Center for Economic Institutions
Working Paper Series

No. 2023-4

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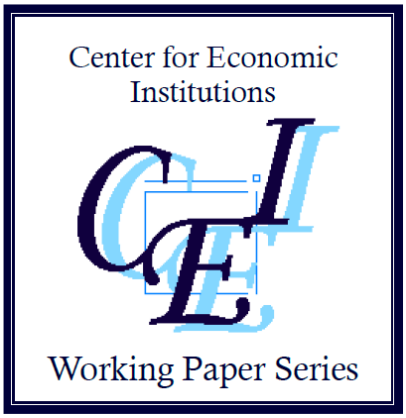
May 2023



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Taxing Reproduction:
The Invisible Transfer Cost of Rearing Children in Europe*

May 2023

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Abstract

What are the intergenerational resource transfer contributions of parents and non-parents in Europe? Using National Transfer and National Time Transfer Accounts for twelve countries around 2010, we go beyond public transfers (net taxes) to also value two statistically less visible transfer types in the family realm: of market goods (money) and of unpaid household labor (time). Non-parents contribute almost exclusively to public transfers. But parents additionally provide still larger private transfers: mothers mainly time, fathers mainly money. Estimating transfer stocks over the working life, the average parental/non-parental contribution ratio flips from 0.73 (public transfers alone) to 2.66 (all three transfers combined). The tax rates implicitly imposed thereby on rearing children are multiples of the value-added tax rates in place on consumption goods. The magnitude of these invisible transfer asymmetries carries multiple implications for sociological debates. For instance, it raises the question whether European societies tax their own reproduction too heavily.

* This article was written as part of the AGENTA project that received funding from the European Union's Seventh Framework Programme for research, technological development and demonstration under grant agreement no 613247. Support from the Center for Economic Institutions of the Institute of Economic Research, Hitotsubashi University, Tokyo, and the Corvinus Institute for Advanced Studies, Budapest is gratefully acknowledged. We are grateful for comments by Marius Busemeyer, Gretchen Donehower, Achim Goerres, Ronald Lee, Paul Marx, Andrew Mason, Timothy Miller, Frederik Pfeiffer, Balázs Romhányi, Luis Rosero-Bixby, Peter Sandholt Jensen, James Sefton, András Simonovits, James Vaupel, and participants at the European Demographic Forum 2021, the National Transfer Accounts network, the Danish Institute for Advanced Study and the universities of Corvinus Budapest, Cracow, Duisburg-Essen, Hitotsubashi Tokyo, Konstanz, Kyoto, Louvain-la-Neuve, and Southern Denmark. The usual disclaimer holds. We thank Gretchen Donehower for sharing her script modelling intra-household transfers.

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Introduction: Shining a Wider Light on the Resources Parents Contribute

People in all post-hunter-gatherer societies face a fundamental lifecycle consumption financing problem: productivity is concentrated in mid-life, but consumption is spread more uniformly over the lifecycle (Ando and Modigliani 1963). In early and late life, we therefore generally consume more resources than we produce, while the opposite holds true in mid-life. There are few individual or market solutions to this lifecycle consumption financing problem. Children and youth, in addition to facing competence limitations in dealing with their needs themselves, face major credit constraints (Becker and Murphy 1988). In turn, stocking consumption goods for late life is not possible even for adults. Commodities are, by and large, perishable, services cannot be stored, and tastes change over time (Samuelson 1958). In other words, there are strong limits to any intertemporal reallocations between one single person over his/her lifecycle. Instead, early-life and late-life consumption financing require solutions that are cross-sectional and exploit the fact that generations overlap. At any time, different birth cohorts live together as different age groups. Hence 'net resource-productive' mid-life age groups can contribute resources to finance the consumption of those who are resource dependent in early life and late life (Lee and Mason 2011; Vanhuysse, Medgyesi, and Gál 2021).

This intergenerational solution to the lifecycle consumption financing problem can be accomplished through various combinations of three channels: (1) private time transfers (redistribution of goods and services produced or provided directly by the people involved) within and between households, (2) private money transfers (redistribution of goods and services paid for but not directly produced or provided by the people involved) within or between households, (3) public transfers through taxes and social security contributions. To illustrate with early-life resource dependency, this means that the responsible child-rearer (for simplicity, the 'parent') can use a combination of: (1) staying at home to care for the child her/himself (unpaid household labor), or doing paid work and either (2) using the extra market income to buy goods and services for the child, or (3) paying extra net taxes that can finance public child care and schooling. The need for transfers to children remains across these three channels. Switching between channels does not eliminate the parent's transfer responsibility, but largely implies a transfer conversion (on which more below): from (1) time to (2) money to (3) taxes.

But crucially, these three transfer types are not equally statistically visible, as they do not generate data in the same way. Familial[1] transfers of money and time (such as the food, clothes, and care given to children) leave few traces, including in statistics, as families do not usually keep accounts of such transactions. By contrast, public transfers (taxes and social security contributions) connect large groups of people and are therefore much more fully recorded and visible in national statistics. Despite key early pleas (Kneeland 1929; Reid 1934) and contemporary feminist critiques (e.g. Burggraf 1997; Folbre 2008a, 2020; Fraser 2022), this asymmetric visibility issue has been largely ignored by mainstream economics (which still predominantly focuses on market exchanges and social externalities) and mainstream social policy analysis (which predominantly focuses on state interventions).

[1] The definition of familial relationships is highly complex in twenty-first century societies, but for easier reading, we frequently refer to what are technically inter-household transfers and intra-household transfers as 'familial' transfers. Note also that the surveys we use in this article do allow for the cohabitation-based definition of parenthood we employ here. This allows us to capture also non-biological parenthood: parenthood status is self-declared, and the coding instructions of the questionnaires we use allow us to code as 'parent' any adult who is identified by the respondent as someone's parent in the household.

Sociologically, however, visibility matters a great deal. Since societies tend to value mainly what they measure, what is imperfectly measured tends to be both imperfectly understood and undervalued. This often has major implications, whether this regards 'invisible women' (Perez 2019) and their 'invisible work' (Daniels 1987), the crowding out of intrinsically motivated behavior by extrinsic rewards (Bowles 2016), large hidden tax expenditures in seemingly lean welfare states (Howard 1997), or the large hidden and often irreparable environmental costs of GDP-measured economic growth (Sen, Fitoussi, and Stiglitz 2010). In this article, we argue that the higher statistical visibility of public transfers compared to private transfers of time and money similarly has major implications for how we sociologically (mis)understand and (under)value the contributions of parents in reproducing society.

We aim to shine a wider light on the measurement of intergenerational resource transfers by parents relative to non-parents, by valuing not just public transfers but also two types of less visible transfers in the family realm: of market goods (money) and, crucially, of unpaid household labor (time). The 'green moment' in thinking about macro-economic growth came when more inclusive ways of accounting laid bare the degree to which economic production tapped into hitherto unpriced but depletable natural assets and ecological services. In the same vein, shining a wider light on less visible transfers in the family realm can show to what degree the intergenerational welfare state is surrounded by a hitherto undervalued world of transfers within households. As we show below, better accounting truly shifts perspectives in this regard, and not just marginally.

We measure more fully the distribution of the input value of an activity with major social externalities – childrearing – between those who engage in it directly and those who do not. For simplicity, below we do not refer to 'child-rearers' and 'non-childrearers' but to 'parents' and 'non-parents.' However, our use of the term 'parent' does not fully correspond with the common-sense meaning (those who ever had children). Rather, it denotes parents who co-reside with minor children. Specifically, we aim to examine the ratio P/nP of resource contributions (P) by self-declared 'parents' (people who co-reside with their children) over resource contributions (nP) by 'non-parents' (people who have no children or do not co-reside with them). We focus on the cross-sectional and working-life transfer costs of rearing children, using a sample representing two-thirds of the European Union (EU) population in 2010 (pre-Brexit) and covering all main types of welfare regime: Continental (Belgium, Germany, France), Nordic (Finland, Sweden), Anglo-Saxon (United Kingdom), Mediterranean (Spain), and five institutionally heterogeneous East-Central European countries (Bulgaria, Poland, Estonia, Latvia and Lithuania). We adopt definitions and models of the National Transfer Accounts methodology (henceforth NTA) and we extend it further. Appendix A.1 spells out in detail the methodological innovations of the NTA method in extending the standard System of National Accounts, and how we go one step beyond these innovations by also splitting age-based NTA accounts along a further age-variant variable, childrearing. More specifically, we split the age profiles of public transfers and familial transfers (of money and unpaid household labor) by parenthood status and use them in a flows-to-stock exercise to assess synthetic working-lifecourses of parents cohabiting with minor children and of non-parents (both non-parents living in childless households and non-parents cohabiting with minor children who are not their own) in terms of net transfer outflows in working age.

Section 2 reviews the literature and indicates why measuring parental resource contributions better matters. Section 3 spells out our theory and expectations. Section 4 discusses definitions, data and the methods used to model the three types of intergenerational transfers. Section 5 presents cross-sectional age profiles of transfers split between parents and non-parents and a flows-to-stock exercise to assess synthetic lifecourses of parents and non-parents in terms of

net transfer payment during their working lives. Section 6 widens the analysis by estimating the implicit tax rates on parenthood and discussing gender (motherhood and fatherhood). We conclude by discussing further implications for sociological research and policy debates.

The Costs of Child Rearing: Literature Review

Wide across middle-income and rich societies, it is parents, not taxpayers, who bear the lion's share of the cost of raising children: in money and in time, directly and in opportunities foregone.[2] For most parents, the effort involved in rearing children is substantial. This has been demonstrated even in studies that do not estimate the value of parental time. For instance, Kleven et al. (2019) estimate that long-run child penalties for mothers in terms of lower labor market earnings five to ten years after childbirth are large across six OECD countries, at between 21 and 61 percent (see also Andrew et al. 2021; Doren 2019; Goldin 2021; Goldin, Pekkala Kerr, and Olivetti 2022; Kahn, García-Manglano, and Bianchi 2014). Penne et al. (2020:10) construct a needs-based indicator of the degree to which public transfers compensate parents for (just) the direct cost of children for two child ages in three parental income classes across six European cities. They find that public transfers compensate less than half the cost of children in 34 out of these 36 categories. Verbist and Van Lancker (2016: 1309) estimate the average share of the direct cost of children that is compensated by public transfers for three family types in 31 European welfare states. They find that public transfers compensate less than half the cost in 81 out of these 93 categories. Telling as they are, these findings heavily underestimate the true cost of childrearing. Parents, especially single mothers, also dispose of significantly less discretionary time than non-parents (Goodin et al. 2008). As we show below, in addition to providing net public transfers, parents, and only parents, provide still larger private transfers: fathers mainly money, mothers mainly unpaid household labor.

Previous empirical research indicates the scale of the positive externalities parents provide. Lee and Miller (1990) find that, at least in industrial societies with fertility rates around or below reproduction level, these externalities are positive and significant, amounting, for instance, to about $250,000 in today's currency for the US (nearly three years of average salary). Folbre (2008a) shows that parents, especially mothers, pay most of the costs of raising the next generation, whereas employers and taxpayers derive significant net benefits. Illustrating the importance of wider accounting, Suh and Folbre (2016) indicate a lower bound estimate of the replacement cost of nonmarket work of 44 percent of conventionally measured GDP for the USA in 2010. Wolf et al. (2011), who do not take into consideration any private transfers, show that the combined net present value of taxes paid and benefits received for parents and their offspring in the USA exceeds that of non-parents by 66 percent. This article adds new and internationally comparative European evidence to the debate.

Why Measuring Matters

These observations raise a positive question: is there significant asymmetry in the overall resource transfer contributions by parents versus non-parents, possibly in statistically opaque ways? This question takes on added urgency on an aging, longer-living continent with generally below-replacement fertility levels, particularly in societies with rates of intentional childlessness that are increasing (as in East Central Europe for post-1960s female cohorts) or

[2] See e.g., Adda et al. (2017); Bradbury (2008); Doepke and Zilibotti (2019); Folbre (2001, 2008a); Gál et al. (2018); Kornrich and Furstenberg (2013); Penne et al. (2020).

already high (as in Western and, even more so, Southern Europe) (Pessando 2019; Sobotka 2017). All else equal, if children raised one generation ago primarily by their own parents, rather than by general taxes or social security contributions, substantially finance the old-age consumption also of non-parents, the latter could be said to *de facto* free-ride on the collective effort provided by parents in reproducing society.

Such free-riding would matter because parents predominantly pay privately for the cost of rearing children to productive adulthood.[3] Moreover, some of this private cost is socially imposed on parents by socio-legal obligations for continuity of adequate care (Alstott 2004; Folbre 2008a; Olsaretti 2013). To the extent that their children subsequently become 'net resource-productive' adults as taxpayers, social security contributors, and caregivers (and parents in their turn), parents create positive externalities that will benefit all of society. For instance, as adults, children will later finance public infrastructure and public pension, health, and long-term care benefits - all of which will then also benefit current non-parents (England and Folbre 1999b; Folbre 1994; George 1987; Wolf et al. 2011). To be sure, children also provide important private benefits to their parents, and some part of the cost of raising them resembles pure consumption. Rearing children, at least in high and middle-income societies today, is best described deontologically as a strong intrinsic commitment.[4] But, barring immigration on a politically unrealistic scale, it is a commitment that in aggregate is key for the reproduction of society all the same (Folbre 2008a, 2020; Fraser 2022; Olsaretti 2022). Social reproduction depends on productivity-adjusted demographic continuity: this is a function of both the size ('quantity') and the capabilities ('quality') of successive generations.

This also raises a related normative question: to what extent *should* parents be compensated for childrearing? Why would a high parent/non-parent resource contributions ratio matter morally at all? After all, because of free self-selection into parenthood, we can assume that those whose wellbeing will be improved by having children will, on aggregate, have children – and vice versa (Deaton and Stone 2014). On one side of the argument, authors focusing on the 'public good' component of children incline towards more extensive compensation of parents (e.g. Penne et al. 2020; Verbist and Van Lancker 2016) – or even a legal claim by parents on their children's earnings (Burggraf 1997; Demeny 1987). On the other side, the 'Parental Provision' argument holds that since parents were aware of children's likely costs and consequences yet freely decided to have them, they now have no moral claim on compensation for rearing children. In fact, parents should actually be taxed if their children produce 'public bads' (Casal and Williams 1995, 2004). Children certainly produce negative environmental externalities. Some therefore claim that procreation is equivalent to morally problematic excessive consumption – the view of children as 'Hummers' (Conly 2016; Hedberg 2018; MacIver 2015).

Our position on the compensation question is less assertive than either side. Assertive conclusions on both sides of the debate, as it stands, tend to exclusively focus on either the positive externalities (public goods) or the negative externalities (public bads) parents produce - but not on both together. These lopsided conceptualizations matter because strong normative conclusions directly derive from them. As noted, children also embody social externalities, so they are not fully reducible to private consumer durables ('pets') or private investment goods

[3] See, notably, Burggraf (1997; England and Folbre (1999b, 1999a); Esping-Andersen (2009); Folbre (1994, 2001, 2008a); George (1987); Lee and Miller (1990); Wolf et al. (2011). Doepke and Zilibotti (2019) review economic models since Becker (1981) of parents' direct and indirect roles in children's human capital formation.

[4] See Folbre (2008a). Parents also seem to view their children as fundamentally sui generis goods. They value time spent caring for children more than other household or leisure activities (Krueger et al. 2009), allocate their time use accordingly (Doepke and Zilibotti 2019; Gershuny 2000), and react to material incentives rather weakly when it comes to time spent with children (Guryan, Hurst, and Kearney 2008).

('gold bars').[5] But importantly, the social externalities children embody are inseparably both positive and negative. Children are indivisible and thus better conceptualized as three things simultaneously: consumption 'private goods' to their own parents, 'public bads' to both their own and their parents' generations, and investment 'public goods' to their parents' generation, whose members (including non-parents) will tomorrow depend on today's children's productive contributions. While we remain *a priori* agnostic about the compensation question, our approach contains potentially far-reaching implications for addressing it. Whether, and to what degree, one believes that public policies should compensate parents, it is important to better measure the distributional impact of the status quo as this allows democratic debates about social reproduction and the costs of childrearing to be held on more complete and more explicit terms. Our main aim is to empirically lay bare the magnitudes of, and the asymmetries in, the contributions of parents relative to non-parents.

Theory and Expectations

The early-life consumption financing problem discussed above is unique in a specific way. Of all the activities that people in mid-life are responsible for, childrearing stands out as the one for which responsibility is the least sharable between parents and taxpayers. Extensive socialization of early-life care appears to be constrained in a way that, for instance, the financing of public goods, long-term care or pensions is not. In all modern societies, there is a notable asymmetry in the socialization of early-life and late-life needs (Lee and Mason 2011). Pre-adulthood children are raised predominantly by their own parents (a private family channel), whereas older people are predominantly supported as a generation by the generation of their adult children (a socialized, government channel). Even the large welfare states in (non-Anglo-Saxon) Europe engage in a division of labor to solve the lifecycle financing problem: they are elderly-oriented welfare states, embedded within societies composed of strongly child-oriented families (Gál, Vanhuysse, and Vargha 2018). The model of predominantly private childrearing has fully reasserted itself even in the rare settings designed explicitly to overturn it, such as collective childrearing communities in 1960s-1970s America (Cohen and Eiduson 1976) and the original Israeli kibbutz model of collective childrearing by multiple non-kin caregivers (Abramitzky 2018). When the state has had to take over as a last resort, as in the case of institutionalized orphans, child developmental and adult outcomes are generally considered to be worse, even excluding those cases in which severe neglect occurs (Wade, Fox, and Zeanah 2019). Yet, if accomplished early enough, transferring orphans to care by foster parents or adoptive parents can then often limit or reverse many of these adverse outcomes (Nelson, Fox, and Zeanah 2014).

In other words, when it comes to rearing children, what parents contribute in money and in time is not just less visible than what taxpayers contribute. Due to asymmetric socializability, it is also to a lesser degree replaceable. Empirically, rather than normatively, the *prime* responsibility of parents for rearing children appears to be unavoidable. Throughout most of human evolutionary history, this responsibility was to a larger degree shared with 'alloparents' - grandparents, aunts and uncles, and non-kin adults - through cooperative childrearing practices (Hrdy 1999, 2009). But in modern societies, the empirical reality of two-generational households has strongly reduced alloparenting and further increased the prime responsibility of

[5] Contra Becker (1981), children are not only like pets because they also provide a significant financial return in the form of private transfers and tax payments. Contra Cigno and Werding (2007), children are not like gold bars because they do not empirically finance their own parents' late-life consumption. Rather, children as a generation finance late-life consumption of their parents' generation (Vanhuysse et al. 2021).

parents. In contemporary Europe, the household composition structure is such that there are hardly any households in which intergenerational transfers *could* be given by anyone other than parents, such as cohabiting grandparents, uncles, or aunts. Of the 140 million households in the 12 countries we study in 2010, one-third count only one person and one-quarter is composed of couples without cohabiting children.[6] Of the remaining 43 percent households, only a small fraction (5 p.p.) are either households composed of two or more families, such as three-generational households with co-residing grandparents (2 p.p.), or multi-person households composed of non-kin, such as co-residing friends (3 p.p.). These 5 percent of households can be forums for intergenerational transfers, but not for parental transfers. Nearly all of the remaining 43 percent of households (38 p.p.) are either couples raising children or single parents raising children.[7] In practice, intergenerational transfers within families in Europe are largely limited to nuclear households consisting exclusively of co-residing *parents* and children.

In almost all households where intergenerational resource transfers can be given, they are given by parents rather than grandparents or other kin. Precisely because unpaid household labor and money transfers have been hitherto much less accounted for, we expect that adding estimates of these two types of private transfers to estimates of public transfers will reveal significant asymmetries in statistical visibility of the overall resources package contributed by respectively parents and non-parents. Shining a wider light does not merely complete the picture; it may substantially change it. The virtual disappearance of three-generational households in European societies, combined with the unavoidable prime role of parental transfers, leads us to expect a further, hitherto hidden, regularity. We therefore expect that when transfers of money (market goods and services bought for cash) and unpaid household labor are included in addition to public transfers, the parental resource contributions over non-parental resource contributions ratio P/nP will significantly increase to exceed unity everywhere where two-generational households are predominant (the asymmetric visibility hypothesis).

Moreover, while many sociological and institutional factors may contribute to explaining variation in P/nP, we expect this ratio to be consistently above unity wide across different demographic, policy, gender relations and labor market constellations. This is precisely because, in reality, it is parents alone who co-reside with minor children (the predominance of two-generational households today), and it is parents who are primarily responsible for childrearing (asymmetric socializability), one way or the other (the logic of transfer conversion). Simply put, non-parents nearly exclusively either live alone or in couples without co-resident minors. Hence they predominantly use just *one* channel (government) to make intergenerational contributions (though couples are of course likely to use the other two channels to make intergender transfers among themselves). By contrast, since parents use all three channels to make intergenerational transfers, transfer conversion can occur only among them.

To illustrate the transfer conversion logic at the micro level, imagine a mother who stays at home to raise her children herself. She gives time transfers (unpaid household labor) directly to her children. If, alternatively, she takes up paid labor and hires home care help, her market income and her public transfer contributions will increase and her original time transfer will be transformed into a money transfer between her and her child through an intermediary: a market

[6] Household composition structure is almost identical in the EU as a whole (Eurostat *cens_11htts_r2* table).

[7] In one-person households, no intra-household transfers take place. In households without cohabiting children, members do exchange market goods and time, but these are not intergenerational transfers as the participants tend to be close in age. In the age profile, such transfers cancel out. Note also that we coded as couples households containing (a) married couples, (b) couples in registered partnership, and (c) couples in consensual union.

transaction between her and the hired carer. Thus the size of the overall transfer package may be less affected than its composition. If, in a third scenario, the mother works and sends her children to public daycare or kindergarten, her market income as well as her public transfers will again increase while her time transfers decrease. The original at-home time transfer will now be transformed into a parental public transfer to finance services, the recipient of which will be the children, not parents.[8] Again, the overall package may be largely unaffected, even though its composition changes significantly.

Clearly, policy models can affect the relative importance of the family, markets and the state in how the intergenerational resource transfer systems operate across countries. For instance, public childcare, parental leave, family allowances, job-related benefits such as shorter working hours and care leave rights, and other work-family policies allow societies to modify the way parents, especially mothers, can combine work and family life (e.g. Gornick and Meyers 2003; Hook 2006). Since both men and women aspire today to combine careers with family lives, policies helping them to do so are almost certainly welfare-enhancing. Family-friendly policy bundles help parents (especially mothers) by reconciling work with family life and they help mothers by increasing their economic independence and bargaining power (though, paradoxically, they may simultaneously lower mothers' occupational and earnings attainments, see Mandel and Semyonov 2005, 2006; Mandel and Shalev 2009). In so doing, family-friendly policy bundles may help to build new social foundations for a 'return of the family' in postindustrial economies (Esping-Andersen 1999, 2009, 2016).

Yet such family-friendly policy bundles need not imply substantially lower total transfer contributions by parents – even mothers – and may not be best conceptualized as net *extra* resources received by parents. The logic of transfer conversion implies that parents are likely to largely pay themselves for these welfare-enhancing policies, through higher net tax and social security contributions.[9] We therefore expect P/nP to be well above unity even in the most family-friendly and gender-egalitarian welfare states, where (some) gender gaps and mother/non-mother gaps in overall resource contributions will be smaller as more mothers work and single-parent poverty is lower. More generally, while cross-country variation in institutions, demography, policy and gender norms likely determines the relative importance of the three types of transfers parents provide across Europe, such variation is less likely to drive the overall size of the full transfer package parents provide. The logic of transfer conversion thus leads us to expect that cross-country variation in the overall resource contributions package of parents (P) will be smaller than cross-country variation in the three types of transfer components (public transfers, money and unpaid household labor).

Definitions, Data and Methods

Childrearing: definitions

As our focus is on the transfer costs of childrearing, we apply definitions that concentrate on dependence and transfers in terms of material resources: public transfers, money transfers

[8] In other words, the primary recipients of work-family policies, beneficial as these are for parents and society, are children.

[9] Work-family policies may thus be profitable, in accounting terms, for governments. A parent taking up paid work and using public child care reduces her time transfers and pays more net taxes. On balance, extra revenues for governments may exceed the cost of providing child care. Research quantifying this time-to-taxes conversion is scant. However, a four-country simulation by UNICEF (2019) estimates that governments' extra savings on parental leave and extra revenues in labor-related taxes and social security contributions per each newly employed parent exceed governments' extra costs for paying public child care both in the short and the long run.

(including commodities and services purchased in the market), and time transfers. We mainly use the European Union Statistics on Income and Living Conditions (EU-SILC),[10] harmonized European Household Budget Surveys (HBS),[11] the Harmonized European Time Use Survey (HETUS, on which more below), and for health-related data, the European Health Interview Survey (EHIS).[12] None of these datasets contain information on the total number of children a person has. Instead, we exploit the data available on cohabiting persons.

This cohabitation-based definition of parenthood does not separate real-life parents from real-life childless people. Rather, it separates parents (biological or otherwise) who currently cohabit with their children from anyone else. Many parents, in the everyday use of the term, are not considered parents here. A biological parent is coded as a non-parent if he/she moved out of the house due to separation or divorce or if his/her children moved out. This makes non-parents in our calculations significantly more numerous and, as a group, more heterogeneous. Another feature of cohabitation-based parenthood is that it is age-variant in two ways. Real-life parenthood changes with age as children are born sequentially, but it usually remains unchanged after the number of children peaks. In contrast, coresidence-based parenthood is reversible, for instance, when real-life parents separate/divorce or when their children reach adulthood and move out. Just around the age when Europeans reach old age in the sense of becoming net resource-dependent again, the cell frequency of parents cohabiting with their children drops significantly in survey samples: beyond this age, there are hardly any parents left by the cohabitation-based definition. This limits the comparison of parents and non-parents to their working age.[13] It also makes the comparison of real-life social groups, such as large families of low socioeconomic status with three or more children and high-earning families with one or two children, more difficult. However, it does allow a near-complete and almost unhindered analysis of the transfer cost of childrearing because, as we show below, parental and non-parental transfers can be separated with a high degree of certainty using the cohabitation-based definition of parenthood.

As noted, we define a 'parent' as a person who co-resides with at least one of his/her children, and a 'child' as someone who co-resides with at least one of his/her parents. The latter definition is qualified with two further specifications. First, everyone below age 13, even those not co-residing with a parent, is also considered a child. Second, if someone is both parent and child in a three-generational household, we consider him/her a parent but not a child. Finally, a non-

[10] EU-SILC is coordinated by Eurostat, which provides data on individuals and households in EU Member States. The data collection builds on a common ex-ante framework that defines the harmonized target variables to be collected by the national statistical agencies. The dataset used here is the cross-sectional User Database, version 2011-4. Income reference year is 2010, and the combined sample size for the 12 countries is N=257,851.

[11] HBS provides information about the final consumption expenditure of goods and services of private households. The survey is carried out by each Member State, while the harmonization of the classifications and coding system of essential variables at the EU level is the responsibility of Eurostat. Reference year is 2010, and the combined sample size for the 12 countries is N=434,910.

[12] EHIS, coordinated by Eurostat, collects data on health status, healthcare use, and health determinants of the adult population living in private households. We use data from wave 1 for countries where this is available (year of data collection 2006-2009: Estonia, Belgium, Bulgaria, France, Latvia, Spain, Poland) and wave 2 for countries which did not participate in wave 1 (year of data collection 2013-2015: United Kingdom, Germany, Lithuania, Finland, and Sweden). Combined sample size for the 12 countries is N=172,520.

[13] Working age is defined here as the section of the life-course when the aggregate number of transfers provided exceeds the aggregate number of transfers received. Children, both dependent and of working age, are omitted from the comparison because they are neither parents nor non-parents. On how omitting working-age children from non-parents affects P/nP, see Appendix B.1.

parent is a person who is 13 years old or older and does not cohabit with any of his/her children (either because he/she has no children or because they do not co-reside with him/her).[14]

Age profiles

The surveys used in this article allow a cross-sectional comparison of the transfer package of the average parent to that of the average non-parent. However, we also want to compare the accumulating transfer stocks over the life-course by parenthood status, not just the transfer flows of the reference year. For that purpose, we first need to go beyond the cross-sectional averages and draw the cross-sectional age profiles of parental and non-parental transfers.

Cross-sectional age profiles are frequently used to construct stylized lifecourses by assuming that current age-specific characteristics in higher ages will apply to the current young when they grow older. For instance, a current 20-year-old is assumed to have the same characteristics 20 years from now as a current 40-year-old, and so on. Some key indicators of social sciences are based on such stylized lifecourses, such as the total fertility rate, an indicator of assumed lifetime fertility derived from period age-specific fertilities; or the period life expectancy at birth, which would be the average length of life of the newborn cohort should they go through the current period age-specific mortality patterns over their life-course. A special case of this period-to-longitudinal methodology is applied to assess the value of stocks accumulating over time. For instance, the cross-sectional age profile of savings can be used to approximate the accumulating wealth (Bommier and Lee 2003; Lee 1994b).

The period-to-longitudinal (and, within it, flows-to-stock) methodology represents a stylized future scenario to assess what would happen if the age profiles remained unchanged. It has a solid analytical value but is not designed to accurately forecast the future. The conditions under which the cross-sectional distribution properly represents the life-course distribution are restrictive. The lifetime patterns of the currently young can significantly deviate from what today's period age profiles describe. In addition, the choice of the parameters used to calculate present values, such as the growth and discount rates, strongly affect the outcome. However, the ratio between two stocks estimated the same way is essentially stable because the effects of parameter change mostly cancel out by dividing one present value by the other. So the usual qualifications to the applicability of the flows-to-stock methodology do not perceptibly affect our calculations (we will return to this issue below).

While drawing the age profiles of transfers, we generally follow the methodological standards of National Transfer Accounts, a recent development in national accounting specifically designed to capture age-related economic and social issues in a comprehensive and consistent way (Lee 1994a; Lee and Mason 2011).

Public transfers

We construct age profiles for public transfers, private money transfers and private time transfers. The first type, public transfers, includes all taxes, social contributions, and other forms of public revenues collected, and all cash benefits, in-kind services and public goods paid for by what public statistics call the general government: the central government (at both levels in countries having a federal structure), local governments, social security funds, and other public funds. Based on household survey information, we distribute the aggregates by age,

[14] Grandparents living with their grown-up children and grandchildren are treated as parents. For further details on grandparents see Appendix B.1.

covering the entire population, including those who do not pay a particular form of tax or receive a particular form of benefit or service. The survey-estimated age profiles are adjusted to SNA and the corresponding NTA aggregates, assuring that the entire public sector and the entire population are covered. Our reference year is 2010.

Tables 1 and 2 summarize the key methodological decisions about the construction of age profiles of public expenditures and taxes and contributions. The tables specify the SNA aggregates the age profiles are adjusted to, the functions of public spending, the sources of the aggregate data, the level of reporting data in the surveys (individual or household), the incidence assumptions and the sources of the microdata. Appendixes A.2 and A.3 provide further details.

Table 1: Summary of the methodology of constructing the benefit age profiles

AGGREGATES			AGE PROFILES		
SNA indicator	**function (COFOG)**	**source of data**	**level of reporting**	**distribution of benefits (access and amount)**	**source of data**
pure public goods (collective consumption expenditure of general government)		Eurostat, gov_10a_exp		uniform	EU_SILC (weighted total population)
in-kind-benefits (individual consumption expenditure of general government)					
	education - in kind (by level)	Eurostat, gov_10a_exp	individual	access: attendance by educational level; amount: per capita spending by educational level	EU-SILC (individual attendance by level; total number of students by level)
	health care (by service category)		individual	access: belonging to risk group (defined by age, education and gender); amount: pattern of using services by risk group and service category priced by unit cost of use by service category	EHIS information imputed into EU-SILC (pattern of using services by risk group and service category); EU-SILC (total number of uses by risk group and service category)
cash benefits (social benefits other than social transfers in kind)					
	education – cash	Eurostat, gov_10a_exp	individual	access and amount reported in the dataset	EU-SILC
	old-age		individual		
	survivors		individual		
	sickness/disability		individual		
	unemployment		individual		
	family/children		household	distributed equally among adults in household	
	housing		household		
	other social protection, cash		household		

Notes: COFOG: Classification of the Functions of Government. Unit of use: days in hospital, visits to the general practitioner and outpatient center. Imputation methods are described in Appendix A3.

Table 2: Summary of the methodology of constructing the age profiles of taxes/contributions

	AGGREGATES			AGE PROFILES		
	SNA indicator	**type of tax**	**source of data**	**level of reporting**	**incidence**	**source of data**
direct taxes	current taxes on income; net social contributions		Eurostat National Tax Lists	household	labor income	EU-SILC
	current taxes on wealth		Eurostat National Tax Lists	household	household head	EU-SILC
indirect taxes	taxes and subsidies on products					
		VAT	Eurostat National Tax Lists; CPB, 2013 (VAT rates)	estimated from household consumption and VAT rates	NTA equivalence scale	HBS information imputed into EU-SILC
		excise tax	Eurostat National Tax Lists; Excise Duty Tables of DG TAXUD (excise taxes)	individual/household	fuel consumption equivalence scale (fuel); individual consumption (alcohol, tobacco)	HBS and EHIS information imputed into EU-SILC
	other taxes and subsidies on production		Eurostat National Accounts		overall age profile of taxes on products	
other	other current transfers		Eurostat National Accounts		uniform	

Notes: DG TAXUD: Directorate General for Taxation and Customs Union. The NTA equivalence scale assigns a weight of 0.4 for those age 4 or younger, increases linearly from age 4 to age 20, and is equal to 1 for adults age 20 and older. Imputation methods are described in Appendix A.3.

Familial money transfers: cash and commodities

Disposable income is further redistributed within households (when, for instance, parents spend their earnings on goods and services for their dependent children) and between households (when pensioners support their adult children).[18] This tertiary redistribution, however, is not included in standard national accounts or government statistics. As an important novelty, NTA models private *money* transfers, the redistribution of financial resources and commodities bought in the market within and between households, making it more suitable for analyzing intergenerational transfers than previous data structures. Money transfers include, for instance, the food and clothes consumed by children as paid for by their parents or the utilities and other 'household public goods' consumed by all household members, including those who do not contribute to them. Intra-household money transfers typically do not change hands as a particular act of giving and receiving; in fact, they are typically not even identified as 'transfers' in the everyday meaning of the term. Parents who buy food for their children perceive it as a cost but would not usually call this a transfer in a questionnaire.

Such intra-household money transfers cannot be directly observed but have to be modeled. Providers of such transfers are household members whose individual resources (net income from labor and public cash transfers received) exceed the amount they consume. Beneficiaries are the other way around. Separately, both providers and beneficiaries can be identified straightforwardly. However, they cannot necessarily be assigned *together* to specific transfers (such as electricity used by a member and its bill paid by others).

Household members who have a deficit (consume more than their resources would allow) receive transfers from members who have a surplus. A set of sharing rules covering potential instances of household-level deficits/surpluses define the process and outcome of intra-household redistribution. Surplus members transfer the same share of their excess resources: the procedure sets a household-specific 'transfer rate' (sometimes called a 'family tax rate') specified by the rate of household-level aggregate deficits and surpluses and applied to the individual surpluses. The household head acts as one of the household members, but he/she also collects the outstanding surpluses/deficits and saves them (outstanding surpluses) or finances them from asset-based revenues or dissaving (outstanding deficits). It is also the household head who redistributes as transfers the individual shares of the imputed rent emanating from the ownership of owner-occupied houses. The age profiles of resources and uses are adjusted so that the population-weighted aggregates match the aggregates of national accounts. This way, the resulting age profile of intra-household transfers is consistent with the SNA. This guarantees that the calculation covers the entire economy and the entire population.[19]

Not all familial transfers take place within households, but the relative importance of inter-household transfers dwarfs in comparison with intra-household transfers.[20] Since neither income nor consumption surveys include information about the providers or recipients of inter-

[18] Our analysis is limited to income flows and does not cover wealth transfers. Lee et al. (2017) present NTA-based wealth accounts, but their conceptual framework cannot be extended to cover parenthood status as defined here. The cohabitation-based definition of parenthood is sufficient to capture current flows since they exclude only a tiny fragment (about five percent) of private transfers exchanged between households. However, a significant part of wealth transfers changes hands between non-cohabiting people.

[19] We thank Gretchen Donehower for sharing her script modeling intra-household transfers. For further details, see Istenič et al. (2017); United Nations (2013).

[20] Redistribution through public channels mobilizes 46 percent of net national income in our 12-country sample. Familial transfers represent another 24 percent of net national income and are nearly exclusively exchanged within the household (23 percent).

household transfers, they cannot be included in the calculations. Excluding them affects the results in a conservative way. Inter-household transfers are predominantly provided by separated/divorced biological parents or grandparents. If such transfers were included, the parental transfer packages we estimate below would be even larger.[21]

Familial time transfers: unpaid household labor

While NTA shines a wider light on intergenerational resource transfers by extending the statistically visible world from public transfers to private money transfers, it stays within the frontiers of the national economy, as reported in SNA. The NTA contribution thus remains incomplete: NTA rearranges SNA but does not consider what could be termed 'time transfers,' the exchange of goods produced and services provided by *unpaid household labor*. Time is the currency of life (Krueger et al. 2009). It is also key to a more complete grasp of what generations do for each other (Gál et al. 2018). There is a growing sociological understanding of the importance of, and the changing patterns in, the time devoted to family duties and other household labor (for a review see Cornwell, Gershuny, and Sullivan 2019). To shine a yet wider light on resource transfers between generations, NTA needs to be further extended with National Time Transfer Accounts (NTTA).

The estimation is based on time-use surveys. As a first step, the time spent on unpaid production activities is identified, and its age profile is drawn. Second, based on a set of assumptions specified in Appendix A4, home production is assigned to its presumed consumers. Third, the value of time spent in unpaid household labor is evaluated. Net time transfers are calculated as the difference between the values of household labor consumed and provided. We use HETUS data and adopt the procedure applied by Vargha et al. (2017).[22] Vargha et al. (2017) published profiles of the value of unpaid household labor and the consumption of its outcome by gender; we required additional details by parenthood status. Unlike the data sources used to construct the age profiles of public and private money transfers, HETUS data are not released as a micro-dataset but as a set of multidimensional tables. These tables offer details about the time spent on an average day and allow us to distinguish between altogether 20 distinct unpaid household labor activities, which were grouped into two summary categories: childcare (including activities that can be performed only for children) and housework (all other activities). The data source allowed crosstabulations of these activities with basic demographic characteristics, such as gender and age, and some limited child-related household information, such as the number of children of age 0 to 6, the number of children of age 7 to 17, and the exact age of the youngest child. However, no information was available on household size, the age of other household members, or familial relationships.

Pricing unpaid household labor is difficult precisely because it is unpaid: there is no market mechanism to evaluate it. Instead, we assigned the selected work activities to the wages of their closest category by the International Standard Classification of Occupations. This method applies the wages of the persons whose job is done (specialist replacement wage approach)

[21] The source of a familial transfer can be a public transfer. For example, unemployed parents use their benefits to support their children. However, such a transaction represents an offsetting effect. The public benefit received diminishes the net transfer burden of the parent but transferring the resources further to other family members cancels out this decrease.

[22] The Harmonised European Time Use Surveys (HETUS) quantify the time people spend on various activities, such as paid work, household chores and family care, personal care, voluntary work, social life, travel, leisure and others. The participating national statistical agencies use standardized survey designs and statistical classifications coordinated by Eurostat. The main survey instruments are a household questionnaire, an individual questionnaire and a time-use diary in 10-minute time slots. We use the first survey round (1998-2006).

instead of the wages of the persons doing the household work (opportunity cost approach). This choice conservatively affects our results since the opportunity cost approach typically assigns a higher value to household labor (particularly tasks done by men) than the replacement wage approach. For the same reason, applying economy-average wages to household labor (generalist replacement wage approach) would also result in a higher P/nP ratio (for details, see Appendix B.5).

The resulting information set can be employed to construct production age profiles but gives no sufficient ammunition for even the simplest model of the consumption of goods and services provided by household labor. To extend our information base, we imputed the age by gender by household-characteristic information set into the EU-SILC dataset and modeled the intra-household distribution of the outcome of unpaid household labor based on its household rosters. Childcare was assigned to children, and general housework was distributed equally among all household members.

Baseline Empirical Analysis

Cross-sectional analysis: Overall age profiles and age profiles by parenthood status

Figure 1 shows the age profiles of, respectively, public, familial money and familial time transfers in net terms (transfers received less transfers provided). They condense information of our 12 European countries. As the aggregation requires re-scaling of the national age profiles, following NTA standards, we use the average market labor income of 30-49-year-olds (irrespective of parenthood status and including those who do not work), as presented on the vertical axis of Figure 1.[23] The horizontal axes represent ages in cross-section.

The public transfer curve (left panel) marks three separate age groups. Children and older adults are net beneficiaries; working-age adults are net contributors. The left panel stands in sharp contrast with familial money transfers (central panel) and time transfers (right panel). Here, children are net beneficiaries and working-age adults net providers, but the balance for older adults converges to zero. In effect, older age-groups are absent from the intergenerational familial transfer mechanism. Grandparents do not typically live with the families of their adult children in contemporary Europe – and familial transfers are overwhelmingly exchanged within households. Inter-household transfers make up just five percent of the total, both among money and time transfers.

[23] Rescaling to make national values comparable, we follow the NTA standard and divide the national values of benefits and taxes by the national per capita labor income of the age-group 30-49. Re-scaling thus filters out the effect of differences in income levels across countries, and it is less arbitrary than alternatives based on consumption baskets.

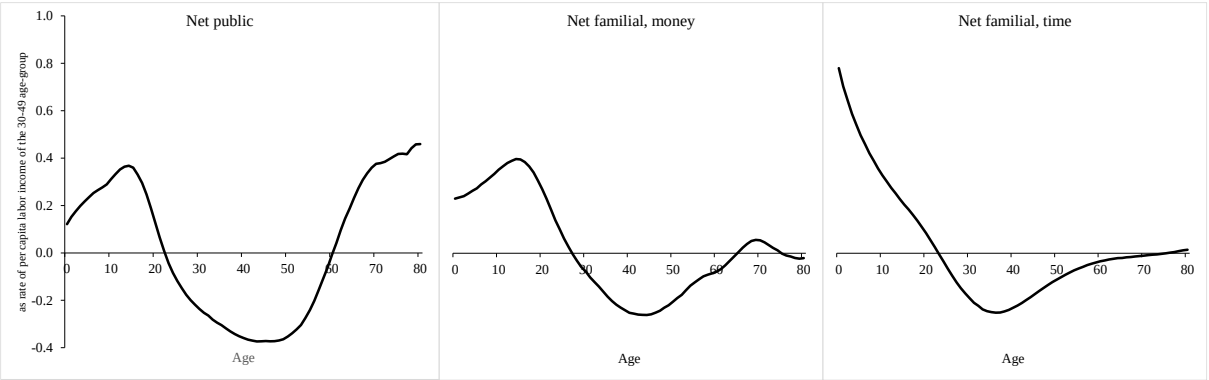

Figure 1. Per capita age profiles of net public, net familial money and net time transfers in 12 European countries, 2010

Source: Authors' calculations.

Note: Per capita figures refer to entire year groups, not only those who provide or receive transfers. Values are normalized on the per capita market labor income of persons aged 30-49 of the respective country.

Figure 2 replicates Figure 1 but is limited to working-age and splits the profiles by parenthood status. The NTA methodology allows a data-driven sectionalization of the lifecycle. Since the focus of this study is transfers, we use the net transfer curves to separate age groups (children, working-age people, older people) by their status in transfer provision. Accordingly, people become net transfer providers, all three types of transfers combined, at age 25 and remain in this position until age 61 in the 12-country sample. Cross-country variation is small: entry age is 24-25 in all countries except Bulgaria (26) and Spain (27), exit age is 61-62 except in Poland (58), the UK (63), and Sweden (64).

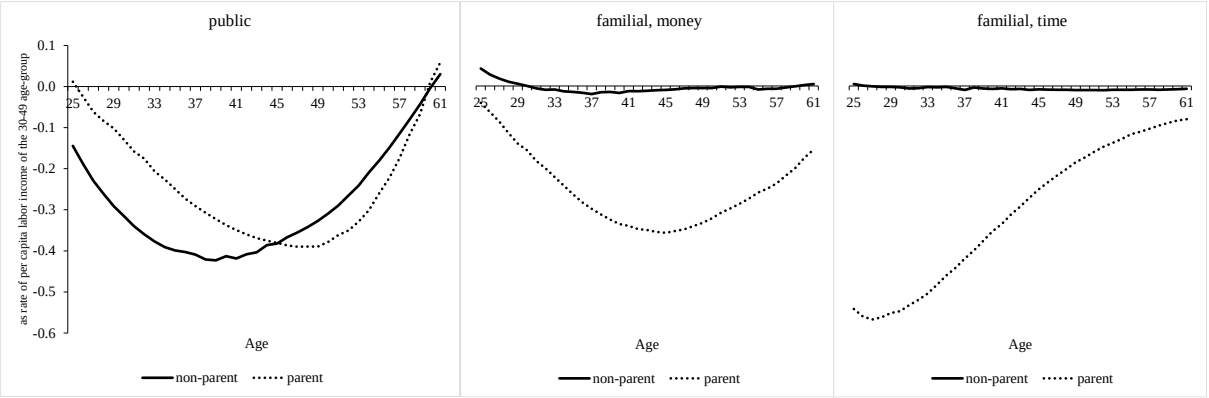

Figure 2. Per capita age profiles of net public transfers, net familial money transfers and net familial time transfers by parenthood status in working age in 12 European countries, around 2010

Source: Authors' calculation.

Parents and non-parents do not differ much in terms of their net contributions to public transfers (left panel of Figure 2). Non-parents pay higher net taxes than parents in more year-groups, and when they do, the gap between the two curves is somewhat larger than when parents take over at age 46. Yet, the overall disparities are not particularly wide. On the whole, non-parents pay

more in net taxes than parents do. The real difference comes in familial transfers. Non-parents barely appear to contribute any such transfers either in money or in time, in *net* terms. Non-parents living in childless households do not provide such transfers. Non-parents cohabiting with children do, but they make up less than three percent of the non-parent population. Of course, many childless working-age people also provide valuable upward familial support (Pessando 2019), just like many childless elderly people provide valuable downward contributions. But on aggregate, and as far as data avalability allows, *net* familial transfers are provided overwhelmingly, almost exclusively, by parents. Parental money transfers are roughly similar in size to public transfers; parental time transfers are even larger. Consequently, the overall transfer package of parents is significantly larger than that of non-parents.[24]

Flows-to-stock analysis: The lifetime cost of rearing children

Applying the flows-to-stock procedure discussed above, we now use the period age profiles presented in Figure 2 as stylized working-lifecourses for parents and non-parents in Table 3. The profiles are adjusted with parameter values for economic growth (1.5 percent annually), mortality (Eurostat *demo_mlifetable_px* table), and a discount rate (5 percent). We calculate the present values of the expected future net transfers by type (familial time, familial money, and public). We express them in terms of the yearly labor income of people between the ages of 30 and 49. Accordingly, the denominator refers to an indicator of the market economy, whereas the numerators include items both from the market economy and the realm of unpaid labor. We call the resulting parent/non-parent ratio (P/nP) the transfer cost of childrearing. In Appendix B.6, we present the results based on alternative parameter settings.

The likely reasons for the cross-country differences in Table 3 are multiple. They include, for instance, social policy model traits such as welfare state size, and degrees of decommodification and familialism (e.g. Esping-Andersen 1999, 2016), levels of economic development, the size and gender composition of the service economy (e.g., England 2010; Esping-Andersen 2009), wage structure, and the relative importance of the self-subsistence economy. While the number of observations is too small to allow rigorous statistical assessment of the independent effects of various explanatory variables, descriptively two general messages stand out. They are contained in Table 3's summary bottom row showing population-weighted European averages and are replicated in *every* country in the sample.

[24] There is a strong class and status gradient to the private resources spent rearing children (e.g. Kornrich and Furstenberg 2013). In Appendix D, we therefore further explored per capita age profiles of transfers by education status (below-high school, high school graduate, above-high school).

Table 3. Various transfer stocks of parents and non-parents generated over the working life in terms of years of prime-age earnings, 12 European countries in 2010

	Non-parents					Parents					Parents public / Non-parents public	Parents total / Non-parents total
	(1)	(2)	(3=1+2)	(4)	(5=3+4)	(6)	(7)	(8=6+7)	(9)	(10=8+9)	(11=9/4)	(12=10/5)
	Familial, time	Familial money	Familial, combined	Public	Total	Familial, time	Familial money	Familial, combined	Public	Total		
Belgium	-0.7	-0.2	-0.9	-6.7	-7.6	-8.7	-4.4	-13.1	-5.9	-18.9	0.88	2.49
Bulgaria	-0.2	-0.1	-0.4	-6.9	-7.3	-5.2	-5.9	-11.0	-5.0	-16.1	0.73	2.20
Germany	-0.1	0.1	0.0	-6.6	-6.6	-8.5	-4.2	-12.7	-4.6	-17.3	0.69	2.61
Estonia	0.1	-0.1	0.0	-7.5	-7.5	-5.5	-5.0	-10.5	-5.4	-15.9	0.72	2.10
Spain	-0.3	-0.1	-0.4	-5.3	-5.7	-7.2	-4.8	-12.0	-4.7	-16.7	0.89	2.95
Finland	0.0	0.0	0.0	-6.2	-6.2	-8.9	-5.5	-14.4	-5.4	-19.8	0.87	3.17
France	-0.1	0.0	0.0	-6.0	-6.0	-7.9	-5.0	-12.9	-4.2	-17.1	0.71	2.85
Lithuania	0.0	-0.8	-0.8	-6.5	-7.3	-3.9	-6.3	-10.2	-6.4	-16.6	0.99	2.28
Latvia	0.1	-1.1	-1.0	-7.5	-8.4	-2.7	-5.3	-8.0	-5.4	-13.4	0.73	1.59
Poland	-0.1	-0.3	-0.5	-7.9	-8.4	-9.5	-4.6	-14.1	-5.4	-19.5	0.69	2.32
Sweden	-0.2	-0.1	-0.3	-5.9	-6.2	-8.4	-5.2	-13.6	-4.9	-18.5	0.84	2.99
UK	0.0	0.0	0.0	-6.8	-6.9	-7.3	-5.9	-13.1	-3.5	-16.7	0.52	2.43
coeff. of var. of absolute values	1.16	1.30	0.97	0.11	0.13	0.31	0.12	0.15	0.15	0.10		
EU12	-0.1	0.0	-0.2	-6.4	-6.6	-7.9	-4.9	-12.8	-4.7	-17.5	0.73	2.66

Source: Authors' calculation.

Notes: g= 1,5%; r=5%. Prime-age earnings: average labor income of the 30-49-year-old age group. Reported EU12 averages are population-weighted.

First, in the public realm, parents everywhere contribute fewer transfers than non-parents over the course of their productive lives: about 4.7 years of prime-age earnings (column 9), compared to 6.4 years for non-parents (column 4). This amounts to about 73 percent of what non-parents contribute (column 11), ranging from 52 percent in the UK to sample-highest values of 84 percent in Sweden, 87-89 percent in Finland, Belgium, and Spain, and 99 percent in Lithuania. Second, in the family realm, parents, and only parents, everywhere provide in addition a still larger amount of private transfers of money and time. Non-parents barely contribute any familial transfers (0.2 years of prime-age earnings; column 3). But parents contribute total familial transfers that are everywhere significantly larger than their public transfers, typically even two to three times larger: on average, 12.8 years of prime-age earnings (column 8). Descriptively, the total familial contributions by parents range from 8.0 years in Latvia to 12.7-13.1 years in Germany, France, Belgium, and the UK, 13.6 years in Sweden, 14.1 years in Poland, and 14.4 years in Finland. Comparing columns 6 and 7, parental time transfers (7.9 years of prime-age earnings) are on average 1.6 times larger than parental money transfers (4.9 years).

Analytically, Table 3 reveals a significant asymmetry in statistical *visibility*. Nearly all non-parental transfers (98 percent) are statistically visible, ranging from 88-89 percent in Belgium, Latvia and Lithuania to 100 percent in Germany and France. By contrast, only just over one quarter of parental transfers are statistically visible, ranging from 21 percent in the UK to 39-40 percent in Lithuania and Latvia. Second, there are significant asymmetries in the sheer *sizes* of the working-lifetime resource transfers to the intergenerational transfer system: those made by parents are about 2.66 times higher than those by non-parents. Descriptively, P/nP ranges from 1.59 in Latvia to 2.61 in Germany, 2.85 in France, 2.95 in Spain and 2.99 in Sweden, and 3.17 in Finland. These baseline findings complement studies employing different methods showing that parents have fewer material and time resources than socio-economically comparable non-parents (e.g., Adda, Dustmann, and Stevens 2017; Doepke and Zilibotti 2019; Goodin et al. 2008; Penne et al. 2020; Verbist and Van Lancker 2016). But the magnitude of parental contributions, when revealed by including the family realm with NTA and NTTA methods, is much higher here.

Shining a wider light, stepwise, on the relative contributions of parents, beyond merely completing the asymmetries picture, substantially changes it. The P/nP ratio flips around, from 0.73 on average for public transfers alone (column 11), to 1.49 for public and private money transfers combined ((column 7+column 9) /(column2+column 4)), to 2.66 for all three transfer types combined (column 12). In line with the asymmetric visibility logic, columns 11 and 12 show that P/nP significantly increases to exceed unity everywhere in our sample. In line with the transfer conversion logic, the coefficient of variance of the absolute values of the overall parental transfer package P in column 10 (0.10) is smaller than that of each of its three subcomponents in columns 6, 7 and 9: time transfers (0.31), money transfers (0.12) and public transfers (0.15).[25]

The results reported in Table 3 could, in theory, still reflect the economic contributions of unobserved differences between parents and non-parents. But it is robust with regard to the parameters of the flows-to-stock exercise. As Appendix B.6 shows, lower discount rates and higher economic growth do not affect the patterns described above and change P/nP ratios only

[25] The same structure of cross-country variance also holds, more strongly, for fathers separately (0.09 versus 0.13, 0.25 and 0.69) and for mothers separately (0.24 versus 0.50, 2.52 and 0.28). See the subsection on 'parenthood or motherhood?' below.

marginally. Since we do not directly use the result of the flows-to-stock exercise but compare the outcomes of two such procedures (for parents and non-parents), our conclusions are less vulnerable to the usual risks of estimating stocks from flows.[26] Appendix B.6 also shows how changes in the cross-sectional age profile would affect the results. Specifically, we quantify the effect of changing parenthood density (equivalent to changing cohort-specific fertility) and find that the results reported here are conservative: in countries where cohort-specific fertilities have changed more, the P/nP ratio is actually smaller.

Further Empirical Analysis

Child-rearing as a highly taxed activity?

The baseline findings in Table 3 raise the question whether European societies may implicitly 'tax' their own reproduction very heavily. Going one step further, Table 4 therefore estimates the metaphorical tax rates that are implicitly imposed on parents across Europe. It calculates the difference (rather than the ratio) of the same three transfer type stocks of parents minus that of non-parents over the working life, but now relative to the present value of net consumption over the working life. This exercise allows us to calculate net parental transfer contributions in terms of the net amounts spent on consumption, just like value-added taxes and excise taxes (the two typical forms of taxes on consumption in Europe) are calculated. For comparison, column 1 shows that average VAT rates in our twelve-country sample, calculated by taking into account the relative weight of commodities charged with different VAT rates, were 12 percent on average in 2011, ranging from 8-9 percent in Spain, Poland and the UK to 17-18 percent in Lithuania and France. Column 2 presents the denominator of our parental tax estimation exercise: working-lifetime net consumption.[27] On average, aggregate net consumption over the working life is equivalent to 10.2 years of prime-age labor income in the sample, with relatively lower values in Nordic and Continental countries and somewhat higher values in the UK and Southern and East-Central European countries except Estonia.

Columns 3-6 then estimate the implicit tax rates on parenthood by relating the excess contributions by parents (net of those by non-parents) for the three types of resource transfers (the numerator) to the consumption estimates of column 2 (the denominator). Column 3 reconfirms that the excess parental contributions of public transfers are negative everywhere. Parents pay fewer public transfers than non-parents, on average by an amount equivalent to 17 percent of working-lifetime consumption, ranging from 1 percent less in Lithuania to 27 percent less in the UK. But column 4 adds that parents contribute many more private money transfers than non-parents, on average about 48 percent of working-lifetime consumption, ranging from 36-41 percent more in Latvia, Lithuania and Poland to 67 percent more in Sweden.

[26] We consider parenthood status as a binary variable, but of course parents may have multiple children. Appendix E therefore further distinguishes between parents with only one and with two or more children. With the exception of Latvia, the difference between single-child parents and multiple-child parents mirrors the baseline difference between non-parents and (all) parents above: single-child parents pay more in public transfers than multiple-child parents but they contribute less in both private money and private time transfers.

[27] We follow the same steps as made above. We use NTA procedures to draw consumption age profiles. NTA defines consumption as net of taxes, which is precisely what we need as standard consumption-related tax rates also apply to net-of-taxes consumption. To estimate a consumption stock (the present value of consumption over the working life), we use the same procedure and, in the base case, the same parameters as above. We present results generated by alternative parameter settings in Appendix F.

Table 4. Estimated implicit taxes on childrearing

	(1)	(2)	(3)	(4)	(5)	(6)
	Average VAT rate, 2011	Present value of net consumption over the working life, in years of prime-age labor income	Working-lifetime			
			Public	Familial money	Public + familial money	Time
			transfers as % of working-lifetime net consumption			
Belgium	11	8.2	-10	51	40	97
Bulgaria	15	12.7	-15	45	30	39
Germany	15	9.4	-22	45	24	90
Estonia	12	9.2	-23	53	31	60
Spain	9	10.9	-5	43	38	64
Finland	10	9.3	-9	59	50	96
France	18	8.7	-20	58	38	89
Lithuania	17	13.5	-1	41	40	29
Latvia	12	11.8	-17	36	18	24
Poland	8	10.3	-24	41	17	91
Sweden	13	7.5	-13	67	55	109
UK	9	12.4	-27	47	21	58
EU12	12	10.2	-17	48	31	77

Source: Authors' calculation. VAT rates: CPB (2013).
Notes: Prime-age earnings: average labor income of the 30-49-year-old age group. Reported EU12 averages are population-weighted.

These two transfer types are part of the national economy and do not belong to the realm of unpaid household labor. Together, public transfers and familial money transfers by parents above those by non-parents amount to almost one-third of working-life consumption on average. In other words, if the average European parent in our sample, hypothetically, suddenly became a non-parent, she would be able to consume 31 percent more in goods and services, ranging from 17 percent in Poland to 50 percent in Finland and 55 percent in Sweden. The implicit (metaphorical) tax rate on these two types of childrearing transfers is high by an objective yardstick. Comparing columns 5 and 1 shows that the 31 percent average tax rate on parental excess transfers of public and familial money resources alone (excluding time transfers) amounts to more than *two-and-a-half times* the average VAT rates in place across Europe in 2011.

We next enter the realm of unpaid household labor. Column 6 in Table 4 shows private time transfers as a percentage of net working-lifetime consumption.[28] The excess net contributions by parents in this realm amounts to 77 percent of working-lifetime consumption on average, ranging from 24-29 percent in Latvia and Lithuania to 96-97 percent in Finland and Belgium and 109 percent in Sweden. This can be interpreted metaphorically as a tax on the time spent in rearing children. While it is expressed in terms of consumption in column 6, the currency is different here. In the realm of unpaid household labor, lower transfer burdens translate into alternative forms of time use. The alternative is not more consumption of goods and services

[28] We do not add time transfers to the other two transfer types because for a proper interpretation of its magnitude, the value of the consumption of goods and services produced by unpaid labor would need to be added (column 1 would need to be extended with the present value of the consumption of household labor). This would reduce all values of columns 3, 4, and 5 by increasing the denominator and would render comparison with VAT rates in column 1 intractable.

produced by unpaid household labor, but rather less production of unpaid household labor and instead more leisure and more paid work. In other words, if the average European parent became, hypothetically, a non-parent, she would suddenly, by sheer virtue of being a non-parent, be able to spend much more time in leisure and in paid work. Comparing columns 6 and 1 shows that the average 77 percent tax rate on parental time is very large by the yardstick of real-world consumption taxes: it is more than *six times* higher than the average VAT rate applied across Europe.

Table 3 indicated that parents in the two Nordic societies in our sample contribute relatively more overall resources to the intergenerational transfer systems than parents in other European societies. Table 4 further corroborates this finding: the implicit taxes on parental public and money transfers and on time transfers are highest again in Sweden (55% and 109%) and Finland (50% and 96%). This may seem counterintuitive. Nordic Europe, after all, is famously family-friendly, with extensive subsidized childcare facilities with internationally high coverage and low child/carer ratios, and comparatively extensive parental leaves, family allowances, and other social policies to support parents and improve their work-family balance (Esping-Andersen 1999, 2009, 2016; Gornick and Meyers 2003). But as hypothesized in section 2, the family-friendliness of a welfare state does not necessarily imply the reduction of the overall parental transfer contributions. Nordic welfare states clearly help parents, especially mothers, through long and generous maternal and parental leave policies to rear their youngest children at home. Thereafter they help them, through generous childcare policies, to go back to paid employment often in relatively wellpaid jobs in the large and female-dominated public service sector (Mandel and Shalev 2009). This is turn boost mothers' market incomes and the welfare state's tax base (Esping-Andersen 2009, 2016; Gornick and Meyers 2003). Nordic family-friendly policies also reduce poverty rates among families with children, gender inequality especially among low earners (Mandel and Shalev 2009) and long-run father-mother income gaps (Kleven et al. 2019), though they may also reduce mothers' access to high-earning positions and occupations (Mandel and Semyonov 2005, 2006). While Nordic welfare states may not significantly reduce the overall transfer contributions of mothers, they are likely to make their lives considerably easier overall.

This also points to the wider role of service sector wages in the estimation of parental and non-parental transfers contributions. Baumol's (1967) cost disease (the disproportionate rise in relative service prices as service sector productivity tends to lag behind manufacturing) may not characterize all services. But it is likely to apply to the inherently labor-intensive care services most relevant to parents (England, Budig, and Folbre 2002; Esping-Andersen 1999; Folbre 2008b). Comparatively high caring sector wages play a double role here. Higher gross caring sector wages are, first, a direct tax burden, for instance in the form of daycarers', kindergarten teachers' and school teachers' wages. But second, they are also used in our valuation method as replacement wages for pricing at-home parental time. To the extent that it is mainly mothers who benefit from caring sector employment, high caring sector wages are thus likely to simultaneously increase the familial time contributions of at-home mothers (thereby increasing the mother/non-mother gap in unpaid household labor) and to increase the public transfer contributions of employed mothers (thereby decreasing the mother/non-mother gap in public transfers).

This means that comparatively more service-intensive welfare states, such as in Nordic Europe,[29] are likely to be more expensive in terms of both the direct cost of childcare (carers) and its replacement cost, leading to higher P/nP ratios.[30] The Nordic 'solidaristic wage bargaining' model, in which 'alliances of ends against the middle' managed to boost growth and employment while reducing pretax wage differentials, leads to more compressed wage distributions and thus to higher levels of low-end caring sector wages (Moene and Wallerstein 1997, 2003). In other words, by valuing unpaid family alternatives to paid work more, we accurately capture the fact that Nordic societies tend to *value* paid care work more. After all, Nordic parents do need to pay comparatively more if they want to replace their own child care with either public or private carers' wages.

Parenthood or motherhood?

Parents, not states (taxpayers), bear the lion's share of the cost of rearing children. Adda et al. (2017) decompose the lifecycle career cost of children into loss of skills during career interruptions, lost earning opportunities, and selection into more child-friendly occupations. But there is an important further gender component to this. As a result of evolved cultural norms and asymmetric power dynamics in gender bargaining at the micro and macro level, all three factors above may affect *mothers* more strongly than fathers (Burggraf 1997; Folbre 2020; Glauber 2018; Goldin et al. 2022; Kleven et al. 2019). It is conceivable that parent/non-parent differences, as analyzed above, may in fact prove to be a gender imbalance. To explore these questions, we further split parents into mothers and fathers and non-parents into non-mothers and non-fathers. Figure 3 shows the cross-sectional age profiles of, respectively, public, familial money and familial time transfers in net terms (transfers received less transfers provided) separately for fathers and non-fathers on average for our 12-country sample. Figure 4 does the same for mothers and non-mothers.

Figure 3 shows that fathers contribute somewhat more public transfers, and they do so at higher ages than non-fathers. But the real father/non-father differences appear in transfers in the family realm, which are less observable in public statistics and are largely unrecognized by eligibility rules of public health care or pension systems: time transfers and, especially, money transfers. Non-fathers are on average even net beneficiaries of time transfers in all working-age groups, by an amount that almost mirrors their net donation of money transfers. Hence non-fathers' intra-household familial transfers are practically zero at all working ages. In contrast, fathers pay significant money transfers that support the consumption of both mothers and children. Fathers also contribute net time transfers while their children are small, but they subsequently become minor net beneficiaries after age 52.

[29] Finland and Sweden ranked only 13th and 17th within a 27-country EU sample on public cash spending on families and children as a share of GDP in 2010, but they occupied two of the top three ranks on in-kind spending for families and children (with Denmark holding top rank) (Eurostat *spr_exp_ffa* table).

[30] Within a 29-country OECD sample, the Nordic welfare states occupy all four top rankings in terms of service-intensity, closely followed by two of the other countries with top-five P/nP ratios in Table 3: France (6th rank out of 29) and Germany (10th) (Marical et al. (2008).

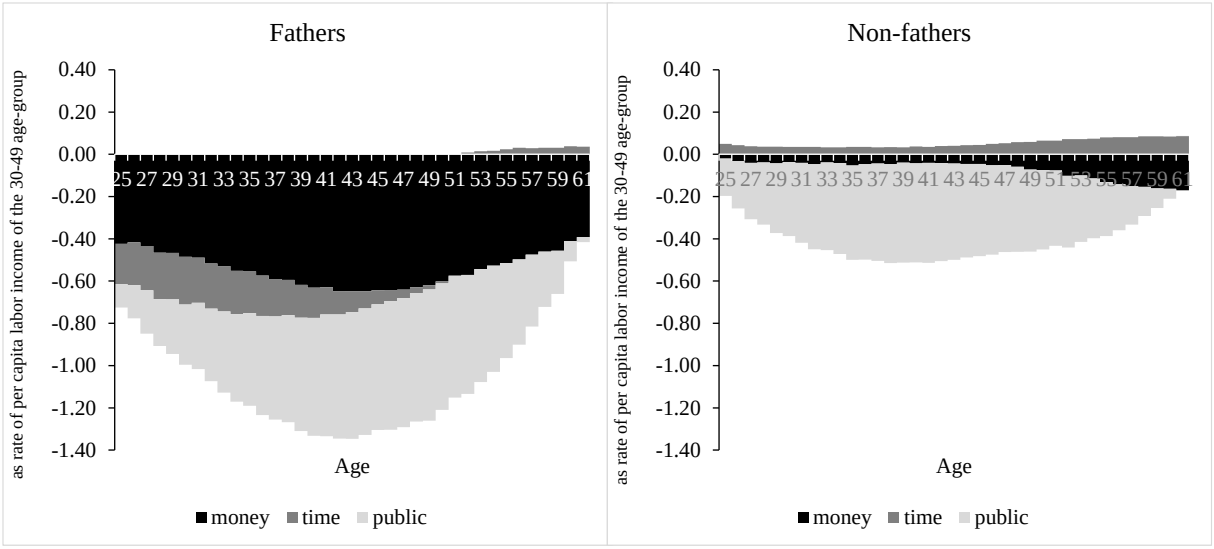

Figure 3. The relative cost of fatherhood: Combined transfer packages of men by parenthood status and age

Source: Authors' calculation.

Figure 4 shows that the composition of the packages of mothers and non-mothers is different from those of fathers and non-fathers. While fathers contribute more public transfers than non-fathers, mothers contribute fewer public transfers than non-mothers. In contrast, mothers' private transfers are significantly larger. Non-mothers contribute minor time transfers but are net recipients of money transfers, making their net resource contribution almost exclusively public at all working ages. In contrast, mothers' contributions are mostly in the less visible family realm and, within it, overwhelmingly in terms of time. The high overall contributions by parents relative to non-parents in Figure 2 and Table 3 are shown here not to be just higher contributions by mothers.[31] While there are many more women than men who are coresiding parents, the gap between mothers and non-mothers is not larger than the gap between fathers and non-fathers.[32] Applying a similar flows-to-stock procedure as above, we now use the period age profiles presented in Figures 3 and 4 as stylized working-lifecourses by parenthood status and gender.

[31] The cross-gender differences respond more strongly to changes in the assumptions than the difference between parents and non-parents do. For instance, if we applied a single average wage for the economy in the monetary valuation of unpaid labor (instead of the multiple activity-specific wages we have used), the mother/father gap would diminish or even disappear. But for the same reason, the P/nP ratio would grow even larger than reported above. Appendix B.5 gives more details about the robustness of our estimates of time transfers.

[32] The 2011 censuses show five times as many lone mothers with at least one co-resident child younger than 25 than lone fathers (11.7 million against 2.3 million) in the then-27 EU.

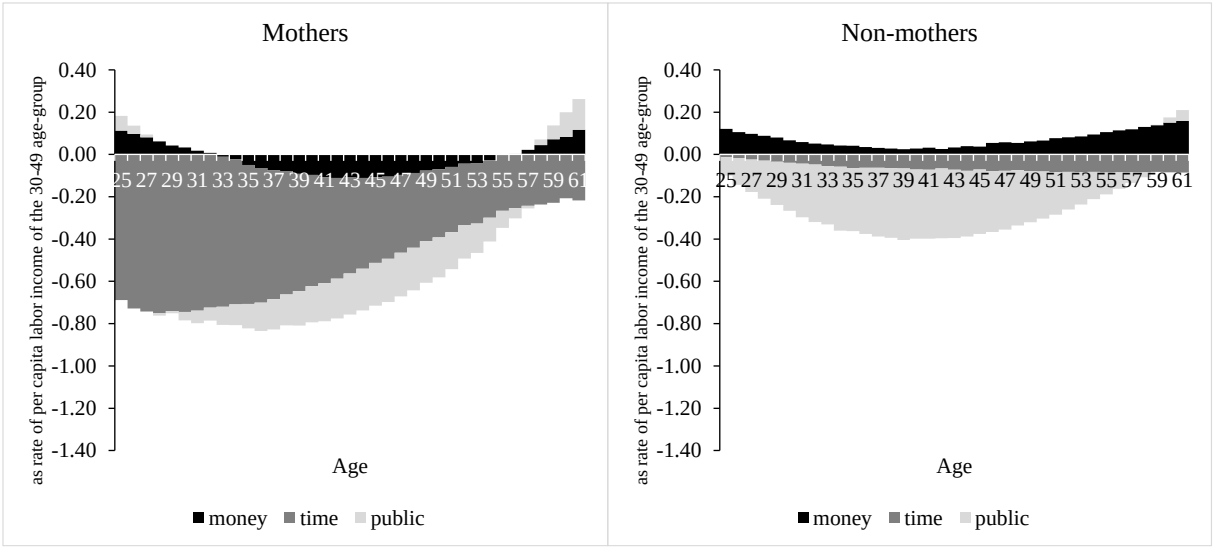

Figure 4. The relative cost of motherhood: Combined transfer packages of women by parenthood status and age

Source: Authors' calculation.

Table 5 presents the population-weighted averages of the 12-country sample of the various transfers for fathers and non-fathers, and mothers and non-mothers. The marginals are weighted averages by gender and parenthood status. A number of key observations stand out. Fathers and mothers both contribute much more than respectively non-fathers and non-mothers. The working-lifetime transfer burden of fathers is larger than that of non-fathers in each transfer category. The father/non-father gap is larger by a small margin in public transfers (one year of prime age labor income) and by a larger margin in time transfers (3.7 years). But there is a huge father/non-father gap of ten years (11.2-1.2) in familial money transfers. The working lifetime transfers picture is different for mothers and non-mothers. Non-mothers provide more public transfers than mothers by about 2.9 (4.8-1.9) years of prime-age labor income; but this is almost fully compensated (2.6 years) by money transfers, which mothers contribute more than non-mothers. The real difference (10.4 years) between mothers and non-mothers lies in their provision of time transfers.

Looking at familial transfers of money and time devoted to unpaid household labor first, a striking feature is how little the aggregates for mothers and fathers differ. What sharply distinguishes fathers and mothers in the family realm is not their overall familial transfer contributions but their composition: fathers mainly contribute money, mothers mainly contribute unpaid household labor. Sociological work has delved deeper into the contextual causes for such a gendered division of labor (see e.g. Cornwell, Gershuny, and Sullivan 2019; Hook 2006; Killewald 2013). Our analysis further shows why valuing unpaid household labor by extending NTA-based calculations with an NTTA exercise is essential to more fully reveal the extent of mothers' contributions. At the same time, the NTA methodology does justice to parents of both genders. Measuring intrafamilial money transfers makes fathers' contributions more completely visible; incorporating the realm of unpaid labor does the same with mothers. A similar gender pattern appears among non-parents. The family realms for non-fathers and non-mothers are nearly perfect mirror images. In all age groups, and increasingly so by age, non-fathers provide more familial transfers and non-mothers provide more time transfers.

While this might appear to corroborate much-debated specialization-by-gender theories (Becker 1981), it should be added that gendered roles appear increasingly unrelated to relative earnings potential (Andrew et al. 2021; Goldin 2021).

Table 5. Transfer stocks of parents and non-parents generated over the working life in terms of years of prime-age earnings by gender and parenthood status for three types of resource transfers (public, private money, private time), 12 European countries in 2010

public				
		parental status		
		parent	non-parent	total
gender	women	-1.9	-4.8	-2.9
	men	-8.4	-7.4	-8.2
	total	-4.8	-6.2	-5.4
money				
		parental status		
		parent	non-parent	total
gender	women	-1.2	1.4	0.2
	men	-11.2	-1.2	-6.7
	total	-5.0	0.1	-3.1
time				
		parental status		
		parent	non-parent	total
gender	women	-11.6	-1.2	-7.6
	men	-2.7	1.0	-0.8
	total	-7.9	0.0	-4.4

Source: Authors' calculation.

Overall, gender status informs about the type of invisible transfers provided; parenthood status informs about their magnitude (which in turn depends on how unpaid services are valued relative to paid services). When we next also consider public transfers to eyeball the overall picture of all three types of transfers combined, two observations stand out. First, fathers provide more total transfers than mothers. Second, the gap between fathers and non-fathers is not strikingly different from the gap between mothers and non-mothers. Current methods both of measuring and valuing paid and at-home care work and of distributing consumption among household members may hide inequalities to the detriment of women (Folbre 2020; World Bank 2018). Yet our findings indicate that gender imbalances may not be, first and foremost, about resource consumption or production. Instead, gender imbalances reflect deeper asymmetries in property rights, eligibilities, and valuation of different types of societally valuable contributions, and therefore, ultimately, in societal norms and power relations.

For a host of sociological and political economy reasons that provide stringent macro-institutional and macro-structural constraints on individual-level preferences, women still record generally lower labor market participation rates, total working hours, and hourly wages than men (e.g., Goldin 2021; Goldin et al. 2022). Gender inequalities in all three of these components of earning inequalities tend to increase *after* parenthood, which suggests that unpaid care work plays a key role (Andrew et al. 2021). For instance, the long-run cost of *mother*hood in earnings alone, while varying, is large everywhere: 21-26 percent in Scandinavian countries, 31-44 percent in Anglo-Saxon countries and 51-61 percent in German-speaking countries. By contrast, the long-run cost of *father*hood is zero in Denmark, minor in

Sweden and Anglo-Saxon countries, and even negative in German-speaking countries (Kleven et al. 2019). The third component, lower wages, in part results from women's higher concentration in lower-paying occupations, often in caring work (e.g., England 2010; England et al. 2002; Folbre 2020; Iversen and McCall Rosenbluth 2010). Care sector penalties and motherhood penalties, while ever-evolving and public policy supply-dependent, remain deeply entrenched (Budig and England 2001; Doren 2019; Glauber 2018; Goldin 2021; Kahn et al. 2014; Kleven et al. 2019). The work of carers, mostly mothers, in reproducing society over time is both societally undervalued and imperfectly accounted for.[33]

Better accounting, by more comprehensively valuing all types of productive work, matters crucially not just for equity reasons but also for the efficient allocation of human capabilities to different types of work. Shining a wider light on what working-age adults contribute also inside the family indicates that the source of father-mother inequity is not primarily in how much genders contribute, but may instead reflect how their respective contributions are valued. What fathers contribute is largely measured, societally valued, and protected by contracts and property rights; what mothers contribute, especially at home, in rearing the next generation largely is not (Burggraf 1997; Folbre 2020). This tilts intra-household power relations, even when anti-discrimination laws are in place and the legal standing of genders is equal, including the right to inherit or receive education (Folbre 2006; Goldin 2021; Iversen and McCall Rosenbluth 2010). As an accounting framework, NTA is not prepared to capture the deeper nature of these gendered power imbalances. As noted, our replacement wage method used the comparatively low market valuation of paid care work. Since it therefore attaches a comparatively low value to at-home care work, it mainly undervalues the contributions, specifically, of mothers.

Conclusions and Discussion

This study has measured the intergenerational transfer contributions by people co-residing with their children relative to people either not having no children or not co-residing with them, by going beyond net public transfers to also factor in two types of statistically less visible transfers in the family realm: of market goods (money) and unpaid household labor (time). Because of the irreplaceable primary role of parents in rearing minor children in a Europe of two-generational households, the resource packages parents contribute to the intergenerational transfer system are quite radically different from those of non-parents everywhere. Non-parents contribute almost exclusively to public transfers, more so than parents. But parents, and only parents, provide in addition still larger, albeit less visible, familial transfers: mothers mainly unpaid household labor, fathers mainly money.

Valuing not just public transfers but also private money and unpaid household labor transfers, has revealed significant asymmetries in statistical visibility. Nearly all non-parental transfers are statistically visible, compared to just over one-quarter of parental transfers. Shining a wider light, stepwise, on the relative contributions of parents does not merely complete the asymmetries picture; it substantially changes it. The average ratio of parental contributions to non-parental contributions flips around: from 0.73 for public transfers only, to 1.49 for public

[33] See e.g. (Burggraf 1997; England and Folbre 1999b, 1999a; Folbre 2001, 2008a, 2020). In a striking illustration, Folbre (2020: 77) notes that the compensation received by families of female victims of the 9/11 attacks was significantly lower than that received by families of male victims, as precedents in tort law emphasized the value of victims' predicted future earnings.

and private money transfers, to 2.66 when we further add time transfers. This 2.66 value captures the sheer *magnitude* of the full package of working-lifetime resource transfers by parents relative to non-parents. And the 'tax rates' implicitly imposed thereby exclusively on childrearing are between two-and-a-half and six times higher than the value-added tax rates *de facto* in place across Europe on consumer goods such as food, clothes, electronics and furniture. Asymmetric resource contributions of these magnitudes are not currently part of public policy debates. Whether, and to what degree, one believes that public policies should compensate parents, it is important to better measure the distributional impact of the status quo as this allows policy debates to be held on more complete terms. To repeat, our main aim has been to empirically lay bare the magnitudes of, and the asymmetries in, the contributions of parents relative to non-parents. Revealing their sheer size by more completely measuring the full transfer package is a prerequisite for more accurately assessing whether the status quo is desirable.

While our approach has remained strictly positive, our findings raise important questions about the optimality of current distributions of the cost of societal reproduction between parents and non-parents (see also Wolf et al. 2011). Unless an opposite asymmetry in net benefits appears in old age, the scale of these working-life asymmetries constitutes a large *de facto* redistribution from parents to non-parents that is statistically largely hidden from view. To repeat, children are undoubtedly also consumption 'private goods' conferring utility or wellbeing benefits to their own parents. The parental redistribution/compensation question arises from the fact that children are, additionally, also investment 'public goods' to their parents' generation, whose members (including non-parents) will tomorrow depend on today's children's productive contributions. Ours is a descriptive accounting analysis of the relative working-lifecycle patterns of three types of resource transfers contributed by parents and non-parents in Europe around 2010. This analysis has limitations. For instance, we could not estimate the contributions of parental *offspring* over time, though this has led us to err almost by definition on the conservative side in estimating the parents/non-parents gap. Wolf et al. (2011), who do estimate for parental descendants, find that the ratio of the combined net present value of public taxes paid minus public benefits received by US parents and their offspring exceeds that of non-parents (who have no offspring).

Second, we have not considered parents' indirect role in children's potential future negative impact on the environment, notably through net carbon emissions. As we have noted, children embody also a third component: they are environmental 'public bads' to both their own and their parents' generations. In recent years, several authors have argued that parents are not just indirectly causally responsible but also directly morally responsible for their offspring's carbon emissions. Therefore, they claim, a desirable approach to reduce carbon emissions is to penalize parents in some form for procreating (Conly 2016; Hedberg 2018; MacIver 2015). Our generational resource-contribution accounting method cannot measure these environmental externalities, but does help to reveal an important neglected element in these debates. Since children are indivisible, the positive and negative externalities they produce are inseparable. Otherwise stated, penalizing parents for the environmental burden of their children logically implies rewarding parents for the productive contributions of their children.[34]

Here is where our approach points to a last normative implication. This study has laid bare the sheer scale of the asymmetric transfer *contributions* by parents. Let us note, in ending, a further

[34] Appendix C shows why any policy aiming to internalize only children's negative externalities is logically inconsistent.

asymmetry in the way societies *reward* alternative forms of saving for late-life (Burggraf 1997; George 1987; Olsaretti 2022). The returns to one form (private savings in personal financial assets – gold bars) are privatized; those to another form (parental investments in the productive capabilities of children) are largely socialized. After all, the scarce resources which parents spent on children could have been put to alternative uses, such as increased leisure or consumption or positive-return investments such as assets or savings accounts. Technically, older persons' public transfers could be conceived, in part or fully, as returns to their earlier investment in rearing children (Cigno and Werding 2007; Demeny 1987; Olsaretti 2013; Sinn 2004). But empirically, social policies (say, public pensions, health or long-term care benefits) significantly taking into account such past parental investments cannot be observed in contemporary societies.[35] Everywhere, the societal returns of parental childrearing are, by and large, shared with non-parents, concomitantly reducing the benefits available to parents. Larger contributions *and* smaller rewards: this appears to add up to a double whammy on the plates of those who rear children. Although it may be largely hidden from view, the full cost of reproducing society seems very high in contemporary Europe.

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[35] The Mutual Information System on Social Protection shows that within the benefit formulas of the public pension schemes of the twelve countries in our sample, only one country gave any reference to child-rearing, while some countries accepted periods spent with children as service years (see www.missoc.org).

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APPENDICES

Appendix A: Methods, definitions and data

A.1. The National Transfer Accounts method

While drawing the age profiles of transfers, we generally follow the methodological standards of National Transfer Accounts, a recent development in national accounting specifically designed to capture age-related economic and social issues in a comprehensive and consistent way (Istenič et al. 2017; Lee 1994a, 1994b; Mason and Lee 2011). NTA extends the System of National Accounts (SNA) in three major ways. First, it introduces age into the age-insensitive SNA. The units of SNA are institutions such as households, firms, and the government, which have primary income (such as revenues from labor and assets), and in a secondary redistribution, pay or collect taxes, receive benefits or use public services. In contrast, the units of NTA are age groups. The same accounting items, such as primary income, taxes, benefits and public services, are rearranged and assigned to people of different ages. Households, firms and the government are replaced by workers, owners of capital and property, taxpayers, and recipients of services and benefits – all of whom enter the accounting system by their respective ages. For that purpose, NTA breaks up the black boxes of institutions, most importantly households, because they include people of different ages.

Here lies the second novelty of NTA. Beyond allocating primary income and the secondary redistribution of these resources by government, NTA deepens national accounting by adding a tertiary redistribution among individuals. NTA models private within-household transfers, such as parents buying services and commodities for their children, and complements them with transfers between households. By doing so, NTA incorporates an essential segment of reality that was so far ignored by the accounting system. Participants of the tertiary redistribution are overwhelmingly, though not exclusively, related to each other. Workers and taxpayers are simultaneously also partners and spouses, children and parents.

The third contribution of NTA is a shift in focus. NTA data largely increase the visibility of the inter-age transfer system by adding private transfers to the picture. However, even this deepening of the analysis is limited to the market economy. NTA rearranges the items of SNA but does not go beyond its frontiers. Besides a small part of the unpaid economy (the services of owner-occupied dwellings, the production of agricultural production for own consumption, and own-account construction of dwellings), it covers the outputs of market transactions. The subjects of the tertiary redistribution, the goods and services exchanged within or between households, were all paid for before they changed hands as private transfers. However, unpaid household labor is also a significant source of inter-age transfers. Beyond buying food and clothes, parents also contribute to their children's well-being by cooking, cleaning, and doing various other household chores. An extension of NTA, the National Time Transfer Accounts (NTTA; Donehower 2013; United Nations 2023), quantifies these transfers. By processing time-use surveys and adjusting them with market wage data, NTTA monetizes unpaid household labor, assigns its output to its consumers in the household, and draws the age profiles of household production and the consumption of its goods and services. SNA also has its household satellite account; however, NTTA is a more integral part of a typical NTA analysis than the household satellite accounts are of standard national accounting.

NTA covers the economic activities of the entire society. It can also be split to separate accounts of subgroups, such as regions (Kluge 2010), races (Oosthuizen 2019) and genders (e.g.,

Hammer, Prskawetz, and Freund 2015; Vargha, Gál, and Crosby-Nagy 2017). These studies split societies along age-invariant variables. We go a step further and split the accounts along an age-variant variable, child-rearing.

A.2. Public transfer aggregates

On the expenditure side, we cover pure public goods (in the terminology of the System of National Accounts, SNA, collective consumption expenditures of the general government), in-kind public services that the beneficiaries consume individually, such as education and health care (individual consumption expenditures of the general government), and cash benefits (social benefits other than social transfers in kind). The functional taxonomy of the programs (education, health, old age, survivors, sickness and disability, unemployment, family and children, housing and others) follows the Classification of the Functions of Government (COFOG) of the United Nations Statistics Division.

Data on expenditures are based on Eurostat sources (*gov_10a_exp* table downloaded on November 2, 2021). Cash benefits are identified as the COFOG category of 'social benefits other than social transfers in kind.' In-kind services are items of public consumption, which can be either individual or collective in COFOG terminology. Pure public goods, such as general public services, defense, public order and safety, economic affairs, environmental protection, as well as housing and community amenities, are, with a few insignificant exceptions, classified as collective public consumption.

On the taxation side, we cover direct taxes (taxes on income and wealth and social contributions), indirect taxes (taxes on products, such as value-added tax and excise tax, and taxes on production that enterprises pay for engaging in production, independent of the value of the goods produced, such as taxes payable on fixed assets or certain transactions), as well as other revenues (other current transfers in SNA terminology).

Figures of aggregate public revenues by type are drawn from the National Tax Lists of Eurostat (downloaded on May 7, 2017) and from the non-financial transactions table of national accounts also held by Eurostat (*nasa_10_nf_tr* table extracted on November 2, 2021). The database classifies all receipts of taxes and social contributions of the general government by economic function, such as taxes on consumption; labor taxes (separately by employers, employees, and the non-employed); taxes on capital income (separately by corporations, households, and the self-employed); and taxes on the capital stock. Consumption taxes can be further decomposed into value-added tax and excise taxes on alcohol, tobacco, and fuel based on National Tax Lists and the Excise Duty Tables of the Directorate-General for Taxation and Customs Union of the European Commission. The National Tax Lists split personal income taxes among labor taxes borne by employees and the non-employed as well as taxes on capital income of households and self-employed persons.

The public revenue category of 'other taxes and subsidies on production' includes taxes and subsidies paid by or to enterprises for engaging in production, irrespective of the value of the goods produced or services provided, such as taxes payable on fixed assets or certain transactions. The aggregate amounts for this category were drawn from the *nasa_10_nf_tr* table of Eurostat mentioned above.

Our reference year is 2010.

A.3. Public transfer age profiles

Pure public goods are neutral in terms of age and parenthood status, so they have a flat age profile for both parents and non-parents.

Non-uniform age distributions of education, health care, and social protection are drawn using two comparative surveys, the harmonized Household Budget Surveys and the European Union Statistics on Income and Living Conditions (EU-SILC). Besides, data on the consumption of health care services are drawn from the 2009 wave of the European Health Interview Survey.

Age profiles of direct taxes are estimated from EU-SILC. Such taxes are reported at the household level. The amounts in question are divided among household members proportionately to their labor income.

Profiles for value-added taxes (VAT) are constructed in a two-step procedure. First, consumption is distributed among household members. We apply a consumption-focused equivalence scale specifically developed for the purposes of NTA to distribute VAT among household members (Lee, Lee, and Mason 2008). The NTA equivalence scale assigns a weight of 0.4 for those age 4 or younger, increases linearly from age 4 to age 20, and is equal to 1 for adults age 20 and older. It differs from other better-known equivalence scales in that it does not aim to capture the economies of scale in the expenditure of households but rather to model the distribution of resources. While it is widely accepted that the extension of a one-person household with another adult member will increase the expenditures by only 50 percent, as the so-called modified OECD equivalence scale suggests, it is unreasonable to assume that the second member will consume only half of what the original member consumed. For this reason, leading experts specifically advise against applying the usual equivalence scales (Lee et al. 2008). In the second step, average VAT rates by main COICOP categories (Classification of Individual Consumption by Purpose by the United Nations Statistics Division) are assigned to the consumption of individuals. The average VAT rates are drawn from CPB (2013).

We use the international version of the EU-SILC and HBS datasets that usually contain less information than the original national surveys but fit better in a comparative analysis.

EU-SILC can be used to reconstruct the age and parenthood status of the recipients of *cash benefits* in the social protection categories of old age, survivorship, sickness/disability benefits, unemployment, family/children, housing, and other forms of social exclusion. Education-related cash benefits can also be captured in the dataset. Many of the listed categories comprise several allowances. Some benefits appear in the individual files of the dataset, making them easy to assort by age and parenthood status. Others, such as those in the categories of family/children, housing, and other social exclusion, are recorded at the household level. Allocating them among household members requires additional assumptions. We assigned them to the adults (age 18 or older) in the household and distributed them equally. Such an incidence affects the age profile of public transfers in a conservative way as it somewhat diminishes the net overall transfer package parents provide.

As against cash benefits, the value of the consumption of *in-kind services*, such as education and health care, is not directly recorded in the surveys applied here. Data on use, if available, has to be extended with external information or assumptions. Regarding education (which includes preschool education here), users can be identified in EU-SILC. The survey explicitly asks about attendance, and its level, individually. Aggregate public spending is also available by educational level in the *gov_10a_exp* data matrix (see above). This information set is extended here with the assumption that per capita spending by educational level is uniform and

does not differ by parenthood status (which is practically irrelevant as there are hardly any parents among pupils and students).

As for health care, even the information on the use of services is missing from HBS or EU-SILC. We apply the 'insurance value approach' commonly recommended in the literature (Verbist, Förster, and Vaalavuo 2012). It states that the benefit is not the actual use but the availability of service. Consequently, the value of the service can be identified with the average cost of its provision. Every individual receives a benefit determined by the average health care spending on their demographic and socio-economic group. We employ data from the first wave of the European Health Interview Survey (EHIS), which records the number of days spent in hospital and the number of visits to a general practitioner or an outpatient center. We calculate the average use of primary and outpatient services by gender, age group, and educational category, impute these averages into the EU-SILC dataset and weight them by per patient public spending in the relevant service categories (aggregate public spending by service category is available in the *gov_10a_exp* Eurostat table mentioned). Accordingly, the health profiles are based on the frequency and length of consuming health care services but not on actual spending.

Excise tax is levied on the consumption of tobacco, alcohol, and fuel. The latter is estimated from HBS data using weights developed by experts of the Hungarian Central Statistical Office to split consumption among household members. As for tobacco and alcohol, the HBS only provides information on household expenditure but not the quantities consumed. For estimates of the latter, we used the 2009 wave of the EHIS survey.

Using the incidence assumption that, in the same way as the taxes and subsidies on products, the category of other taxes and subsidies are borne by consumers, we constructed a general consumption age profile from the weighted averages of the VAT and excise taxes profiles. We adjusted this profile to the aggregate of other taxes and subsidies.

The primary data source of the calculations is the EU-SILC. However, as listed above, various taxes are estimated from the HBS and EHIS. In order to get to total taxes paid, and net benefits (benefits less taxes), VAT and excise tax payments are imputed to EU-SILC. Similarly to other studies on the redistributive effects of indirect taxes (e.g., De Agostini et al. 2017; Pestel and Sommer 2017), we applied a regression-based imputation method. We constructed a model of VAT payments in the HBS based on overlapping socio-demographic variables as explanatory variables and used this model to predict the VAT payment of households in the EU-SILC. The variables used to predict household VAT payment are the following: gender of household head, age of household head, percentage of household members below age 5, percentage of household members between age 6 and 14, percentage of household members aged 70 years or older, urbanization (densely populated, intermediate, thinly populated), region, household size, household type (six categories), highest education level of household head (less than upper secondary, upper secondary, tertiary), the economic activity of household head (employed, unemployed, retired, inactive), occupation of household head (10 categories) and log household income. A similar method was used to impute units of alcohol and tobacco consumption from EHIS into EU-SILC in estimating the age and SES profiles of excise taxes.

A.4. Additional information on the construction of the age profiles of time transfers

As mentioned in the main text, data on time use were not released as individual- or household-level information. Queries for multidimensional tables had to be submitted to Statistics Sweden,

one of the agencies responsible for constructing the Harmonised European Time Use Survey comparative database, with a constraint of a minimum cell frequency of 25.

As a first step, work activities performed by the respondent were separated from other activities on the HETUS activity list consisting of altogether 49 activities. The selection was based on the third-party principle: an activity is considered work if it can be outsourced to a third party. For example, cooking is work, but eating is not. The 20 activities used in this study are: food preparation; dishwashing; cleaning; other household upkeep; laundry; ironing; handicraft; gardening; tending domestic animals; caring for pets; walking the dog; construction and repairs; shopping and services; physical care, and supervision of a child; teaching, reading, talking with a child; other domestic work; organizational work; travel related to shopping; transporting a child; other domestic travel.

For the pricing of unpaid labor we applied the specialist replacement wage approach. The selected activity categories were assigned to the minute wages of the closest occupation category in the International Standard Classification of Occupations. We used wage data from the 2002 wave of the Structure of Earnings Survey (SES) and adjusted them with the average gross wage growth between the survey year and our base year. As a final step, the minute wages were adjusted to be consistent with total labor costs. The SES reports on minute wages in gross terms, but the average labor income of the 30-49-year-old cohorts used for normalization of national values throughout this study is consistent with total labor income (which includes contributions paid by employers). So, the minute wages were multiplied by the rate of compensation of employees (the SNA term for total labor income) and wages and salaries (the SNA equivalent of gross wages).

NTTA methodology (Donehower 2013) recommends distributing the output of general housework equally among household members. The application of the age-based NTA equivalence scale (see Appendix A.3) here would be counterintuitive: the need for additional housework, and consequently the consumption of such additional work, is likely to be negatively, not positively, correlated with the age of the child. The smaller the child, the more time is needed for cleaning, tidying the house, food preparation, etc. A per capita distribution is therefore conservative as it probably assigns more time consumed and consequently fewer net time transfers given by the provider. As for age-specific care work, Donehower (2013) suggests constructing a regression model that generates age-specific coefficients. Care is very age-sensitive among care recipients. The youngest-young and the oldest-old require disproportionate attention. We opted for a simpler solution because we do not need the two ends of the age distribution. Our analysis is limited to the working age. The amount of time devoted to care work is given in the survey and the number of net time transfers provided will not be affected by how the transferred time is distributed among children.

Appendix B: Robustness of the results

Extending our section on *Definitions, data and methods* and Appendix A, this appendix goes through the methods applied in the article, focusing on the explicit or tacit assumptions of the calculations to discuss how alternative assumptions would or would not affect the conclusions. We show that, given the limits of the available data, we applied standard methods and assumptions widely accepted by leading experts and specialized agencies. Wherever the outcome depended on our choice, we made a conservative choice that actually led us to, if anything, underestimate the extra net transfers of child raising as reported in the article. Often, the consequences of choosing an alternative solution have marginal effects, and when they do not, we present the alternative results.

B.1. Definitions

Working-age children and non-parents

This article treats working-age people who cohabit with their parents and have no children of their own as children. They are not included in the group of non-parents. This assumption affects the outcome in a conservative way: if working-age children had been considered as non-parents, the parent versus non-parent gap would have been even wider, as Figure B.1a demonstrates.

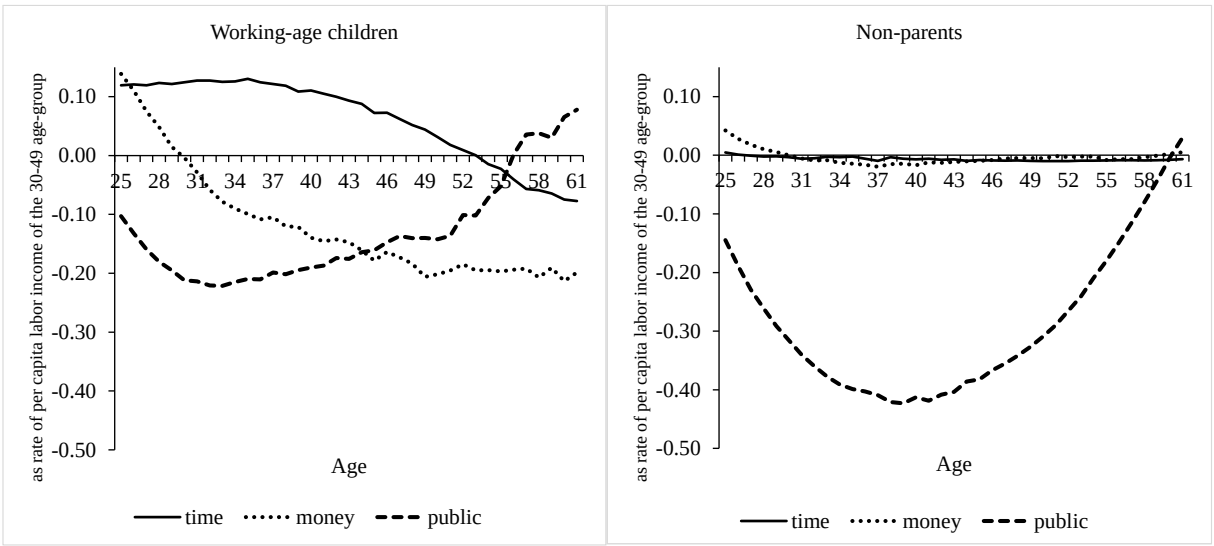

Figure B.1a: Per capita age profiles of public transfers, familial money transfers and familial time transfers in working age for working-age children and non-parents in 12 European countries, around 2010

The left-hand panel of Figure B.1a depicts the age profiles of the three transfer types for working-age children, who are shown to be net recipients of money transfers up to age 30 and time transfers to age 53. The left-hand panel of Figure B.1b shows the cumulative number of working-age children and non-parents in percentages by age. Examining the two charts together reveals that half of the working-age children are net beneficiaries of money transfers and 95 percent receive net time transfers. Adding them to the group of non-parents would shift the

practically zero lifetime balance of time transfers (-0.1 years of prime-age earnings, see the bottom row of Table 3 in the main text) to slightly positive (0.4 years) that is to the position of net beneficiaries. The lifetime balance of money transfers would decrease from zero to -0.2 years.

We added the age profiles of non-parents to the right-hand panel of Figure B.1a, which collects the non-parent curves of the three panels of Figure 2 of the main text. Comparing the two sets of age profiles of working-age children and non-parents reveals that although working-age children are net providers of public transfers, their contribution is less than that of non-parents.

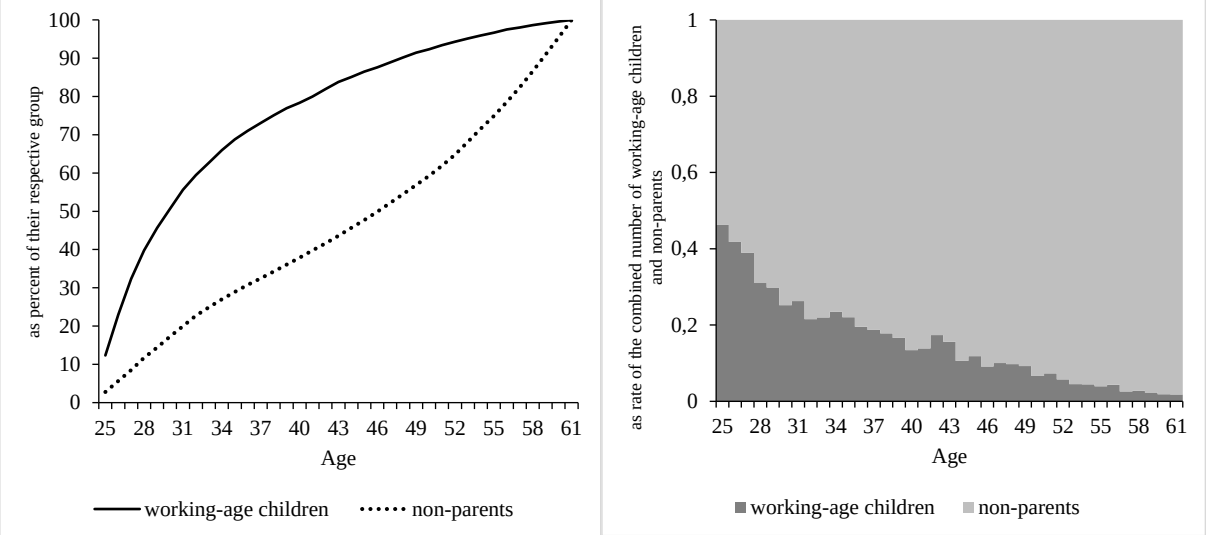

Figure B.1b: The cumulative number of working-age children and non-parents in percentages by age (left-hand panel) and the distribution of the combined working-age children and non-parent population by age (right-hand panel) in 12 European countries around 2010

The right-hand panel of Figure B.1b shows the distribution of the combined working-age children and non-parent population in the 12 sampled countries by age. If working-age children were added to non-parents, the latter would dominate the combined results due to their larger proportions, but the former would diminish the net balance of the latter, further widening the parent versus non-parent gap.

Grandparents

Grandparents can appear in three ways in the analysis. First, they can co-reside with their grandchild without the parent being present. In such a case, we consider the parent losing or giving up responsibility for the child, and we classify the grandparental transfer as non-parental. Second, grandparents can live with both the grandchild and the latter's parent. In such circumstances, the ultimate responsibility for the child still lies with the parent. So, in three-generational households, grandparental transfers are considered intra-household parental transfers to the working-age parent of the grandchild. In the third case, grandparents not co-

residing with their grandchildren, transfer contributions or receipts enter the intra-household reallocation system as net inter-household transfers. The intra-household model assigns such net transfers to the household head. In the case of outflows, it reduces the number of aggregate transfers, mostly parental transfers. In the case of inflows, it transforms grandparental transfers into parental transfers.

Grandparental transfers have gained much attention since comparative data sources of inter-age transfers have been constructed. Especially the SHARE project (Survey of Health, Ageing and Retirement in Europe) opened up the opportunity for such research. SHARE is a multi-purpose, multi-country panel survey of the 50+ population. Its questionnaire repeatedly contains specialized blocks on financial transfers (FT block) and support, such as personal care, practical household help or help with paperwork (SP block), both given and received. The surveying strategy of SHARE on transfers focuses on interpersonal relations and collects information relation by relation. Researchers using this evidence found significant downward flows of net transfers, both in terms of money and time, from older parents to grown-up children and grandchildren (e.g., Albertini, Kohli, and Vogel 2007, henceforth AKV). This contrasts with the findings of this paper on familial inter-age transfers from older people being marginal.

Yet, we have reasons to keep to our conclusions. Survey results largely depend on how questions are asked. In this respect, our data source on time transfers, HETUS, is superior to SHARE. The former is a comparative dataset of specialized surveys on time use; the latter is a general survey including numerous unrelated blocks and devoting only a few questions to supporting activities. SHARE asks the respondent if they received from or gave support to someone outside the household in the last twelve months; if yes, who that person is; how frequent the help was (daily, weekly, monthly, or less); and how long an average occasion lasted in hours. Such a way of questioning is exposed to memory distortions and the difficulty of measuring time in hours. Also, it blurs the difference between primary and secondary activities (such as, e.g. doing general household chores and babysitting at the same time. In contrast, the HETUS time use surveys are diaries covering the entire previous day divided into 10-minute time slots and separating primary and secondary activities (of which we considered only the former in this paper). Using data from the first wave of SHARE, AKV find 902 hours of supporting activities in their sample of ten Western European countries, specifically by parents to children outside the household, including looking after grandchildren. This is 148 minutes (almost two-and-a-half hours) a day. In contrast, HETUS shows that an average woman in her thirties spends 74 minutes on childcare in the 12-country sample we analyze in this paper, exactly half of what older people are supposed to spend helping their grown-up children and grandchildren living outside their household. The HETUS data suggest 13 minutes a day in the 50+ population of activities benefitting someone living in another household, less than one-tenth AKV report on. Since time-use surveys provide more accurate figures, we consider our results more reliable and the AKV data on inter-household time transfers overestimated.

As for financial transfers, SHARE data are more detailed than our source, the EU-SILC, which includes only one question about financial transfers received from and another about financial transfers given to other households. In contrast, SHARE asks about transfers separately in relation to each person the respondent named as a target or source of such transfers. Other details of the question block have changed over time. Financial transfers in SHARE include both intra-household and inter-household transfers, so they cannot be directly compared to our inter-household transfers. More importantly, AKV ignores the tendency of respondents to overestimate what they give and underestimate what they receive (see e.g., Cox, Hansen, and

Jimenez 2004; Kim et al. 2011; Wilhelm 2006). The SHARE sample includes only respondents age 50 or above (and for several questions, the partner/spouse of the respondent, irrespective of age). So it excludes large segments of the population that are potential recipients and sources of inter-age transfers exchanged with the 50+ population and who would potentially report on more transfers given to older persons and fewer transfers received from them. Since AKV do not adjust their results for this distortion, we have reasons to consider their estimates for money transfers excessive.

B.2. Data

Some of the data used for the calculations are official figures provided by Eurostat, the statistical service of the European Union, such as the tables on public transfers, the sector accounts of the set of national accounts, and the National Tax Lists. Others came from the European Commission (the Directorate General for Taxation and Customs Union or DG TAXUD in short), such as excise taxes, or official agencies operating on behalf of DG TAXUD (the Central Planning Bureau of the Netherlands, which collected the rates of value-added taxes in the Member States). The surveys used are part of the European data infrastructure and regularly serve as background for policymaking and research. Our key source is the European Union Statistics on Income and Living Standards (EU-SILC). EU-SILC is based on a standardized survey that the statistical agencies of all Member States are mandated to make annually. At points, we imputed information from other sources, such as Household Budget Surveys (HBS) and the European Health Interview Survey (EHIS). All these sources are based on a harmonized methodology supervised by Eurostat. The reason for data imputation is our focus on the parent-non-parent distinction. The first wave of EHIS, which we used as a source for individual contacts with the public health care system and alcohol and tobacco consumption, does not contain information on parenthood status. The HBS does, but only indirectly; also, it registers age only by five-year intervals. It is only EU-SILC that includes a full household roster. For the imputation, we applied methods tried before by authors and institutions of high reputation and recommended in the literature. We checked the reliability of the imputation procedure by comparing the age distributions in the original datasets and the resulting age profiles in the target dataset (see below).

B.3. Public transfers

Twenty-five percent of the total public benefit outflows of the twelve countries in the sample represent pure public goods with uniform age distribution. Another 39 percent is paid in cash and can be distributed using individual-level survey information (old age, survivors, unemployment, sickness, and disability). Altogether, almost two-thirds of public benefits can thus be assigned to age groups without specific incidence assumptions.

A further 27 percent, spent on education and health care, which are almost exclusively provided in-kind, is also estimated from individual-level data, but the construction of the age profiles requires further information or assumptions. For health care, we had access to individual-level data but from two separate datasets: patterns of service use from EHIS and parenthood status from EU-SILC. The procedure through which the information from the former was imputed to the latter was described in Appendix A. The procedure's reliability is demonstrated in Figure B.2. In households with no members below age 16, the correlation between the age profiles in

the original EHIS sample and after imputation is 99 percent; in households with members younger than age 16, it is 98 percent.

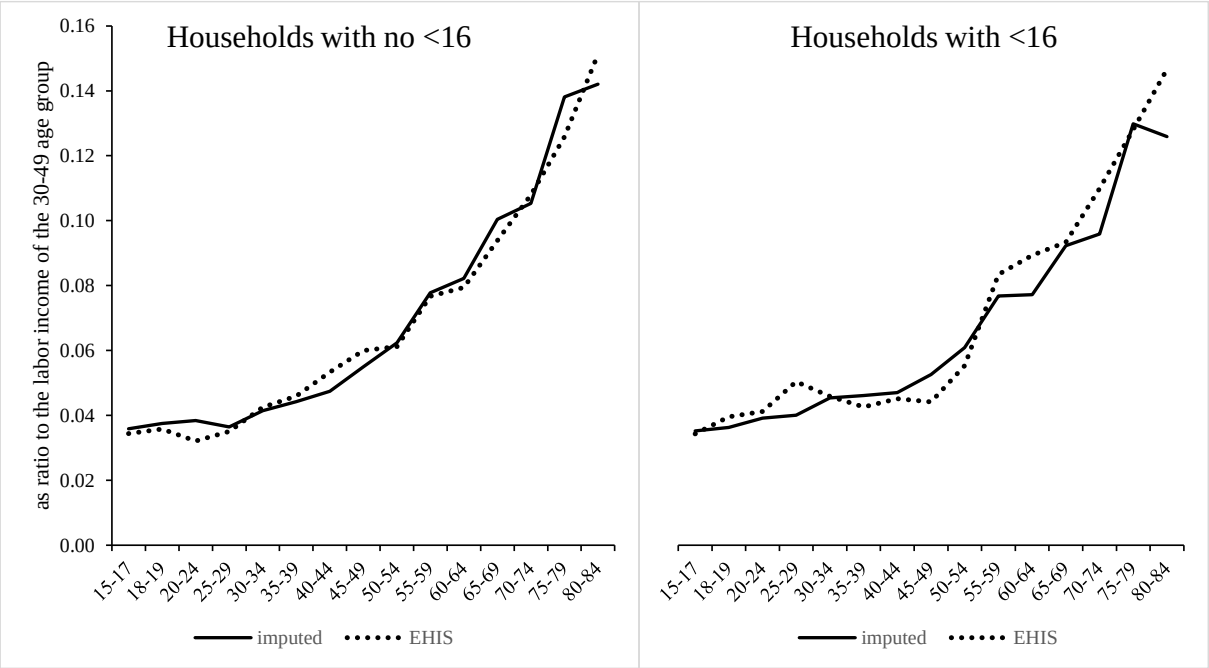

Figure B.2: The age profiles of public health spending in households with and without members younger than 16 years in the EHIS sample and after imputation

Notes: EHIS: European Health Interview Survey. Figures are population-weighted averages of the 12 sampled countries.

In the case of education, we assume uniform per capita spending by educational level. For instance, all pupils of a country between ages 10 and 14 are supposed to receive the same per capita public funds for education. We find this to be a reasonable assumption, but even if it were not, the results of this paper would remain practically unaffected as our aim is to compare two stylized types of working-age people who receive hardly any of these resources, parents and non-parents. The immediate beneficiaries of education are children: only seven percent of public education transfers are spent on working-age people. The assumption thus has only a marginal effect on our conclusions.

The rest, nine percent of public spending, is cash benefits (in the categories of family and children, housing, and other social protection) registered at the household level in the survey. We distributed these equally among the household members aged 18 and older. We used this incidence assumption as it was more conservative in that it gave less to parents than the potential alternatives, such as the application of a higher fixed age limit, say age 25, or the country-specific cutting points between childhood and working age and between working age and old age.

On the revenue side, 29 percent of public inflows stem from various indirect taxes, such as the value-added tax (VAT), the dominant form of taxing consumption in Europe, and excise taxes. Another 69 percent are raised from direct taxes, such as taxes on income and wealth and social contributions. Of the 69 percent, 48 percentage point is collected from taxes levied on labor,

such as income taxes on labor and social contributions. Fourteen percentage points are charged on income from wealth, such as the corporate income tax, and seven percentage points on the stock of wealth. The remaining one percent of public revenues are not collected as taxes (such as other current transfers of the general government).

In the construction of the age profiles of public revenues, we studied the practice of public agencies that conduct tax incidence analyses regularly, such as the Office of Tax Analysis of the Department of the Treasury of the United States (OTA), the Congressional Budget Office (CBO), and the United States Congressional Joint Committee on Taxation (JCT). Since tax policy is primarily a national responsibility in the European Union, we found no European counterparts of these organizations.

The incidence assumptions of the three agencies are similar. They all assign taxes on consumption to the consumer. In finding the consumer, we relied on recommendations from international agencies, such as the United Nations Population Division (United Nations 2013).

Excise taxes were distributed following individual consumption patterns and tax rates, leaving again little space for alternative calculations.

As for taxes on labor (including social contributions), all three agencies mentioned above assign these to workers irrespective of the legal distribution of the obligations between employees and employers. The general consent of practitioners in the field suggests that our age profiles of taxes of this category are robust.

Initially, all three agencies assigned taxes on revenues from capital ownership to the owners. However, as mounting evidence provided by academic research suggested otherwise, these incidence assumptions have been revised one after the other. The OTA from 2008, the JCT, and the CBO from 2013 split taxes on asset-based revenues between wealth owners and workers in varying proportions (see Cronin 2022). In other words, the general practice is to assume that owners can pass on taxes on capital income to their employees to various degrees. We took a step further and assigned the entire sum to labor and distributed it by the labor income of household members.

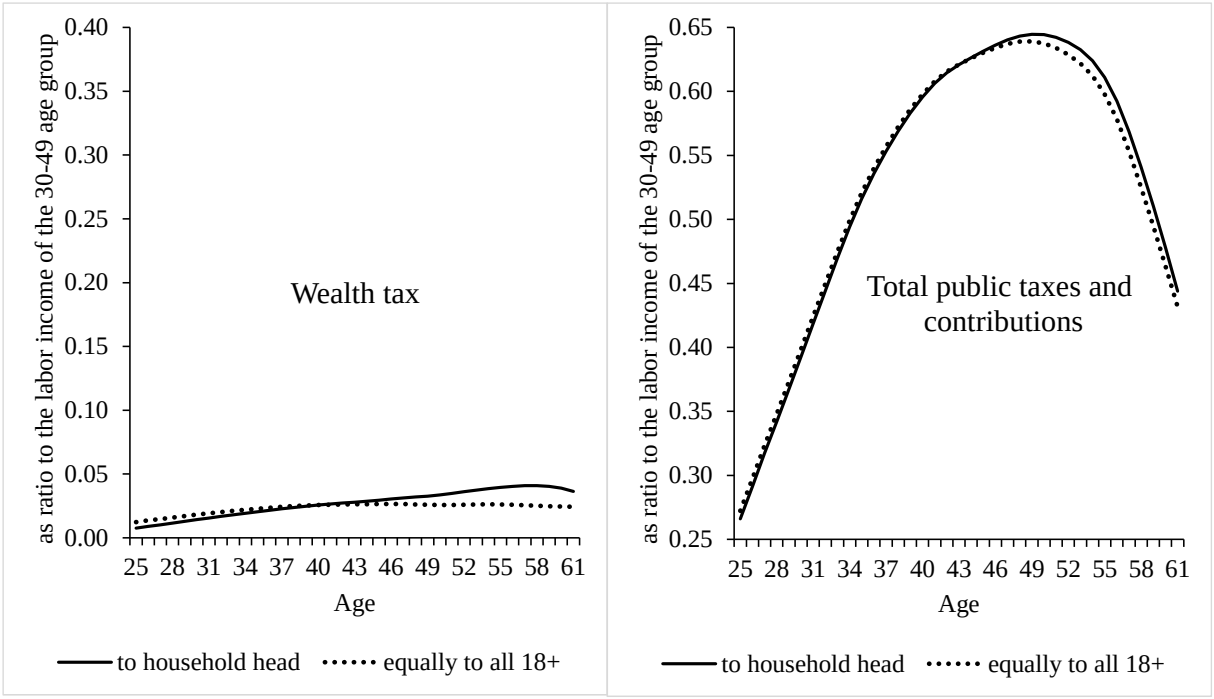

Figure B.3: The age profiles of taxes on wealth (left-hand panel) and total taxes and contributions (right-hand panel) if taxes on wealth are assigned to the household head (solid line) or all people in the household aged 18 or above (dotted line)

Notes: Figures are population-weighted averages of the 12 sampled countries. In order to make the difference between the two lines perceptible, the vertical scale of the right-hand panel is shifted.

Taxes on the stock of wealth are attributed to the owners by general consent. That still leaves space for idiosyncrasies as to identifying the owner of wealth within the household. Following NTA recommendations, we assigned wealth to the household head in our baseline calculation reported in the article. However, this incidence assumption is not necessarily conservative, so we calculated an alternative that distributes wealth among all persons aged 18 or older in the household. As shown in Figure B.3, the conclusions remain practically unaffected, partly because the difference between the two versions of the age profile of taxes on wealth is marginal and partly because taxes on wealth make up only a small fraction of total public revenues. The left-hand panel shows that the wealth tax profile peaks at a higher age if assigned to the household head, but the weighted average ages of the two variants are close to each other (respectively, 47 and 44 years). The right-hand panel demonstrates that the overall effect of the incidence assumption is marginal. We had to cut off a part of the vertical scale (while assuring full comparability of the two panels) to keep the difference between the two variants perceptible.

To sum up, we find our age profiles of public transfers quite robust. They do not depend on our choices; the methods we used were recommended by leading experts and established agencies; the potential alternatives are less conservative than those we applied, or when they are not, the effect of alternatives is rather limited.

B.4. Private money transfers

For modeling private money transfers, we use techniques recommended by United Nations (2013). The method is rather straightforward: household members with more resources than they consume give away the surplus to members whose resources are insufficient to finance their own consumption. There are three key assumptions. First, consumption within the household is distributed by the NTA equivalence scale (as discussed above). Second, the model does not distinguish between more or less generous transfer providers: members having a surplus are supposed to give the same proportion of their respective surpluses. This can be considered a household-specific transfer rate: unique to each household but applying equally to each surplus-member of the household.

Third, the model puts all responsibilities on the household head to handle potential imbalances between consumption and resources at the household level. Transfers are zero-sum transactions: what someone gives, someone else takes. By definition, individual transfer inflows and outflows must therefore cancel out at the household level. Consequently, the model has to handle cases where households have more resources than they consume or consume more than they can afford. The solution suggested by United Nations (2013) puts the household head at the center. It assumes that if surplus-members still have extra resources after filling the gaps for the deficit-members, they transfer them to the household head, who in turn saves them. In the opposite case, where deficit-members still have not received enough intra-household transfers, although surplus-members gave away all they could, the household head is supposed to mobilize familial wealth or borrow from external sources.

In principle, this way of handling outstanding household-level surpluses or deficits can affect the age profile of private money transfers since household heads are usually somewhat older than the other surplus-members. However, the potential effect is rather limited. The average share of the outstanding amount (the sum of intrahousehold transfers that could not be channeled to deficit-members either because they have received enough or because the surplus-members could not send enough) is less than ten percent of the total intrahousehold transfers sent or received. Also, the two opposite flows, one to the head in case of outstanding surplus and one from the head in the opposite case of outstanding deficit, mostly cancel out each other, thus further diminishing the net effect. The age profiles of the two flows of outstanding deficits and surpluses are strongly correlated (0.89), and the average ages of their senders and recipients are close to each other (43 and 45 years, respectively).

B.5. Private time transfers

Unlike the construction of the age profiles of public transfers and private money transfers, the analysis of time transfers is less straightforward, and the results strongly depend on the researchers' choices. We identified the following crucial decisions that affect the outcome and demonstrate that we opted for the conservative solution at every point.

First, the literature distinguishes between the output and the input method of evaluating unpaid household labor. The former derives the value of an activity from the value of its product. For example, the value of time spent cooking is the value of the meal prepared. This approach allows for taking into account productivity differences and economies of scale, which is an advantage compared to the input approach. Labor productivity depends on age: on average, a 40-year-old person finishes a task faster than an 80-year-old. Output pricing would assign the same value to the same dinner, regardless of the time it took to prepare. In contrast, input pricing

would find the output of the less productive person more valuable. In addition, if every family member eats the same dish either at home or in a restaurant, preparing the meal requires only a bit more work in larger families. However, the restaurant applies output pricing, so the bill does depend on family size, whereas an input approach would find just a minor difference.

In effect, however, the output approach is still experimental. Time use surveys usually do not contain information on the output of the activity, and HETUS data are no exception. Concluding on the output from the activity would require heroic assumptions. So, like all NTTA studies and almost all papers quantifying the value of unpaid household labor, we use the input approach. Fortunately, choosing this option does not affect our results, or it affects them in a conservative way. In terms of economies of scale, the input approach underestimates the true difference between those raising children and those who do not. Households with dependent children are larger on average than households without, so the insensitivity of the input approach results in lower values of unpaid labor and, consequently, time transfers in such households. The other advantage of the output approach, its reflection on labor efficiency, is mostly neutral from the perspective of this article as we compare household labor performed by two groups of working-age people. There is no evident reason to expect more efficient labor from non-parents than parents.

Second, applying market wages to unpaid labor could raise the problem of selection bias. Following this logic, market competition selects more productive workers, so those unselected but performing the same tasks for no pecuniary compensation can be expected to be less productive. Assigning the same wages to their efforts that reward their counterparts in the market could overestimate the value of unpaid labor. However, the selection bias argument does not always work well in this context. Many simple household tasks require no specific skills, and those who perform these tasks professionally may not necessarily be selected based on their productivity. On the contrary, analogous to the Ricardian comparative advantage, workers may be engaged in a division of labor even if one worker is more efficient in all types of jobs. In such a case, the less productive worker would be specialized in the least rewarding job.

In other typical household works, especially in caring activities, the selection bias argument may actually work in the opposite way. Even if the primary carer, most frequently a relative, is not trained in this job, his or her presence, the fact that it is he or she doing the activity in question brings an intrinsic value reversing the selection bias argument. The activity at hand may well be undervalued, not overvalued because it is done by a non-professional person.

Empirical evidence suggests that the selection bias concern is unjustified. Bridgman, Duernecker, and Herrendorf (2018) demonstrate that a specialized household worker is not likely to be much more productive in performing household work than a private individual and therefore argue that it is reasonable to use the wage of household workers as a proxy for the return to an individual's labor input in household production. They document a low degree of wage dispersion in jobs that most frequently have a household equivalent compared to the wage dispersion in other sectors or the entire economy. This evidence suggests that the productivity differences in the household sector are small, and there is only a limited role for the accumulation of occupation-specific human capital in this area. Francavilla et al. (2009) apply Heckman's selection model (Heckman 1979), a two-equation estimation procedure that takes into account that people who work in the unpaid sector have, on average, different characteristics from workers in the labor market. The first equation calculates the probability of participating in the labor market based on a set of individual, household, and contextual

characteristics. The second equation estimates the wage level given the probabilities determined by the first equation, correcting in this way for the possible bias of using market wages to price unpaid activities. Honing in on the eleven countries of our sample (they do not cover Bulgaria) from Francavilla et al. (*ibid*, 117), there is no difference between the observed market wages and the estimated, bias-corrected wages among men. Among women, the difference is a mere two percent.

Third, even if market wages are justified to apply to household activities, the question remains: which wages to apply? Of the three usual choices, such as opportunity costs (the wage of the person performing household activities), a generalist wage (the average wage of the relevant sector or the entire economy), or specialist wages (the wage rewarding the activity in question), the third one is usually the lowest. Caring, housekeeping, or other market equivalents of typical household activities are typically paid below average. This makes our method, based on specialist wages, conservative.

In Figure B.4, we demonstrate this by comparing the values of the net transfer packages of parents and non-parents, fathers and non-fathers, and mothers and non-mothers in two scenarios: time transfers calculated by specialist wages (as in the main text) and by the average wages of the respective economies. Clearly, our choice affected reported results in a conservative way: using average wages would have shown the parent versus non-parent gap to be even wider.

Figure B.4 also highlights the effect of the assumptions on the male versus female gap. The difference between non-fathers and non-mothers, but especially between fathers and mothers, is sensitive to methodological choices. Our way of opting for what diminishes the parent versus non-parent gap also reduces the female contribution to the intergenerational transfer system.

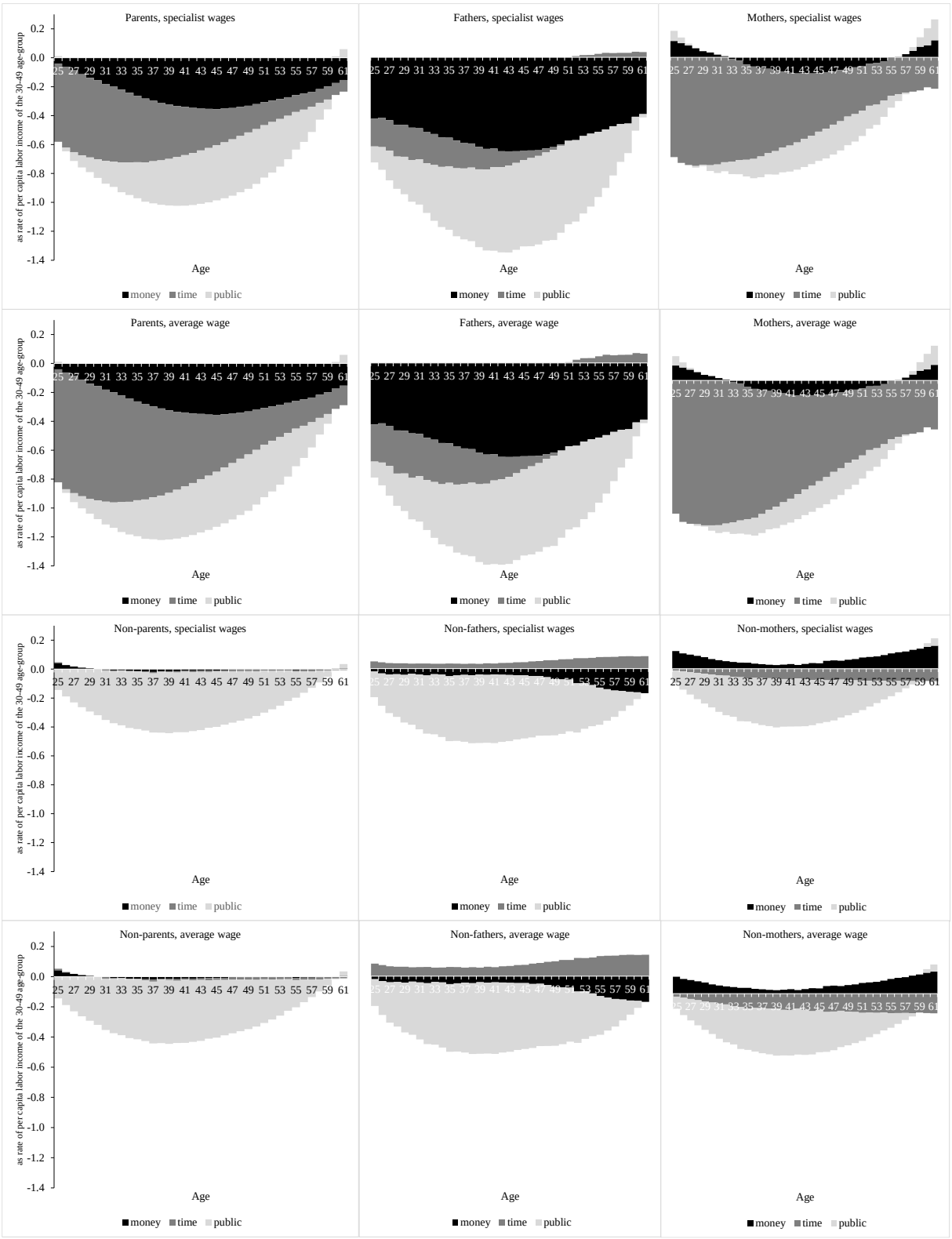

Figure B.4: Combined transfer packages by parenthood status, gender and age by specialist replacement wages and average wages in the economy

B.6. Flows-to-stock analysis

Alternative parameter settings for the flows-to-stock calculation

As Table B.1 shows, lower discount rates and higher economic growth affect the rate of parental and non-parental transfer packages only marginally. For instance, keeping growth at 1.5 percent, a lower discount rate of 3 percent enlarges the parent/non-parent ratio for our twelve countries from 2.665 to 2.674. Keeping the discount factor at 5 percent, a higher growth at 2 percent has an even more negligible effect visible only at the fourth decimal (2.665). Lastly, a combined higher growth (2 percent) and lower discount (3 percent) scenario raises the parent/non-parent ratio to 2.679.

Table B.1 Estimates of parental and non-parental transfer packages based on alternative parameter settings

	Non-parent				Parent				Total parent / Total non-parent
	Familial, time	Familial, money	Public	Total	Familial, time	Familial, money	Public	Total	
g=1.5%, r=3%									
BE	-0.9	-0.3	-8.9	-10.1	-10.8	-6.2	-8.2	-25.1	2.485
BG	-0.3	-0.2	-8.7	-9.3	-6.1	-8.3	-6.7	-21.1	2.270
DE	-0.1	0.1	-8.6	-8.6	-10.4	-6.1	-6.7	-23.2	2.686
EE	0.1	-0.1	-9.5	-9.6	-6.6	-6.7	-7.0	-20.4	2.124
ES	-0.4	-0.3	-6.9	-7.5	-8.8	-6.7	-6.7	-22.2	2.957
FI	0.0	-0.1	-8.5	-8.6	-10.9	-7.7	-7.9	-26.5	3.082
FR	-0.1	0.1	-7.9	-8.0	-9.7	-7.1	-5.9	-22.8	2.853
LT	0.0	-1.0	-8.3	-9.4	-4.6	-8.6	-8.6	-21.7	2.315
LV	0.1	-1.4	-9.4	-10.7	-3.3	-7.2	-7.1	-17.5	1.638
PL	-0.2	-0.5	-10.2	-10.9	-11.3	-6.3	-7.0	-24.6	2.269
SE	-0.2	-0.2	-8.1	-8.5	-10.4	-7.6	-7.2	-25.3	2.964
UK	-0.1	-0.1	-9.0	-9.2	-9.0	-8.2	-5.6	-22.7	2.480
EU12	-0.2	-0.1	-8.4	-8.6	-9.6	-6.9	-6.6	-23.1	2.674
g=2.0%, r=5%									
BE	-0.7	-0.2	-7.2	-8.2	-9.1	-4.8	-6.4	-20.3	2.487
BG	-0.2	-0.2	-7.3	-7.8	-5.4	-6.4	-5.4	-17.2	2.217
DE	-0.1	0.1	-7.1	-7.1	-8.9	-4.6	-5.0	-18.6	2.630
EE	0.1	-0.1	-8.0	-8.0	-5.7	-5.4	-5.8	-16.9	2.108
ES	-0.3	-0.2	-5.6	-6.1	-7.6	-5.2	-5.1	-17.9	2.948
FI	0.0	0.0	-6.7	-6.8	-9.4	-6.0	-5.9	-21.3	3.147
FR	-0.1	0.0	-6.4	-6.4	-8.3	-5.5	-4.6	-18.4	2.849
LT	0.0	-0.8	-6.9	-7.7	-4.1	-6.8	-6.9	-17.7	2.291
LV	0.1	-1.2	-7.9	-9.0	-2.8	-5.7	-5.8	-14.3	1.600
PL	-0.2	-0.4	-8.4	-9.0	-9.9	-5.0	-5.8	-20.7	2.304
SE	-0.2	-0.1	-6.4	-6.7	-8.8	-5.7	-5.4	-20.0	2.985
UK	-0.1	0.0	-7.3	-7.4	-7.7	-6.4	-4.0	-18.0	2.437
EU12	-0.1	-0.1	-6.9	-7.0	-8.3	-5.4	-5.1	-18.7	2.665

Table B.1 contd.

	Non-parent				Parent				Total parent / Total non-parent
	Familial, time	Familial, money	Public	Total	Familial, time	Familial, money	Public	Total	
g=2.0%, r=3%									
BE	-0.9	-0.4	-9.6	-10.9	-11.4	-6.7	-8.9	-27.1	2.486
BG	-0.4	-0.3	-9.3	-9.9	-6.4	-9.1	-7.2	-22.8	2.289
DE	-0.1	0.1	-9.2	-9.3	-11.0	-6.7	-7.4	-25.1	2.709
EE	0.1	-0.2	-10.1	-10.2	-7.0	-7.3	-7.5	-21.8	2.131
ES	-0.4	-0.3	-7.3	-8.1	-9.3	-7.3	-7.3	-24.0	2.962
FI	0.0	-0.1	-9.3	-9.4	-11.5	-8.4	-8.8	-28.7	3.063
FR	-0.1	0.1	-8.6	-8.6	-10.3	-7.8	-6.5	-24.6	2.855
LT	-0.1	-1.1	-8.9	-10.1	-4.8	-9.3	-9.3	-23.4	2.323
LV	0.1	-1.5	-10.0	-11.4	-3.4	-7.8	-7.6	-18.9	1.652
PL	-0.2	-0.5	-10.9	-11.6	-11.8	-6.9	-7.5	-26.3	2.257
SE	-0.2	-0.2	-8.9	-9.3	-11.1	-8.4	-8.0	-27.6	2.958
UK	-0.1	-0.1	-9.7	-9.9	-9.5	-8.9	-6.3	-24.7	2.497
EU12	-0.2	-0.1	-9.0	-9.3	-10.1	-7.5	-7.2	-24.9	2.679

Notes: Reported EU12 averages are population-weighted. Country codes: BE: Belgium, BG: Bulgaria, DE: Germany, EE: Estonia, ES: Spain, FI: Finland, FR: France, LT: Lithuania, LV: Latvia, PL: Poland, SE: Sweden, UK: the United Kingdom; g: economic growth, r: discount rate.

The effect of changing parenthood density

Conclusions derived from the separate per capita age profiles for parents and non-parents could be affected by the potentially changing proportions of parents and non-parents. So, we checked how the cross-country differences of changing age-specific fertility are related to the parent/non-parent transfer gap. The fertility age profiles of subsequent birth cohorts by country are presented in Figure B.5.

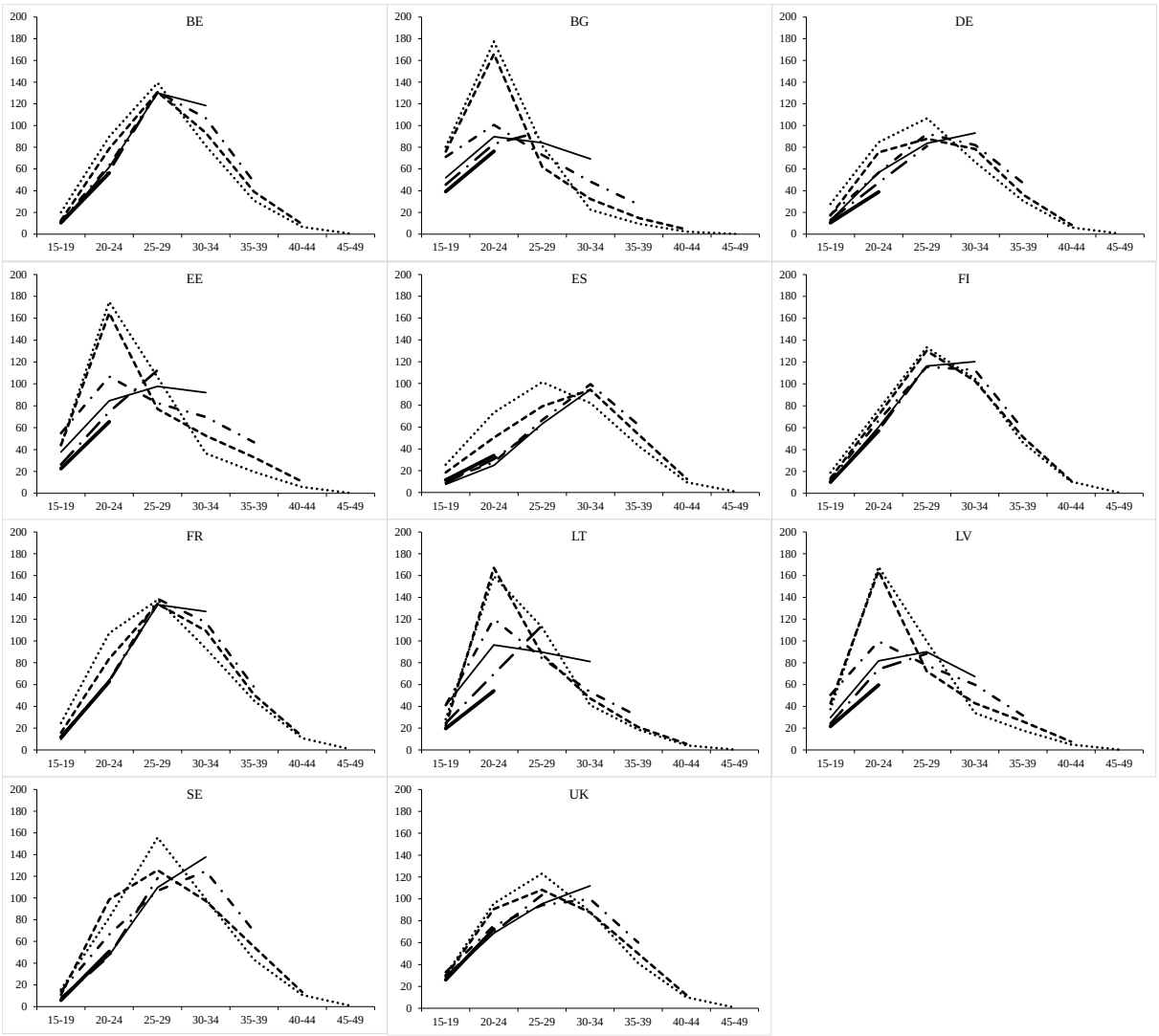

Figure B.5 Fertility age profiles of subsequent birth cohorts prior to the base year

Data: Age-specific fertility rates from the UNDESA fertility database. Data for France and the UK are UN estimates and Eurostat data instead of registry data. Age-specific Polish data are not available from before 1990.

Cohort codes:

The birth cohort of 1991-95 is represented by a dot at age 15-19, their age in the base year, 2010.

Country codes: BE: Belgium, BG: Bulgaria, DE: Germany, EE: Estonia, ES: Spain, FI: Finland, FR: France, LT: Lithuania, LV: Latvia, SE: Sweden, UK: United Kingdom.

We created an indicator of the similarity of fertility age profiles as a sum of the absolute values of the differences in the age-specific fertility rates of subsequent birth cohorts. The resulting numbers were correlated with the difference between the total net transfer burdens of parents and non-parents (columns 5 and 10 in Table 3 in the main text). Since transfer burdens were provided in negative numbers, we took their negatives to get to the excess burden of parents (see Table B.2). We found a strong, negative correlation (-0.7) between the occurrence of

fertility changes and the parent/non-parent gap. The larger the changes in age-specific fertility (and consequently the variation of period parenthood density), the smaller the difference between the transfer packages of parents versus non-parents. In other words, parenthood density does affect our results, but it does so in a conservative way. Had there been no changes in fertility, the difference between the transfer packages of parents and non-parents would have been even larger than the values reported here.

Table B.2 Similarity of fertility age profiles and excess parental transfers

	Similarity of fertility age profiles	Excess parental transfers
Belgium	7.6	11.3
Bulgaria	17.6	8.8
Germany	9.8	10.7
Estonia	20.7	8.3
Spain	10.9	11.1
Finland	5.5	13.6
France	8.5	11.1
Lithuania	19.0	9.3
Latvia	16.7	5.0
Sweden	14.7	12.3
UK	8.8	9.8

Source: Authors' computation from Table 3 of the main text (excess parental transfer burden) and age-specific fertility rates from the UNDESA fertility database (fertility age profiles).

Notes: Similarity of age profiles: sum of differences in age-specific fertility rates of subsequent cohorts (absolute values); the smaller the value, the more similar the age profiles. Excess parental transfer burden: the absolute value of the difference between parents' and non-parents' transfer burden, expressed in terms of years of prime-age labor income (difference between columns 5 and 10 in Table 3 of the main text). Country codes as in Figure B.5.

Appendix C: Penalizing parents for the environmental burden of their children

Holding technology constant, new people embody negative environmental externalities (Dasgupta 2019; Harford 1998). In recent years, several authors have argued that parents are not just indirectly causally responsible but also directly morally responsible for their offspring's carbon emissions. Therefore, they claim, a desirable approach to reduce carbon emissions is to penalize in some form parents for procreating (Conly 2016; Hedberg 2018; MacIver 2015). This parental moral responsibility claim logically fails because it involves double counting: it attributes the same carbon emissions to both parents and offspring, thus violating the constraint that 'the total of emissions attributed to each person should be equal to the total actually emitted' (Broome 2016). Any attempt to split or partition offspring's carbon emissions, in turn, leads to morally unacceptable consequences (van Basshuysen and Brandstedt 2018; Pinkert and Sticker 2021).

Beyond this, our accounting method cannot measure the environmental cost of procreation, but it does help to reveal an important neglected element in these debates about 'procreating less for environmental purposes' at the level of countries (rather than globally). The intergenerational solution to the lifecycle consumption financing problem implies that today's resource-dependent children, as tomorrow's resource-productive adults, will finance the living standards of both tomorrow's young (today's unborn) and tomorrow's elderly (today's net-productive working-aged adults) (Vanhuysse, Medgyesi, and Gál 2021). Here we show why, all else remaining equal (notably future technology and lifestyle patterns), procreating less, in addition to reducing environmental pressure, logically implies lower future living standards of either the current generation of adults *or* the current generation of children. The all else equal caveat is a strong one admittedly. Environmental degradation and climate change will negatively affect living standards of the current and next generations, if no additional public action is taken to prevent it, for instance by changes in agriculture because of droughts or other weather extremes (resulting in higher food prices), more frequent flooding (with high damage costs), and more frequent heat waves (leading to higher health (care) costs.

Consider a hypothetical 'Environmental Generation' of today's adults that aims to reduce environmental pressures specifically by reducing the size of the next generation. All else equal, this strategy would likely reduce future carbon emissions. But it would inevitably also imply at least one of two other things. Procreating less would either increase the lifetime resource contributions by the now-smaller generation of today's children (who will be required to finance the larger Environmental Generation's old-age living standards), or it would lead to lower old-age living standards for the Environmental Generation itself, or some combination of both.

Alternatively, consider the implementation of a new general environmental tax to internalize the negative externalities produced by carbon emissions. This environmental tax would massively increase the tax contributions of today's parents relative to non-parents, as only parents would have to pay environmental taxes also for their children. In other words, the environmental tax is implicitly a tax on procreation. The more parental demand for children is price-inelastic, the less fertility will be reduced, hence the relative transfer contributions by parents will further increase. The more demand is price-elastic, by contrast, the fewer children will be born. As above, this means that either the Environmental Generation must agree to receive reduced transfers in its old age from the smaller generation of children, or the smaller children's generation will have to contribute larger resource packages to support the larger Environmental Generation.

All else equal (notably future technologies and lifestyle patterns), one cannot logically advocate a smaller-sized next generation for environmental reasons *without* thereby accepting lower living standards for at least one generation. As children are indivisible, the positive and negative externalities they produce are inseparable. Any population policy aiming to internalize only the negative externalities is therefore inconsistent. Otherwise stated, penalizing parents for the environmental burden of their children implies rewarding parents for the productive contributions of their children.

Appendix D: Transfer packages by level of education

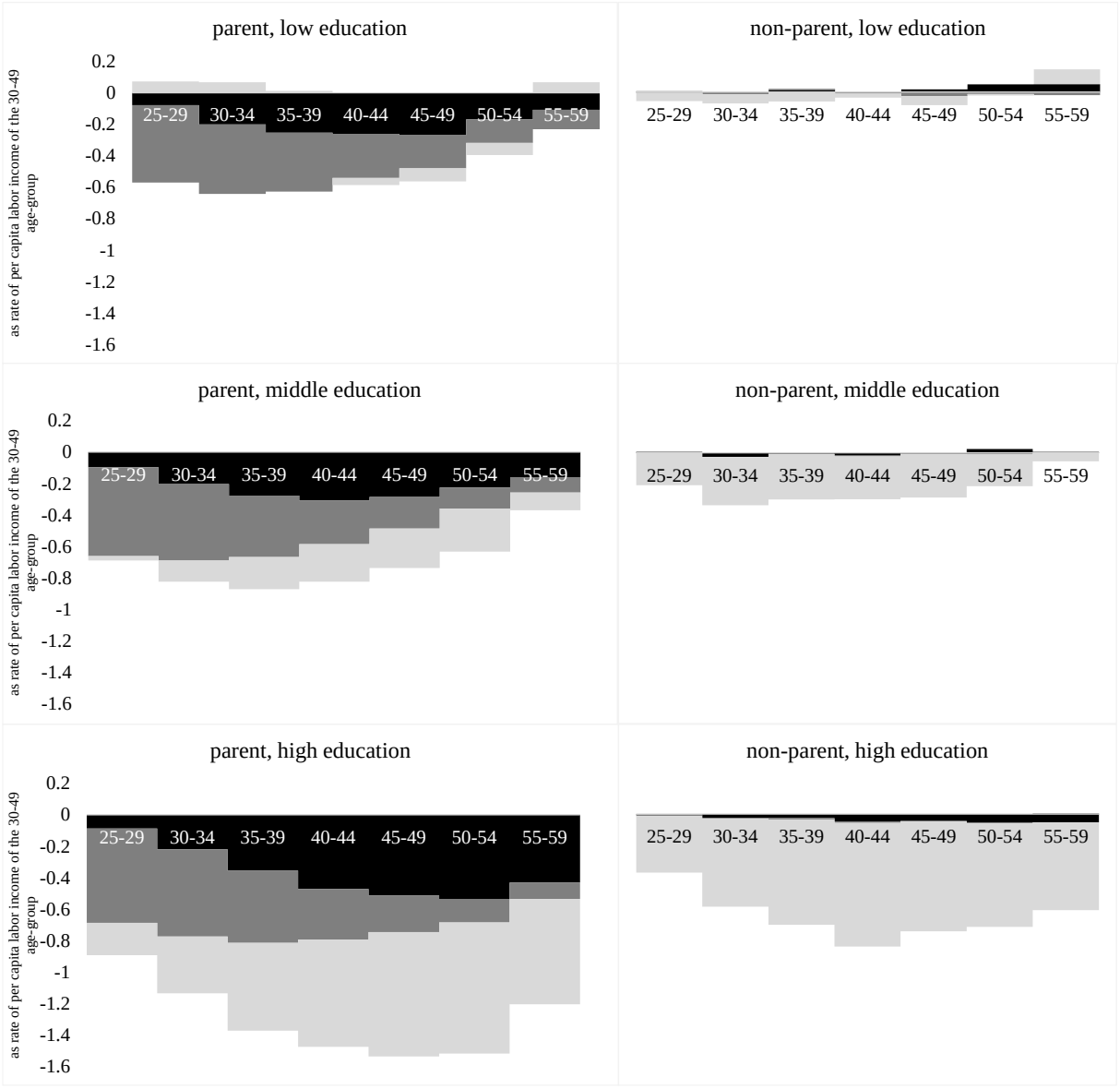

Figure D.1 Combined transfer packages by parenthood status, education, and age-group

Source: Authors' calculation.

Notes: Color code: familial, money, time, public.

Education levels: low: lower secondary education or less (International Standard Classification of Education [ISCED] code 0-2); middle: higher secondary or post-secondary non-tertiary education (ISCED 3-4); high: tertiary education (ISCED 5-8).

Appendix E: Parental transfer packages by number of children

Table E.1 Various transfer stocks of parents with one child and parents with two or more children over the working life in terms of years of prime-age earnings, 12 European countries, around 2010

	Parents with 1 child				Parents with 2 or more children			
	Familial, time	Familial money	Public	Total	Familial, time	Familial money	Public	Total
Belgium	-6.8	-3.3	-6.2	-16.3	-11.5	-5.1	-5.4	-21.9
Bulgaria	-4.5	-4.8	-6.1	-15.3	-6.0	-7.2	-4.1	-17.3
Germany	-7.0	-3.0	-5.0	-15.0	-10.5	-5.7	-4.5	-20.7
Estonia	-4.5	-3.7	-5.6	-13.8	-6.6	-6.3	-5.0	-17.8
Spain	-6.3	-3.5	-4.5	-14.3	-8.3	-5.8	-4.7	-18.8
Finland	-7.6	-3.6	-5.5	-16.8	-9.8	-7.0	-5.4	-22.2
France	-6.5	-3.7	-4.8	-15.0	-9.4	-6.0	-3.7	-19.2
Lithuania	-3.4	-5.1	-6.8	-15.2	-4.4	-7.9	-6.1	-18.5
Latvia	-3.4	-4.3	-5.7	-13.4	-1.2	-6.5	-4.9	-12.6
Poland	-8.3	-3.9	-6.6	-18.8	-10.9	-4.9	-4.3	-20.1
Sweden	-6.9	-3.7	-4.8	-15.4	-10.1	-6.5	-4.8	-21.4
UK	-5.9	-3.5	-4.3	-13.7	-8.5	-8.2	-2.3	-19.0
EU12	-6.6	-3.6	-5.2	-15.5	-9.3	-6.2	-4.1	-19.6

Source: Authors' calculation.

Notes: g= 1,5%; r=5%. Prime-age earnings: average labor income of the 30-49-year-old age group. Reported EU12 averages are population-weighted.

Appendix F: Alternative parameter settings for the calculation of implicit taxes on parenthood

Table F.1 Estimated implicit taxes on parenthood based on alternative parameter settings

	Present value of net consumption over the working life, in years of prime-age labor income	Working-lifetime			
		public	familial money	public + familial money	time
		transfers as % of working-lifetime net consumption			
g=1.5%, r=3%					
Belgium	11.1	-7	52	46	89
Bulgaria	16.8	-12	48	36	35
Germany	12.6	-15	49	33	82
Estonia	12.1	-21	55	34	55
Spain	14.5	-1	44	43	58
Finland	12.6	-5	61	56	87
France	11.8	-17	61	44	81
Lithuania	17.9	1	42	43	25
Latvia	15.7	-15	37	22	22
Poland	13.5	-23	43	20	82
Sweden	10.5	-8	71	62	97
UK	16.9	-20	48	28	52
EU12	13.6	-13	50	37	69
g=2%, r=5%					
Belgium	8.9	-9	51	42	95
Bulgaria	13.6	-14	46	32	38
Germany	10.1	-20	46	26	88
Estonia	9.8	-22	54	31	59
Spain	11.7	-4	43	39	63
Finland	10.0	-8	59	51	94
France	9.4	-19	59	40	87
Lithuania	14.4	0	41	41	28
Latvia	12.7	-17	36	19	23
Poland	11.0	-24	42	18	88
Sweden	8.2	-12	68	57	106
UK	13.4	-25	47	23	57
EU12	10.9	-16	49	33	75
g=2%, r=3%					
Belgium	12.1	-6	52	47	87
Bulgaria	18.1	-12	49	37	34
Germany	13.7	-13	49	36	79
Estonia	13.0	-20	55	35	54
Spain	15.7	0	45	44	57
Finland	13.7	-4	61	57	84
France	12.8	-16	61	45	79
Lithuania	19.4	2	42	44	25
Latvia	16.9	-15	37	23	21
Poland	14.6	-23	44	21	79
Sweden	11.5	-7	71	64	94
UK	18.4	-18	48	29	51
EU12	14.8	-12	50	38	67

Notes: Reported EU12 averages are population-weighted. g: economic growth, r: discount rate.

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