sleeping and leisure activities are not considered productive whereas cooking, cleaning the house and caring for dependents are. We can refer to this set of productive nonpaid activities as home production, domestic production or nonmarket production, interchangeably. As we will see below, we can estimate the number of these activities based on the time devoted to them.

Due to its characteristics, nonmarket production is instantaneously consumed and, unlike market production, cannot be saved or borrowed nor intervened in by the government. Hence, the main equation for NTTA slightly differs from the one for NTA. Now, the nonmarket LCD is defined as the difference between consumption (CT) and production (YT) of domestic activities, both measured in units of time. The resulting deficit (surplus) needs to be covered by transfers from (transfers to) other members of the community, typically other family members. TFTI and TFTO represent the private time transfer individuals receive and give, respectively. Therefore,

$$CT - YT = TFTI - TFTO \qquad [3]$$

As in the case of NTA, we estimate the Spanish NTTA profiles for men and women separately, following Renteria et al. (2016), but in our case, we further disaggregate them by parenthood status and household composition. The data come from the Spanish TUS 2009-2010, by the National Institute of Statistics of Spain. It refers to a sample of 25,895 people living in 9,541 private households. All members at least 10 years of age completed an activity diary from 6 a.m. to 6 a.m. the following day, reporting every 10 minutes all they were doing during those 24 hours.

Domestic activities are divided into household work (cleaning, cooking, laundry, shopping, taking care of pets, household maintenance, household management, gardening, etc.) and care, differentiating between childcare and adult care, within and outside the household.[6] It is

[6] We need to also keep a category of "other care" for that small portion that is not possible to impute to any specific age.

important to note that following the standard NTTA procedure, we only consider the main activity reported in case a secondary activity was happening at the same time. For example, if a person declared cooking as the principal activity but took care of a child at the same time, we only considered that time as housework, not as caring. As we will see below, this method could result in an underestimation of the importance of some activities, typically care, which is usually performed at the same time as other household chores.

By its construction, the TUS provides all the information to estimate NTTA production profiles. To obtain NTTA consumption profiles, certain assumptions are needed. Household work activities are assumed to have characteristics of a public good inside the household (nonrival and nonexcludable); therefore, the time each household member reports is evenly divided among all the household members. We can determine whether care activities are provided for children or adults. Therefore, we regress each type of care production on the number of individuals in each age group, separating children (under age 18) and adult consumers (aged 18 or more). For the production directed to people living outside the household, which cannot be differentiated into adult or children care, we assume their age profile is the same as that of the whole sample. Transfers are obtained as the difference between production and consumption profiles. If the difference is positive, a transfer outflow happens, whereas we have an inflow if the difference is negative.

Regarding the disaggregation of the profiles we aim for in this paper, the TUS contains most of the necessary data. Information is available on all individuals' age and sex. Moreover, the TUS includes a question about household members' relationships, from which we can derive the household members' parenthood and partnership status. As in NTA, childless members living with their couple's children are recorded as parents, and the parenthood status for ages 50+ is imputed as described above. As with NTA, the small number of observations jeopardizes the representativeness of single fathers younger than 40 and the oldest groups (75+) in household Type 3; therefore, these results need to be taken with caution (see Table A1 in the Appendix).

In the second step, to make them comparable to NTA, NTTA profiles need to be monetized, which can be done with at least two alternative methods. The first is the so-called replacement method, in which a nonmarket activity is valued at the cost of purchasing that service in the market. For example, an hour devoted to cleaning the household would be assigned the value equal to the cost of an hour of a cleaning service in the market. Alternatively, the opportunity cost method could be used, implying in this case that the same activity could have different values based on the specific person who performs it (in particular, according to the wage they could obtain in the formal labor market for the same amount of working time). This second approach is only feasible if data on individual wages are available consistently in the same data set as the time used for various activities, which is not the case in the Spanish TUS. Moreover, it is questioned whether the same activity should have different values based on the person who develops it (Donehower, 2019).

Following the NTTA methodological framework, we opted to use the replacement cost to determine nonmarket activities' value, with the following strategy. We distinguished household chores, childcare, adult care and other care (a small part that cannot be classified based on the recipient's age). For housework, we took the minimum wage legally established in 2010 for domestic workers, including social security contributions. We determined the value of childcare and adult care based on the minimum legal wage for workers in specific institutions providing those types of services (nurseries for childcare, centers to help dependent people for adult care). In this case, we used the median wage for the skill categories, but it is still a minimum wage.

Finally, for other care, we opted to use the minimum legal wage. As Table 1 shows, the wages finally used to monetize home production are low compared to the average wage in Spain in the same year. This difference implies that our results for the value of nonmarket activities should be taken as a minimum. To test our valuation method, we conducted a sensitivity exercise, using the average wage for the whole economy to monetize nonmarket activities.

Table 1: Replacement wages used to monetize domestic activities in Spain (2010)

	price per hour (€)
housework	5.60
childcare	6.50
adult care	7.70
other care	5.50
average wage	13.00**

(**) The average wage per hour is obtained from the annual average wage estimated by the National Institute of Statistics (INE), considering 1750 hours of work in a year.
Source: Authors' elaboration based on data from the INE and collective agreements

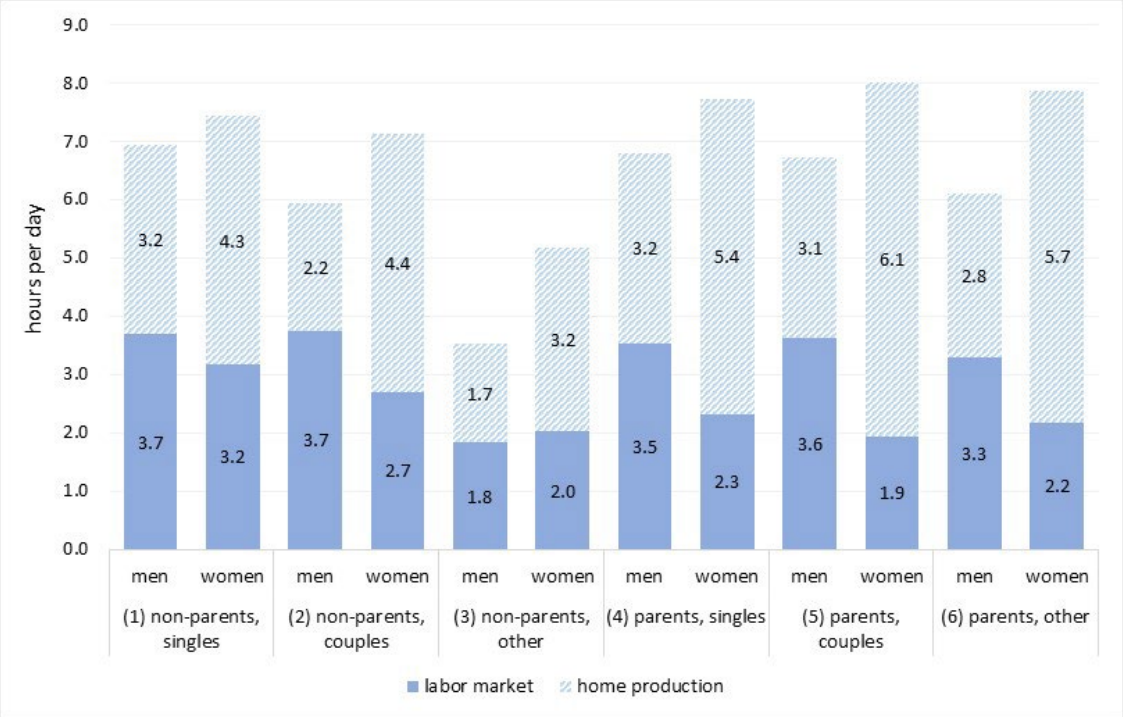
In the next section, we present the main results for NTTA, disaggregated by sex and household structure, and in Section 4, we present the integrated results for NTA and NTTA. We provide more detailed results as well as the sensitivity analysis conducted to test the effects of monetization using various wage levels in the Appendix (Figures A3 and A4). Moreover, to form a clearer picture of the overall importance of transfers occurring in the families, we propose a set of synthetic indicators to approach how resources are produced, consumed and shared. The first indicator, named *self-sufficiency*, is defined as the ratio of production to private consumption, separating market and nonmarket activities. It is intended to capture the need to receive transfers (if consumption exceeds production) or the capacity to give transfers (otherwise). The other two indicators are intended to measure this need for (or capacity to) transfer more accurately: *family dependency* is computed as the ratio of transfers received (inflows) to private consumption whereas *family generosity* is the ratio of transfers given to private consumption. All three indicators are obtained as a weighted average for ages 20+. Although the results are based on cross-sectional data, we intend for them to provide a synthetic view of men's and women's ability to produce all the resources they consume throughout their adult life. It is worth noting that the effects of the choice of the monetization criterion for valuing nonmarket variables are minimized in these indicators because they are defined as ratios.

3. Extended National Time Transfer Accounts (NTTA): Accounting for household arrangements

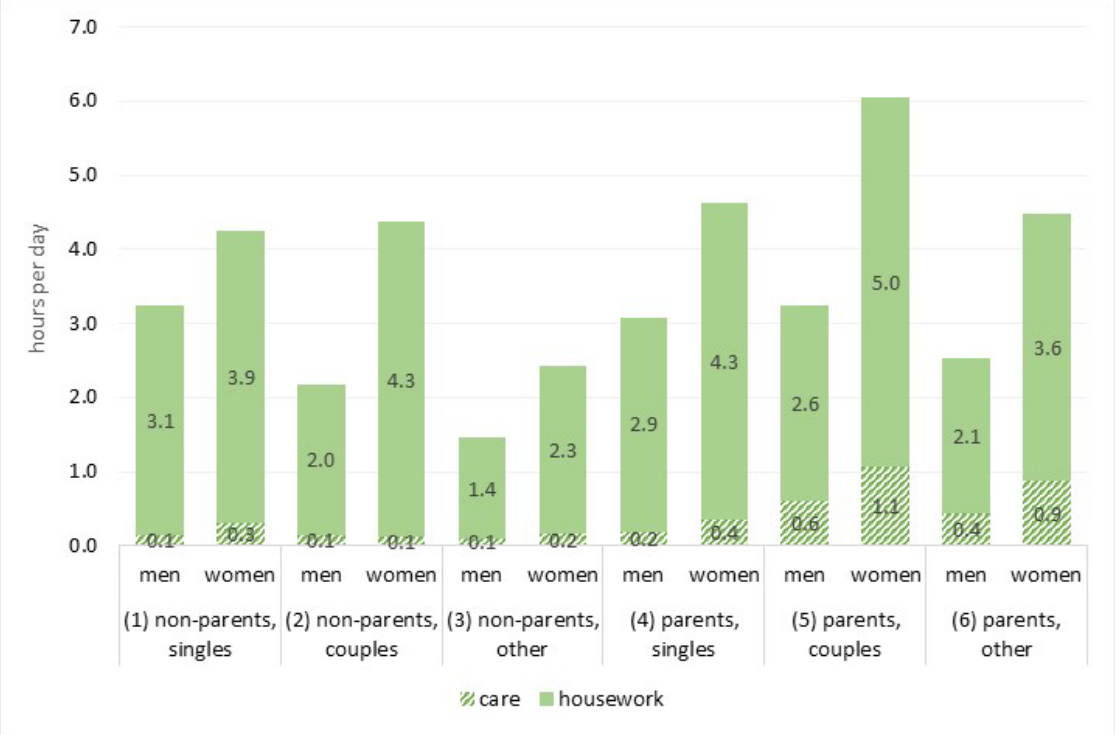
In this section, we present the estimations of NTTA for Spain, disaggregated by sex and household structure. First, we look at total time worked in the market and in-home production for ages 20-64, presented in Figure 2. Our results confirm previous findings indicating that women bear most of the nonmarket production. This result has been found in Spain (Renteria et al., 2016) and other European countries (Vargha et al., 2017) using standard NTTA estimations by age and gender. More generally, the data produced in the Counting Women's Work (CWW) project show that the percentage of market and home production performed by women in various countries varies substantially. For example, in India, where nonmarket activities represent the largest observed percentage of GDP (45%), women's contribution to market and home production is 29 vs 91%. On the contrary, in the US and Spain, with estimated home

Figure 2. Time allocation in productive activities

a) Average (per capita) number of daily hours of work (labor market and home production) by gender and household arrangement (ages 20-64)



b) Average number of daily hours devoted to home production by type (ages 20+)



Notes: Weighted average for ages 20+ obtained from per capita age profiles.
Source: Authors' elaboration

production of 31 and 24%, respectively, of their GDP, women's contribution to market and nonmarket production is 42 vs 62% and 39 vs 63%, respectively.[7]

The main novelty of our analysis is the household dimension taken into account, with which we aimed to disentangle how living arrangements and parenthood affect men's and women's participation in the labor market and in home production. Disaggregating production by household arrangement, panel a) in Figure 2 confirms that total time worked is higher for women, no matter the type of household. Even in the case of singles, in which the gender gap is the smallest, single women work half an hour more a day than single men. Similarly, looking at the distribution between market and home working time, it is interesting to see that there is a gender gap even for childless singles, with women devoting more time to home production and men more time to labor market. Among childless couples, these gender gaps increase, suggesting some gender specialization. The third group of individuals (nonparents, other) presents the lowest figures for time worked because children living with their parents (who are not parents themselves) are included here, and many are still too young to work; nevertheless, a significant gender gap in housework is revealed for children living in the same household. The gender gaps in market work and home production are increased for all types of parents (singles, living together in a couple and living with extended families). The age profiles of home production in each type of household (Figure A1 in the Appendix) confirm that women devote more time to home production than men at any age.

Panel b) in Figure 2 and Table 2 provide additional information to understand more clearly how age, sex and household arrangement affect the mix of market and nonmarket production. The figure compares the average time devoted to home production in two main categories (i.e., care activities and household chores). Housework takes up the majority of hours devoted to home production, and care represents a much lower portion, especially in households without children. This is partly a result of the methodological assumption that time is imputed to the principal activity whereas secondary activities are not considered, implying that the time spent in care is underestimated.[8] We observe that differences between men and women arise in both categories. We also see that for parents, time devoted to housework and care increase for men and women, and the differences by sex are remarkable. Mothers spend 4.6 hours a day in housework and 0.9 in care whereas for men, the figures are practically half of that (2.6 for housework and 0.5 for care). Also, household arrangements are important, and parents living together in a couple devote more time to care than parents living in other arrangements.[9]

Table 2 compares the average number of hours devoted to home production for two broad age groups: 20-49 (typically related with child rearing and more affected by participation in the labor market) and 50+. Each box contains data for both sexes in each household arrangement and summarizes differences by sex (average hours worked by women compared to men) and age group (average hours worked by people aged 20-49 compared to those aged 50+). The data reveal interesting results to capture the effect of the gender gap (shown in the columns) and age (shown in the rows). First, as stated above, women always participate more in nonmarket

[7] Data extracted from the Counting Women's Work (CWW) project, available at https://www.countingwomenswork.org/publications/infographics

[8] According to Zick and Bryant (1996), around one third of parental childcare comes from secondary activities in the US. See also Kalenkoski et al. (2005) for estimations of childcare from secondary activities in the UK, Fedick et al. (2005) for Canada and Craig (2006) for Australia.

[9] This is consistent with other analyses of childcare by family structure (Monna and Gauthier, 2008 provide a review of the literature).

production, regardless of the age group and the household arrangement. The minimum difference is registered for singles: women devote 20-30% more time than men to nonmarket activities. Second, in households without children, those aged 50+, compared to those aged 20-49, work more hours in home production for both sexes and participate less in the labor market. The exception is men living together in a couple, who contribute slightly less to nonmarket activities. However, the situation is clearly reversed in households with children. Although at 50+, individuals tend to leave the labor market, they work less in nonmarket production because children are less commonly present in the household. This seems to confirm that the amount of childcare reported in the TUS is underestimated due to the omission of the secondary activities. An additional explanation is that the amount of housework is larger in households with young children. The exception is the case of single fathers, but no conclusions should be derived due to data limitations for this group. The last row in the table shows the difference in hours explained by the presence of children in each household arrangement. The ratio is always greater than 1 (and larger for women) for ages 20-49 (again with the exception of men, single parents), and it is smaller and usually lower than 1 for ages 50+. The lower labor market participation and presence of children have opposite impacts on home production. Interestingly, in the case of couples, the combination of effects implies that fathers 50+ in a couple do less nonmarket work than those who never had children (2.8 hours instead of 3.2). Another interesting pattern is the size of the gender gap in Types 3 and 6 (living with others), aggravated for parents. Overall, the gender gap in nonmarket work is explained not only by the presence of children but also by co-residence (living together in a couple or with other adults in the household) and the effect of age.

Table 2. Average nonmarket production by broad age groups, gender and household arrangement (in hours per day)

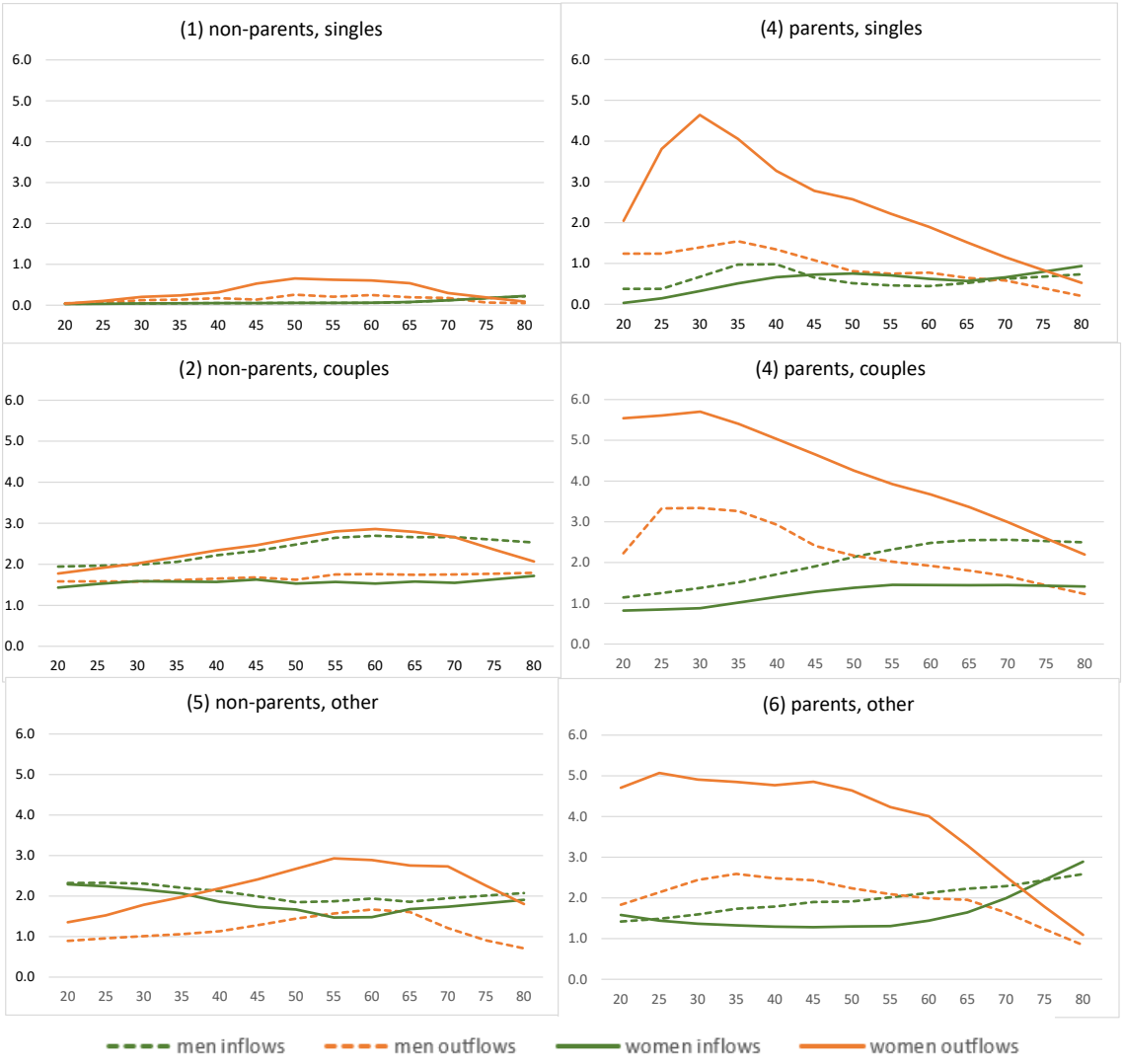
		(1) non-parents, singles			(2) non-parents, couples			(3) non-parents, other		
		men	women	***Gender Gap: women/men***	men	women	***Gender Gap: women/men***	men	women	***Gender Gap: women/men***
20-49		3.2	4.0	***1.28***	3.3	4.1	***1.25***	1.5	2.3	***1.52***
50+		3.5	4.5	***1.29***	3.2	5.2	***1.62***	2.5	4.1	***1.67***
Age effect: 50+/20-49		***1.10***	***1.11***		***0.98***	***1.27***		***1.64***	***1.80***	
		(4) parents, singles			(5) parents, couples			(6) parents, other		
		men	women	***Gender Gap: women/men***	men	women	***Gender Gap: women/men***	men	women	***Gender Gap: women/men***
20-49		2.6	5.5	***2.11***	3.7	6.6	***1.76***	2.9	5.8	***2.00***
50+		3.0	4.4	***1.44***	2.8	5.5	***1.95***	2.3	3.9	***1.68***
Age effect: 50+/20-49		***1.17***	***0.80***		***0.75***	***0.84***		***0.80***	***0.67***	
		singles			couples			other adults		
		men	women		men	women		men	women	
Children effect: Parent/ Childless	20-49	***0.83***	***1.36***		***1.14***	***1.60***		***1.92***	***2.53***	
	50+	***0.88***	***0.98***		***0.88***	***1.06***		***0.94***	***0.95***	

Source: Authors' elaboration

Differences in consumption of nonmarket activities are considerably smaller than those observed for production (see Figure A1 in the Appendix), partly because consumption is registered in surveys at the household level and therefore needs to be individually imputed. The largest gender differences occur in single households, in which women consume (and produce) significantly more than men. This is consistent with the results shown in the literature (South

and Spitze, 1994). For men and women, nonmarket consumption tends to increase until ages 60-65, slightly decreasing afterward.

Figure 3. Age profiles of time transfers received (inflows) and given (outflows), by gender and household arrangement (in hours per day)



Source: Authors' elaboration

As explained above, total production must exactly match total consumption at any moment. Consequently, the eventual differences between production and consumption can only be explained by the existence of time transfers among individuals within (intra-household) or between households (inter-household). To illustrate time transfers better, Figure 3 distinguishes the per capita age profiles of time transfers received (inflows) and given (outflows). As could be expected, transfers are very small in one-person households, where only inter-household transfers might occur, indicating that most time transfers take place in multi-person households. On the one hand, we observe that women's outflow is always greater than men's, indicating that the greater amount of time women devote to nonmarket activities is actually transferred to other individuals and not just consumed by themselves. This happens irrespective of age and household arrangement. Women's outflows are always greater than their inflows, except among the very old in two cases (single mothers and mothers living with others). On the other hand, as in the case of nonmarket production, time transfers are especially large for parents and

for ages related with child rearing. Overall, this figure shows that the gender gap, especially strong among parents, decreases with age.

4. How men and women actually work, consume and share resources throughout the life cycle according to household structure: Combining NTA and NTTA

To complete the picture of men's and women's actual role in the economy, we need to combine the domestic activities shown above with market activities. For that, an estimation of traditional NTA with the same level of disaggregation used for NTTA is needed. We start with the work of Abio et al. (2021a), who estimated NTA for Spain with higher disaggregation but simplified family structure. Below, we present the most relevant results, providing other details in the Appendix.

Figure 4 shows the per capita age profiles of total production from market (NTA) and nonmarket (NTTA) activities for ages 20+. NTTA profiles have been conveniently monetized, as explained in Section 2. In a small box, the relative magnitude of market and nonmarket production is plotted, obtained as a weighted average for all ages. The figure reveals interesting differences between men and women but also according to the type of household arrangement. First, we observe that men show more market production than women due to their greater participation in the labor market and the gender wage gap.[10] The main exception is nonmothers living with others (Type 3) who earn more than their male counterparts. Differences are minor for singles. Interestingly, there is a small gender gap in the first years of the career, but it vanishes and even reverses for higher ages, when women earn slightly more than men. In contrast, women living together in a couple without children and mothers in any household arrangement show labor income profiles significantly lower than men in the same situation. In the case of home production, the reverse happens: women work more than men, with no exception.

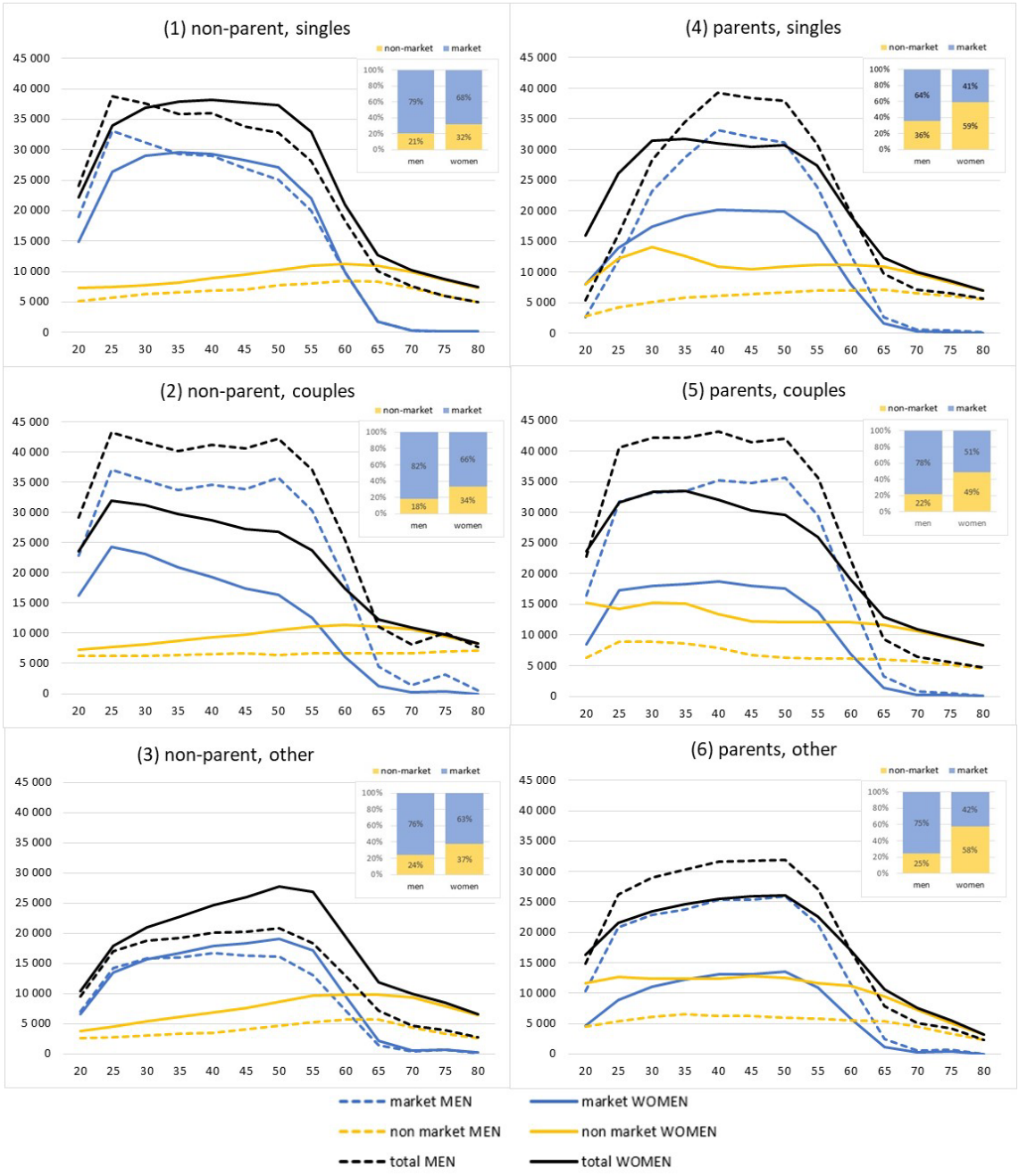
When we sum up both types of production, the total value is higher for men in most cases, partly due to the low price assigned to home production because, as Figure 2 shows, total work time is higher for women. The Appendix provides detailed results of a sensitivity exercise regarding the price used for nonmarket activities. However, Figure 4 shows that nonmothers living alone or with other adults produce more than men at almost every age. In the rest of household arrangements, this only happens after retirement age (65+), when men and women leave the labor market and nonmarket activities become the main mode of production.

Despite the low price assigned to nonmarket activities, our results show that they represent, on average, a 34% of total production's value, with relevant differences by gender and household arrangement. On average, the share of nonmarket activities in total production is greater for women in any household. For example, focusing on single households, home activities represent only 21% of total production for men and 32% for women although market production is higher for women aged 32-60 in this kind of household. This trend is repeated in the rest of the household arrangements. On average, home production represents 47% of total women's production but only 22% of men's. It is worth observing the significant differences between nonmothers living alone and in a couple (individual Types 1 and 2, respectively). When they live together in a couple, women's age profile of market production is considerably lower than when

[10] We cannot distinguish the role of both factors because we are estimating profiles per capita, but some statistics help us determine their importance. According to Eurostat, women's employment rate was 56.3% in Spain in 2010 and men's 69.2% (56.3% and 61.6% in the Euro area, respectively). On the other hand, the gender pay gap in the same year was 16.2% (17.1% in the Euro area). https://ec.europa.eu/eurostat/databrowser/view/LFSI_EMP_A__custom_2919600/default/table?lang=en (https://ec.europa.eu/eurostat/databrowser/view/sdg_05_20/default/table?lang=en)

they live alone. In contrast, nonfathers' age profile of market production increases when they live in a couple, and their home production is reduced, showing a kind of work specialization in couples. The consequence is a much larger proportion of total production for men at any age whereas the opposite happens for single households. For parents (individual Types 4, 5 and 6), differences between men and women are also very remarkable: the age profiles of home production significantly increase for women but only slightly for men aged 20-45 (associated with small children rearing). Overall, our results confirm that women are specialized in home production, particularly when they are mothers. In contrast, men's home production remains significantly below women's in any type of household.

Figure 4. Per capita age profiles of production (market, nonmarket and total), by gender and household arrangement (in euros per year). [In bars: share of market and nonmarket over total production by gender]

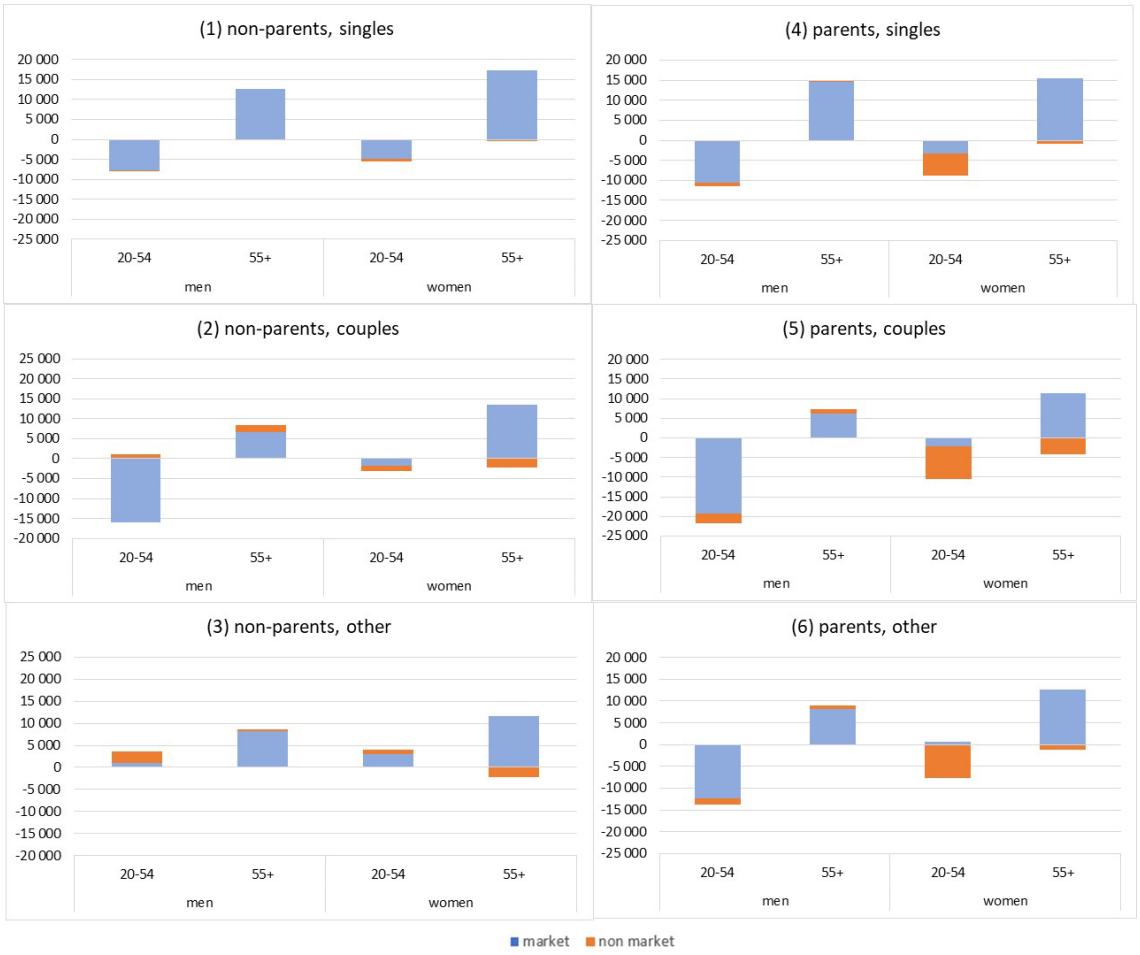


Source: Authors' elaboration

Consumption presents a smooth shape along the life cycle for market and nonmarket services, but it can increase at the end of life. Figure A2 in the Appendix shows detailed age profiles. In sum, consumption of home activities is considerably below that directly bought in the market. Differences by sex and household arrangement are low, partly due to the limits the data pose for the imputation process. Nevertheless, some differences remain. The results show that when living alone, women consume more than men (from the market and from home production). Something similar (with smaller differences) happens when they live with more adults (household Type 3). However, when they live together in a couple without children and when they are mothers, their consumption age profiles are very close to men's. The results also show that parents' consumption is significantly lower than that of nonparents, especially until age 50-55. This is true for consumption from market and home activities.

Considering production and consumption age profiles, the LCD can be obtained. Figure 5 shows the average LCD resulting in each household arrangement by men and women, differentiating two broad age groups: 20-54 and 55+. Moreover, we differentiate the LCD derived from NTA (only market production and consumption) and from NTTA (nonmarket activities).

Figure 5. Average per capita life cycle deficit (LCD) from market and nonmarket activities by broad age groups, sex and household arrangement (in euros per year)

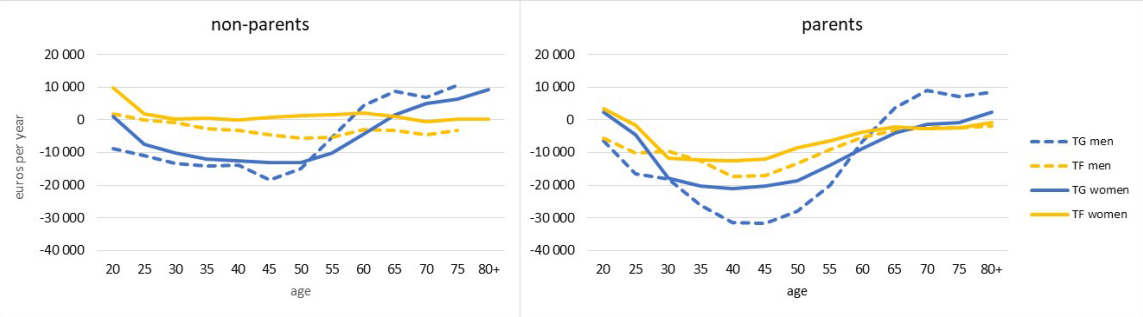


Source: Authors' elaboration

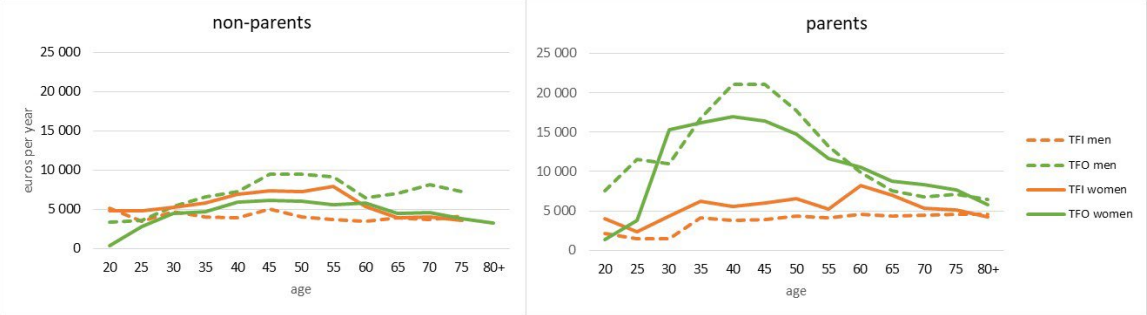
In the first age group, the market LCD is only positive (consumption exceeding production) for childless individuals who are still living with their parents (Type 3) and for mothers living with others (Type 6); the negative values for market LCD elsewhere in this age group are usually much stronger for men, being more similar only for men and women living alone. The market LCD is always positive for ages 55+, when most people leave the labor market. As for nonmarket activities, women show a surplus in all household arrangements except in the 20-54 age group when they are childless and living with their parents. The surplus is especially large for mothers in the 20-54 age group. Men in the 20-54 age group, however, show a much smaller surplus when they are fathers, having the largest deficit in nonmarket activities when they are childless and still live with their parents. Differences by sex observed in LCD will be even higher when we use the average market wage to monetize nonmarket activities, as discussed in the next section.

Figure 6. Per capita age profiles of transfers for parents and nonparents (in euros per year)

a) Per capita age profiles of net public (TG) and total (market and nonmarket) private (TF) transfers



b) Per capita age profiles of total (market and nonmarket) private transfers received (TFI) and given (TFO)



Source: Authors' calculations

Figure 6 summarizes market and nonmarket transfers occurring in the economy, including private and public transfers. In this case, we grouped the results to distinguish parents from nonparents because this is the main characteristic driving differences in private transfers. For comparability, we present public transfers with the same disaggregation. Panel a) summarizes the age profiles of net transfers (received minus given). Public transfers are negative (payments) up to retirement age (a bit earlier for men), and then they become positive (transfers received). As could be expected, men give and receive more due to their greater participation in the labor market; these differences are more pronounced in the case of parents. Gender and parenthood affect the pattern of private net transfers. Men are net givers along their whole adult period, and the same happens with mothers whereas childless women have a profile very close to zero. It is interesting to observe that private transfers become considerably more negative for parents

of child rearing ages (25-54), especially men (who obtain more labor income). Panel b) focuses on the private transfers resulting from market and home production, differentiating the age profile of inflows (received) from that of outflows (given). Indeed, private transfers given in households with children increase significantly for parents with young children (aged 25-54).

Figure 7 displays the synthetic indicators to grasp the role of the family in age reallocations. To simplify, we focus on differences between parents and nonparents. Panel *a* shows *self-sufficiency*, defined as the ratio between production and private consumption. We first observe that men are always self-sufficient in market activities and in nonmarket activities only when they are fathers whereas women are always self-sufficient in nonmarket activities. Parenthood increases both indicators of self-sufficiency for men, in line with the observed stronger implications for men in market and domestic work when they become fathers. Among women, market self-sufficiency is lower for mothers due to their lower participation in the labor market. However, mothers produce almost double what they consume in the form of domestic activities.

Family dependency, in panel *b,* is defined as the ratio of transfers received to private consumption across ages. This indicator focuses exclusively on private transfers (monetary and nonmonetary), and it shows what share of private consumption represents the transfers other members of the community receive (typically the family). Similar to the observed results in *self-sufficiency*, there is a different pattern by sex in market and nonmarket activities: men tend to depend less on market transfers (because they receive more labor income) whereas women need fewer nonmarket transfers (because they dominate in home production). For parenthood status, the identified pattern is reinforced: dependency on monetary transfers decreases for men and increases for women whereas the opposite happens for nonmonetary transfers.

Finally, panel *c* shows the *family generosity* indicator, defined as the ratio of transfers given to one's consumption. Symmetrically to *family dependency*, we compute the ratio of private transfers given to private consumption, ignoring publicly provided services. The results reveal that *family generosity* is a result of being parents (generosity ratios are doubled compared to those observed for nonparents). Moreover, men present a larger rate of generosity in market activities whereas women are more specialized in providing home services (nonmarket transfers given by mothers reach 132% of their consumption).

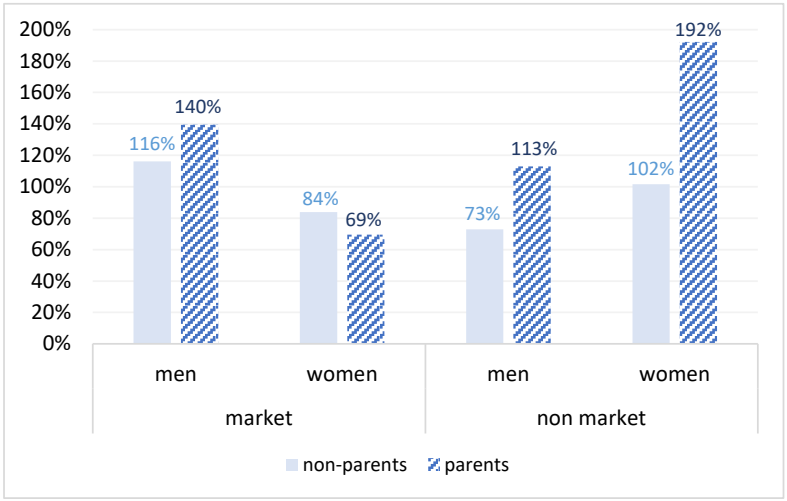
5. Discussion and final remarks

This study offers a quantified view of how resources move across age groups through the family, the market and the public sector, considering differences by gender and household arrangements. With the cross-sectional data, we aimed to give an approximation of how needs are financed along the life cycle. To do so, we start with the NTA method and the extension developed to account for nonmarket production and consumption in gender profiles and introduce heterogeneity in parenthood status and household structure.

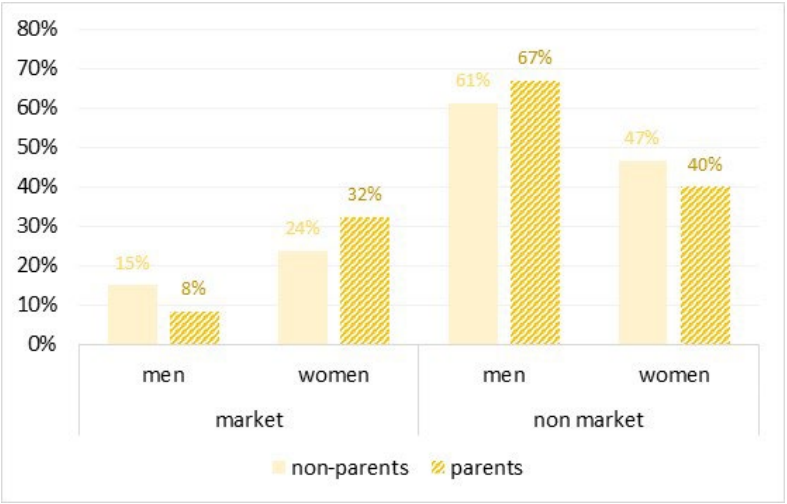
Our results corroborate previous analyses showing that women work more hours than men in total and that they are more specialized in home production and men in market production. Our methodology allows us to go further, identifying how age, parenthood and household arrangements affect this difference. The first striking feature arises when we compare singles with couples without children. Women, even when living alone, spend more time in home production than men, as reported in previous studies. The time they spend in the market is only slightly less than that of men. Second, the household labor division is quite substantial already

Figure 7. Private transfers indicators

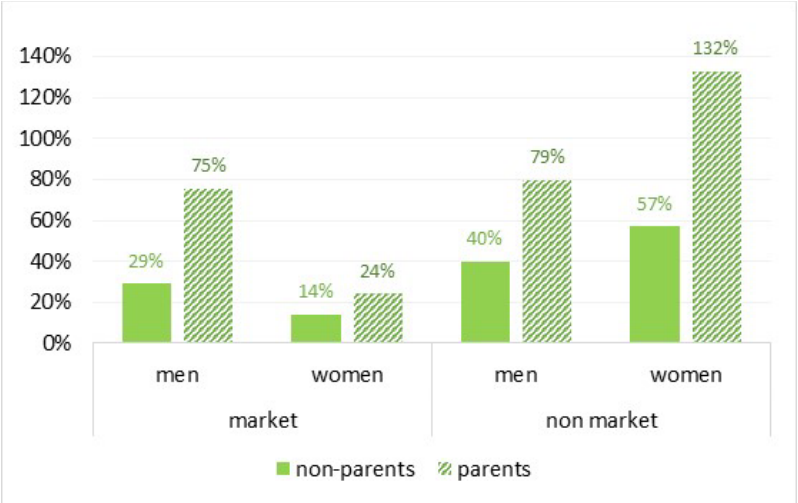
***a) Self-sufficiency* (ratio of production to consumption)**



***b) Family dependency* (ratio of transfers received to consumption)**



***c) Family generosity* (ratio of transfers given to consumption)**



Source: Authors' elaboration

in couples without children. When men are in childless couples, their home production is much less than that of single men working the same in the market whereas women decrease their participation in the labor market and slightly increase home production. As expected, the presence of children in the household reinforces this labor division (Domínguez, 2012; Dribe and Stanfors, 2009).

As a result of greater nonmarket production during all adult life and for all household arrangements, women are net givers of nonmonetary transfers. The majority of those transfers occur inside the household, and in the case of parents, the lion's share goes from parents to children.

To complete the picture of men's and women's roles in the economy, we combined market with domestic activities, monetizing the latter. Nonmarket production is estimated to reach 34% of total production, even when we assign a rather low value to time. Most of these activities are performed by women, who always work more hours than men. But the value of total production is higher for men as a consequence of the low price of time. Only nonmothers living alone or with other adults different from a partner produce more than men almost at every age. In the rest of household arrangements, this only happens after retirement age (65+).

To evaluate the assumption's effect on the price assigned to time invested in home production, we conducted a sensitivity test, considering the average wage in the economy instead of the lower replacement wage used in the base scenario. Figure A3 in the Appendix compares home production using the two alternative prices to market production. The effects of increasing the valuation are quite substantial. The shaded value of women's home production is now visualized. As a result, the value of total production is similar or even higher for women in all household arrangements throughout their adult life, except in couples without children (recall that women in this case reduce market production). Particularly in couples with children, the gender gap in total production, previously observed over the working age, practically disappears although the gender labor division remains.

The differences observed in the value of production by gender and household arrangements and the smaller differences observed in consumption are reflected in the LCD. The market LCD follows the typical life cycle pattern (surplus for 20-54 and deficit for 55+), the former being higher for men and the latter higher for women. In contrast, the nonmarket LCD follows a gender pattern: women tend to have a surplus and men a deficit. Women always show a surplus in nonmarket activities, no matter the household arrangement (even when living alone). This surplus is especially large for the 20-54 age group and those living in households with children. Men, in turn, show a deficit as soon as they live with women or other people, except when raising children. The results of the sensitivity test (Figure A4 in the Appendix), increasing the value of home production, imply that women have a greater total surplus in working age and smaller total deficit in the 55+ age group, which becomes a surplus in some household arrangements.

Individuals having a surplus can transfer money or time to other household members. We computed three indicators to assess the overall transfers in providing well-being. Focusing on gender and parenthood status, we found that throughout their adult period, parents are more *self-sufficient* (they compensate for their consumption with their production) than nonparents, except for women in market activities. Moreover, men are self-sufficient in market activities whereas women are more self-sufficient in nonmarket activities. In fact, parenthood increases self-sufficiency in market activities for men, and it reduces it for women. We also assess

dependency and generosity with respect to total family transfers (monetary and nonmonetary). On the one hand, men depend less on market transfers whereas women need fewer nonmarket transfers; parenthood status reinforces this pattern. On the other hand, *family generosity* is especially important for parents (generosity ratios are double those observed for nonparents). As expected, men show greater generosity in monetary transfers whereas women are more specialized in providing home services.

Overall, our results show interesting interactions among gender, parenthood and household arrangements. Further research is needed depending on the availability of longitudinal data, which is especially scarce in TUSs. Such studies would allow researchers to determine to what extent cohort effects affect the results and thus gain a better understanding of the interplay among the three axes of development.

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APPENDIX

Table A1. Number of observations in the main microdata sets (EU-SILC, HBS and TUS), by gender and household arrangement (Spain, 2010)

	(1) non-parents, singles						(2) non-parents, couples						(3) non-parents, other					
	Men			Women			Men			Women			Men			Women		
age	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS
0-4	0	0	0	0	0	0	0	0	0	0	0	0	853	1 842	760	809	1 622	675
5-9	0	0	0	0	0	0	0	0	0	0	0	0	902	1 706	697	912	1 719	650
10-14	0	0	0	0	0	0	0	0	0	0	0	0	887	1 697	684	807	1 648	630
15-19	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	999	1 828	484	882	1 716	442
20-24	23	21	<20	<20	<20	<20	<20	36	<20	34	67	20	910	1 709	398	839	1 417	378
25-29	56	57	22	46	61	25	84	200	62	134	291	94	726	1 257	305	535	874	272
30-34	94	106	47	71	74	50	210	416	128	183	407	135	445	689	180	290	439	128
35-39	84	125	62	66	68	32	126	285	99	101	263	89	283	459	121	159	253	88
40-44	94	129	54	62	87	35	99	212	74	113	170	59	186	365	115	132	204	75
45-49	87	128	50	62	79	40	72	191	64	107	214	75	177	259	99	104	199	66
50-54	<20	38	<20	80	84	33	92	172	59	77	198	42	42	72	34	56	122	50
55-59	34	34	22	51	80	36	87	184	38	94	151	48	36	55	25	26	60	21
60-64	64	88	35	42	70	31	87	148	52	76	116	38	40	72	23	30	58	<20
65-69	35	56	32	61	74	36	75	105	35	54	84	28	20	36	<20	28	37	<20
70-74	<20	43	21	55	84	48	56	67	25	45	68	24	<20	<20	<20	<20	23	<20
75-79	26	26	<20	70	106	55	48	90	28	39	57	20	<20	<20	<20	<20	23	<20
80+	<20	37	28	111	130	81	58	66	20	36	34	<20	<20	<20	<20	40	77	25
TOTAL	**644**	**888**	**422**	**798**	**1 014**	**510**	**1 108**	**2 174**	**699**	**1 096**	**2 128**	**684**	**6 529**	**12 088**	**3 945**	**5 676**	**10 491**	**3 545**

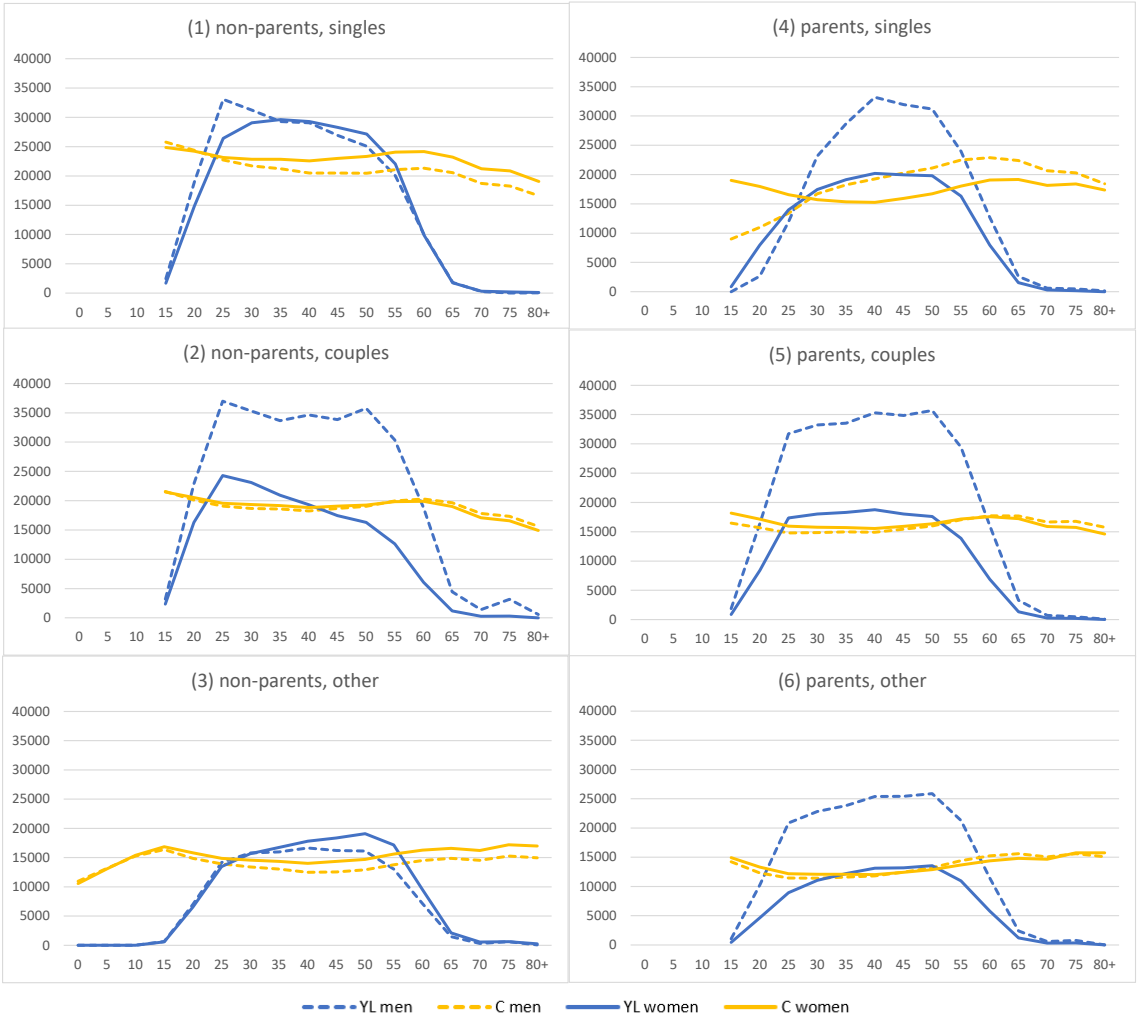
	(4) parents, singles						(5) parents, couples						(6) parents, other					
	Men			Women			Men			Women			Men			Women		
age	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS	SILC	HBS	TUS
0-4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5-9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10-14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15-19	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
20-24	<20	<20	<20	<20	<20	<20	<20	<20	<20	27	81	31	<20	31	<20	40	87	23
25-29	<20	<20	<20	<20	<20	<20	60	171	65	134	318	97	26	50	<20	69	116	42
30-34	<20	<20	<20	34	56	26	302	715	272	496	1036	401	40	84	26	78	151	71
35-39	<20	<20	<20	64	114	47	689	1359	482	768	1584	611	56	124	43	100	186	73
40-44	<20	<20	<20	103	167	82	819	1717	554	914	1834	647	87	135	54	135	244	97
45-49	<20	<20	<20	121	182	73	874	1718	600	887	1688	618	110	175	58	139	234	113
50-54	81	103	50	141	201	93	848	1586	544	836	1497	541	218	307	111	180	314	120
55-59	69	98	42	150	203	101	698	1194	455	661	1184	474	129	287	108	139	294	114
60-64	29	50	41	168	240	96	679	1180	444	655	1049	446	104	192	95	118	255	106
65-69	64	85	19	226	247	109	620	940	375	540	883	325	94	158	47	114	190	81
70-74	58	73	25	176	315	155	438	745	305	384	637	266	84	111	47	102	186	60
75-79	82	98	38	255	364	173	430	673	254	320	492	196	81	118	46	121	221	65
80+	142	143	73	438	531	265	348	538	220	200	289	130	135	215	56	305	554	119
TOTAL	**555**	**691**	**308**	**1 892**	**2 639**	**1 231**	**6 818**	**12 558**	**4 578**	**6 824**	**12 578**	**4 787**	**1 173**	**1 993**	**709**	**1 643**	**3 056**	**1 090**

Source: Authors' elaboration

Figure A1. Per capita age profiles of nonmarket production and consumption, by gender and household arrangement, in hours per day (Spain, 2010)

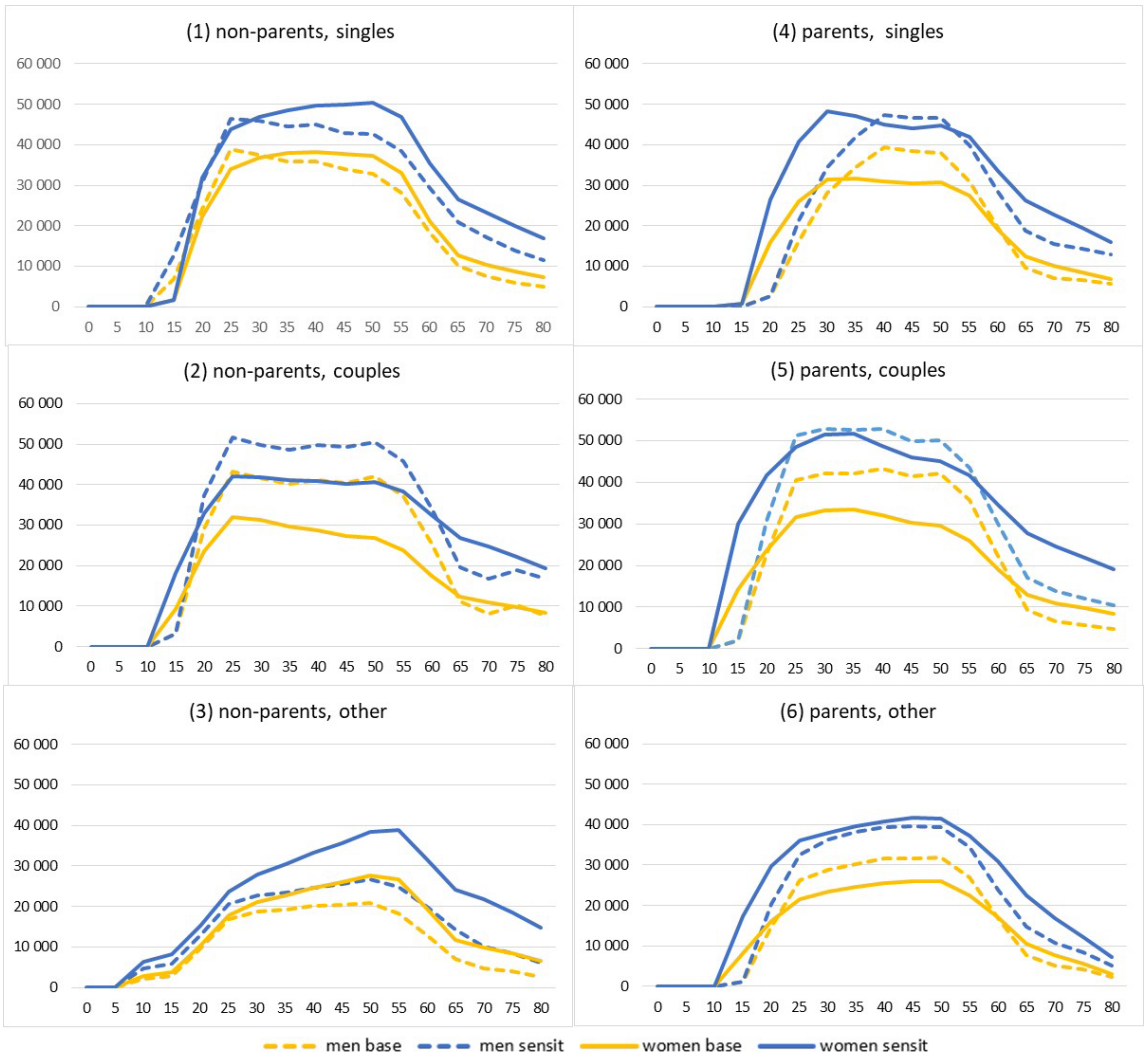
Source: Authors' elaboration

Figure A2. NTA per capita age profiles of labor income and market consumption by gender and household arrangement, in euros per year (Spain, 2010)



Source: Authors' elaboration

Figure A3. Sensitivity analysis to the monetization of nonmarket activities (base scenario and sensitivity): Per capita age profiles of market and nonmarket production (Spain, 2010)



Note: The sensitivity scenario is constructed using the average market wage in the economy to monetize nonmarket activities instead of the replacement wage (see text for more details).
Source: Authors' elaboration

Figure A4. Sensitivity of LCD to monetization of the nonmarket activities: comparing nonmarket and total LCD (baseline and sensitivity), in euros per year (Spain, 2010)

Note: The sensitivity scenario is constructed using the average market wage in the economy to monetize nonmarket activities instead of the replacement wage (see text for more details).
Source: Authors' elaboration