Essays on the economics of intergenerational wealth transfers

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Contents

The danger represented by the thing given or transmitted is possibly nowhere better expressed than in very ancient Germanic languages. This explains the double meaning of the word Gift *as gift and poison.*

(Marcel Mauss, 2001)

Chapter 1

Introduction

1.1 About this dissertation

The ambivalent nature of gifts is a key element of the so called *gift theorem* as originated by Marcel Mauss. This theorem attracted much attention in sociology and anthropology and while it was never prominent in economics, it also found some attention here.[1] The theorem considers gifts not as voluntary presents but rather as element of a perpetual, albeit subtle, and precisely regulated exchange of goods between members of a social entity. Gifts are thus usually less voluntary than the donor would concede and entail many more obligations for the recipient than convenient. To put it short: Members of a social entity exchange gifts to establish community and to express their commitment to this community. The gift symbolizes that the individual prioritizes the community over its individual advantage. The seemingly voluntary nature of giving allows individuals to pretend generosity and thereby symbolically conceal selfish motives. Giving however is obligatory, individuals who fail to comply, loose the faith of their peers. Giving is thus a truly ambivalent process, both for the donor and the recipient.

The present dissertation analyzes the distributional and behavioral repercussions of intergenerational wealth transfers and, doing so, resorts to the classical economic apparatus of empirical analysis and model-based reasoning. The analysis of wealth inequality and intergenerational transfers has recently gained attention in the academic debate: While data limitations have long bedeviled the concise assessment of wealth and inheritance distributions and their mutual relationship, economists today draw

[1] Mauss (1954); Adloff and Mau (2005); Moebius and Papilloud (2006) are examples of works in the anthropological or sociological literature. Kolm and Ythier (2006) give an overview of the applicability of the theorem in the field of public economics. Fehr and Gächter (2000); Falk and Fischbacher (2006) use the gift theorem as tool in the sphere of experimental economics.

from better data sets[2] and a variety of methods that extend our knowledge about the distribution of wealth.[3] Tiefensee and Grabka (2017) estimate that inheritances and inter vivos add up to $200-300$ Billion Euro a year in this decade in Germany. They expect in line with other scholars that the scope of these transfers will increase in the upcoming decades (Piketty, 2011; Wolff and Gittleman, 2014). Numerous studies, as the reader will see below, indicate that inheritances are particularly unequally distributed. At the same time, leading scholars see growing (wealth) inequality as root of the ongoing political polarization in western industrialized countries (Piketty, 2014, 2018; Milanovic, 2016). The assessment of wealth inequality and its relation to intergenerational transfers has thus become easier and has spurred the interest in the question of how society wants to distribute and redistribute lifetime resources.

Bequeathing and inheriting is however a peculiar practice to the economist who often relies on the helpful simplification of pure self-interest as the primary driver of individual behavior: Why would people want to bequeath, i.e. care about what happens to their property and offspring after they will have died? How much and what do they typically bequeath? But also: Why is the inheritance tax such a contentious topic in many societies, notably as considerable shares of its opponents are knowingly unlikely to pay the tax (Gross et al., 2017)? What, in turn, justifies from an individual's point of view the intergenerational path dependency of inheritances in a meritocratic society? Are intergenerational transfers merely about transferring wealth, or what is there more to it?

The gift theorem suggests to read specific types of interactions as reciprocal relationships[4] and introduces the concept of trust to the exchange of goods. It thereby offers an angle to the nexus of bequeathing and inheriting that seems somewhat neglected in the classic economic reasoning and specifically in the main part of the present dissertation. The dissertation is rather concerned with other ambivalences the practice of giving transfers comes along with: Current generations greatly benefit from the capital accumulation of preceding generations but, by this, accept not to live in a fully meritocratic society. Inheritances tend to equalize relative inequality between individuals but seem equally likely to increase inequality between dynasties and to also

[2]The three empirical chapters of this dissertation resort to three different (survey) data sets and reflect the increasing possibilities to assess different aspects of household wealth.

[3]Kopczuk (2014) for instance reviews different methods (mortality multiplier approach, capitalization approach, survey data) of how to grasp the very top of the wealth distribution. Westermeier (2016) reviews the possibilities of survey data supplemented by rich lists and extrapolation methods for the German case. Bover et al. (2014) sketches the particular difficulties in surveying the very top of the distribution.

[4]At first sight it might seem odd that intergenerational transfers could be reciprocal relationships. However, inter vivo transfers gain relevance and, secondly, the reader will see below that inheritances can well be interpreted to follow some reciprocal logic.

expand the differences in absolute living standards between people. For the unborn individual, the path dependency introduced through intergenerational transfers resembles an obligatory lottery, an uninsurable risk to partly depend on preferences and fate of its ancestors. The same individual might later in life simply care a lot about the well being of his children and might thus live a thrifty life with the goal to leave a valuable estate to his descendants.

In this introduction I want to bridge these two views on inheritances: The one that deals with the societal consequences of inheriting and that is at the core of the main chapters of the dissertation. And the one that is neglected in the following chapters and that rather deals with the practice of inheriting itself: Its motivation, its rules and forms. I argue that the *gift theorem* provides a helpful framework to approach this dimension of inheritances. I will briefly introduce the reader to the theorem and some of its implications in the context of intergenerational transfers and their taxation. It stresses the differences between market-based exchanges and exchanges within families and permits to describe the changing role of families in society. After that I will shortly present each of the main chapters of the dissertation. The following detour through the gift theorem, I hope, is interesting for some readers, the more rushing reader might ignore what follows here and can safely resume the read with chapter 1.4.

1.2 The gift theorem and intra-family exchanges

In what follows in this subsection, I introduce the gift theorem and describe why it is a helpful tool to understand the exchange processes within families.

1.2.1 Giving, receiving and reciprocating

A gift, Marcel Mauss (1954) writes, entails the obligation to receive and the obligation to reciprocate. These simple rules bear far-reaching implications: They qualify to bridge the flaws of imperfect and thus potentially impossible contracts (Moebius and Papilloud, 2006). This was particularly necessary in archaic societies when no public power was able to credibly reinforce private contracts. Back then, the simple rules of the *gift* helped primitive people to overcome the hobbesian chaos (Sahlins, 2005). These rules were stabilizing otherwise fragile relationships, established foreseeable behavior, trust and thereby provided the slim framework of social order. The hypothesis of contemporary scholars is that the logic of the gift is still rudimentarily driving (a large share of non-market) exchanges and structures much of our interpersonal relations tacitly.[5] Giving, taking and reciprocating are, by some scholars, considered anthropological constants.[6]

Giving A good in the logic of the gift theorem becomes a gift with all the mentioned implications when it comes along with certain, culturally shaped, social forms. These forms concern the type of things people would typically exchange as gift at a specific occasion (e.g. flowers, a dinner, a banquet, ...), the gifts' values that are deemed appropriate and the kind of representation or arrangement of the actual exchange. These forms, while varying between cultures, generally follow similar patterns across societies. For example, donors typically seek to hide the value of gifts (e.g. by wrapping gifts, hiding price information or not giving money as present). Gifts are furthermore usually presented as being voluntary acts of generosity and not resulting from any obligation.

Receiving At the same time, a given thing only becomes a gift when the donee accepts it as a gift so that the exchange can display its character of mutuality. Once accepted, the gift exchange differs from market exchanges in that it usually entails a temporary imbalance between donor and recipient. In the period between having received a gift and before having reciprocated, the recipient is symbolically indebted to the donor. Of course there is no legal liability (and thus always the freedom not to reciprocate), but rather the feeling of being obliged (by gratitude) to the donor (Adloff and Mau, 2005, p. 22). This imbalance, odd to the suspicious economist, is pivotal for the capacity of *giving* to stabilize relationships. Reciprocating immediately would look as if the donee would pay the donor. The donee would thereby reject to enter the future interactions that the donor might want to establish and that the gift exchange could later entail. The donee would also implicitly question the allegedly selfless motives of the donor. The immediate "payment" could thus be taken as an offense.

The illusion of voluntariness is deliberately constructed in the interest of the donor: It suggests honorable motives, proves the own humanity, as Bourdieu (2005) puts it, by speaking to the donee's humanity and thereby symbolically negates the profane logic of following the self-interest. The donor, so to say, symbolically advances the donee and thereby offers the donee to enter a relationship found on trust rather than revenue maximizing motives. One can read the attempt to hide price information in the same way: Revealing the price of a gift enables the donee to even his debts exactly,

[5] Adloff and Mau (2005) give examples for the enduring influence of reciprocal behavior. It is also debated in how far market exchanges depend on reciprocal structures as contracts are often incomplete and require trust between the exchanging parties.

[6] Hence, the specific practices obviously vary in the range cultural habits always vary. The underlying logic, the gift theorem implies, applies generally.

which would basically allow to end the circle of imbalances and ongoing interactions. Second, it would basically put a price on the relationship of donor and donee, as it would make explicit what amount the donor considered sufficient to honor the donee and what amount he was willing to invest and to put at risk in order to establish and maintain this relationship. Revealing a price bluntly introduces a rationality to the relationship that denies the necessity of the relationship: The logic of self-interest and exact accounting. Hence, by receiving a gift, the donee enters an intertemporal exchange relationship with the donor.

Reciprocating The obligation to reciprocate however exists and lives on while leaving open *when* the recipient will reciprocate, with *what* exactly the debt is equalized and, in case exchanges occur between groups, even *who* will reciprocate.[7] The logic of the gift thus purposefully decouples service and consideration in temporal terms but also in terms of equivalence, introduces uncertainty and specifically draws its power from this peculiar characteristic: During the temporary asymmetry between donor and donee both individuals have an interest to maintain their relationship. The donor in order to be appreciated for his prior concession and basically repaid, the recipient in order to maintain its credibility by repaying its symbolic debt. Reciprocating, while being expected, is not enforceable and thus remains basically voluntary. The (temporary) decoupling of service and consideration introduces a social dimension to the exchange, as it turns an otherwise zero-sum exchange in a generous act. It requires the mutual recognition of being equal, fosters with each exchange the mutual faith and thereby stabilizes the relationship.[8] Hence, while there is a kind of symbolic debt, it is not the economic dimension of the debt that drives the recipient to reciprocate but the gratitude for receiving. Gratitude and faith endure beyond the actual exchange and thereby establish a relationship (Adloff and Mau, 2005).[9] Each gift is thus a symbolic denial of self-interest and a material sign of trust, a promise to rate the community and its rules over the own immediate economic interests.

The exchange is in principle with indefinite end, may grow over time and may establish a socially beneficial environment of trust and foreseeable behavior. In archaic societies this logic facilitated trade and the division of labor.[10] In such societies the *gift*

[7] Mauss differentiates between non-agonistic and agonistic exchanges. I will here only refer to non-agonistic ones (Adloff and Sigmund, 2005).

[8] Authors like Mauss (1954); Stegbauer (2011); Moebius and Papilloud (2006) agree on the effect direction: Not the a priori existing relationship allows individuals to tolerate temporary imbalances. In contrast, the exchanges with their imbalances establish the relationships.

[9] Adloff and Mau (2005) refer to Georg Simmel and his essay *Exkurs über Treue und Dankbarkeit* in which he argues that reciprocity through gratitude is next to money and law the major mechanism to coordinate collective action.

[10] Bourdieu (2005) explains in interesting detail why the social form of giving typically takes extrav-

entails economic, social, religious and juridical consequences and thus reaches beyond the purely economic implications of market exchanges.[11]

Gift and reciprocity: Such patterns of interaction have obviously also caught the interest of economists. The behavioral concept behind the gift theorem is known as reciprocity and finds an application in e.g. the tit-for-tat strategy in behavioral economics: Individuals who comply with the societal rules (i.e. they cooperate) will be able to expect beneficial treatment by group members. Deviating individuals, in contrast, will be punished[12] and excluded from exchange relations. Obviously, individuals resorting to a short-term utility maximizing strategy of following the immediate self-interest will try to free ride and will not return gifts appropriately. One can thus read reciprocity as collective strategy to identify and exclude potential free riders. It establishes a credible threat and thus prevents free riding. Reciprocity thus creates a collectively desirable environment that puts specific demands on the individual behavior (Fehr and Gächter, 2000; Falk and Fischbacher, 2006).

One might oppose that individuals are aware of the dramaturgy of the gift exchange, the constructed uncertainty, the alleged voluntariness and the feigned generosity and that this strategy of preventing free riding might thus easily collapse. Bourdieu (2005, p. 143) clarifies that numerous incorporated habits and adopted social mechanisms prevent humans from objectifying these inconsistencies. The underlying constructs are not explicitly negotiated in the gift exchange. Gift exchange thus bases on keeping certain insights about the underlying dramaturgy "implicit".[13]

1.2.2 The sphere of the family

A specifically fruitful application to the concept of reciprocity in the context of this dissertation is the sphere of the family, that also Hollstein (2005) analyzes in this way.[14]

agant arrangements: Seemingly wasteful, expensive routines stress the supposedly voluntary character of the gift. Choosing generous and costly forms can thus be understood as investment in the credibility of the donor and thus in the reliability of the relationship. By investing in certain social forms, the individual signals that its subordinates its own interests to the rules of the social entity.

[11]The gift is thus called a *total* phenomenon by e.g. Mauss (1954).

[12]Punishing can cause costs to the punishing group member. Punishing itself is basically a public good as it intents to keep the behavioral morals of the group.

[13]These incorporated habits and adopted mechanisms crucially shape what Bourdieu (2005) calls the *Habitus* of an individual. Hence, much of the processes around gift exchanges is incorporated, tacit knowledge, behavioral protocols the individual is not necessarily aware of.

[14]A key disadvantage of reciprocal behavior is that its behavioral rules are heavily depending on habits, traditions and contexts. These characteristics are difficult to control which makes the gift theorem hardly accessible for economists as tool to analyze real world behavior with respect to *causal* relationships. The theorem, as noted above, is however widely analyzed in the more suitable field of experimental economics.

Families have often been described in economics as first instance of labor division practices, as community of intense and steady exchange and as ancient risk pooling institution (Becker, 1974; Becker and Tomes, 1986; Kotlikoff and Summers, 1981; Cremer and Roeder, 2014).[15] At the same time, families run their far-reaching exchanges while typically withdrawing from the logic of precisely pricing goods and services, and equally they do not resort to direct and securely enforceable formal contracts covering their exchanges, as e.g. Laferrere and Wolff (2006) argue. And even if they do, e.g. in the case of marriage contracts, these contracts are typically known to be incomplete. The institutional set up families do not use usually ensures that market exchanges are "evened out". Familial relationships are then also naturally characterized by dependencies and asymmetries enduring over entire life phases. Familial exchanges are furthermore particularly complex and heterogeneous in form and content. The case of parents and children may be the archetype example: Neither of them could keep track of the goods and services they exchange over life phases nor know whether services and considerations will actually equate over the longer term. Even when taking into account that parents are legally forced to care for their children as long as these are under age, parental care usually goes beyond what is necessary. Such behavior is barely sufficiently explained with rational actors weighing up options to maximize some objective.[16] Why do parents behave that way in the obvious risk of children not returning in the same way, once parents will turn dependent on them?

Laferrere and Wolff (2006) argue that *generalized reciprocity* as behavioral principle is suitable to explain and analyze familial exchange patterns. The concept describes exchange relationships that differ from well-defined market exchanges in that exchanges are *generalized* over time and also across persons (Stegbauer, 2011). In the latter case, scholars also refer to *solidarity* to describe this behavior, that does not base on equating services and considerations but deliberately leaves open when and who has to return favors that, according to Hollstein (2005), are at least expected to equate over the life cycle. Any family member in need will thus get help, namely by some family member that currently can help. Exchanges thus follow rules, are not unconditional but also do not require the cumbersome institutional setup of market exchanges.[17]

[15]The labor division within families encompasses all kinds of cooperation, e.g. sharing of housework, mutual help, joint investments in e.g. real assets, common insurances, mutually adjusted earnings profiles, investments in the education of children, financial support for ageing parents, commonly used household goods, care for children, knowledge transfer, ...

[16]The branch of *family economics* is dealing in detail with family-specific exchanges and the explanatory power economic approaches provide to this sphere. See for instance the *Handbook of population and family economics* I am citing some contributions from.

[17]Hollstein (2005) notes that young children, obviously, can hardly accept gifts as gifts in their sheer dependence on their parents. Also, the stark asymmetries between young children and parents questions the applicability of the gift theorem. Hollstein however cites multiple empirical studies that find that grown-up children repeatedly base their reasoning on typically reciprocal motives. Children

Generalized reciprocity suggests that the long-lasting asymmetries in services and considerations between relatives do not burden the relationships but rather facilitate the development of sound trust. Families typically deny that economic interests play a significant role in their shared sphere. The apparent willingness to mutual help is rather framed as side aspect of the social relationship. As Adloff and Mau (2005) explain, the material side of transactions within generalized reciprocal relationships is eclipsed by the social side, the expectations concerning services and considerations are deliberately indefinite.[18] This stressing of the social dimension of generalized reciprocal relationships comes along with the manifestation of a shared group identity: A gift expresses and reaffirms the identity of the donor, as Adloff and Sigmund (2005) explain. Granting familial solidarity to the recipient equally distinguishes the family member from the non-member and thus confirms the shared identity of belonging to the community.[19]

Again, one can infer that this behavior is a strategy to minimize the risk of free riding peers: The logic of individual utility maximization is deliberately excluded, even forbidden in the sphere of the family.[20] Conceding economic interests in the relationship would evoke sanctions and rise significant risks: Such behavior would mean to terminate the reciprocal logic of interchanges. Mutual generosity (in the bounds of the socially expectable) would be *crowded out* by regular self-interest. The process of crowding out cooperative behavior has been described by Titmuss (1970) with respect to blood donation behavior and with explicit reference to the *gift theorem*.[21] Hence, the family can work as economic unit as long as its members credibly commit to a generalized reciprocal behavior and the family thus succeeds in barring the threat of individual utility maximization from its sphere (Hollstein, 2005; Bourdieu, 2005).[22]

thus seem to accept the principle of reciprocity in the exchange with their parents at some point.

[18]Or, how Polanyi (1944, p. 51) puts it, the "division of labor will automatically be ensured; economic obligations will be duly discharged; and, above all, the material means for an exuberant display of abundance at all public festivals will be provided. (...); giving freely is acclaimed as a virtue."

[19]Family members thus commit to some extend to the interests of the group. It is however unclear whether it is suitable to speak of the maximization of a family utility: While genuine familial goals exist and might be pursued, an explicit goal-oriented rationality would undermine the voluntary-cooperative nature of the family.

[20]Polanyi (1944, p. 52) also describes the social embeddedness of economic actions in primitive societies that base on reciprocity and where "no individual economic motives need come into play; no shirking of personal effort need be feared (...). In such a community the idea of profit is barred (...). The economic system is, in effect, a mere function of social organization."

[21]Titmuss refers to the "pure gift" or altruism, as the recipient of the donated blood is usually unknown to the donor This stream of analysis was recently resumed by e.g. Mellström and Johannesson (2010) or Rapport and Maggs (2002).

[22]Bourdieu (2005) (p.151) argues that the logic Gary Becker applies to families contradicts the way families actually work.

1.3 Families and intergenerational transfers

Only inheritances establish dynasties and are thereby not only profane acts of transferring wealth but convey that the family is more than the sum of its mortal parts. In a sense, inheritances could be considered the archetypical family transfer. In what follows, I will follow Leopold (2009) who argues that intergenerational transfers, despite withdrawing by definition from *directly* reciprocal relationships, can be well explained with the concept of *indirect* reciprocity. In particular, I resume two questions from the beginning of the introduction and consider what economic theory can say about them and what the gift theorem can add:

1.3.1 Open questions

- *Why would people care to bequeath?* The economic literature offers different answers to this question: Yaari (1965) for instance resorts to the classical life-cycle hypothesis by Modigliani and Brumberg (1954) and hypothesizes that bequest accrual could be entirely unintended.[23] Only imperfect financial markets and uncertain life spans make that decedents leave their virtually random leftovers to their descendants. Interestingly, when inheritances are fully unintended, bequest taxation would not induce behavioral adjustments and would thus not cause inefficiencies.

  Kopczuk and Lupton (2007) use a structural estimation approach and in contrast suggest that even 70 % of inheritances result from deliberate bequest intentions. Accepting the existence of some kind of bequest motive is then also prevalent in economics and e.g. leads to the literature on optimal inheritance taxation: It is only due to a bequest motive that both the heir (by her extended consumption prospects) and the testator (by the utility from bequeathing) draw utility from the otherwise zero-sum redistribution of resources between generations. As one will also see in chapter 5, the consideration of bequest motives can even lead to optimal *negative* marginal tax rates (i.e. inheritance subsidies).

  The actual nature of bequest motives is difficult to detect. The optimal taxation literature thus discusses a range of motives: Altruism as in Barro (1974), where parents incorporate their children's utility and correspondingly adjust the bequest size. The "joy-of-giving" motive (or "warm-glow" as in Andreoni (1990)) which assumes that parents draw utility from giving irrespective of the specific needs of their children, i.e. they basically consume inheriting as good as any other

[23] See for instance Dynan et al. (2002, 2004).

and thus react to price incentives. Also primarily strategic motives (Bernheim et al., 1985), in which allocations can actually turn out to be inefficient because of the parental monopoly, are discussed.[24] These suggestions are plausible and helpful. They are however also not mutually exclusive (Kopczuk, 2013a), difficult to test empirically (Laferrere and Wolff, 2006) and their application is often not sufficiently motivated: Strategic motives assume a trading relationship between parents and children although agreements are not enforceable as wills are open to one-sided changes by the parent until death. Strategic threats of the heir thus naturally lack credibility.[25] Most papers take a joy-of-giving motive or dynastic preferences as given. Papers however typically lack a discussion of why they resort to a specific motive and they typically ignore *what* originates the motive or leads to the prevalence of bequest motives in the first place. (Kopczuk, 2013a, p. 12) concludes that "searching for *the* bequest motive is unlikely to be successful" as motives might be too diverse and complex to be modeled in a single framework.

- *Why is the inheritance tax particularly contentious?* Obviously people do not like being taxed: Taxes not only reduce, in this case, the transfer mechanically, but also evoke a behavioral adjustment (as long as income and substitution effect do not equalize each other) which might make the testator to bequeath even less. The opposition against the inheritance tax however stands out and is not sufficiently explained by the general opposition against tax obligations: In the US, inheritance taxation is for instance discredited as "death tax".[26] Portugal (in 2004), Austria (2008), Norway (2014) and Sweden (2004) even recently abolished their inheritance tax schemes. The latter stands out for its high taxes on income, the tax on inheritances was however particularly unpopular, as Waldenström and Henrekson (2016) report. Gross et al. (2017) show for Germany that also individuals that do not expect to receive intergenerational transfers (and are thus unlikely to merely judge by their financial interests) have considerable reservations towards taxing inheritances. The authors also find that this opposition is especially pronounced when the tax affects transactions between family

[24]Altruistic bequest motives imply that the utility of the heir directly enters the utility function of the testator, whereas it may be discounted to some degree. Cremer and Pestieau (2006) or Masson and Pestieau (1997) provide concise discussions of different motives. See also chapter 5 in the present dissertation in which parents differ in their degree of altruism.

[25]In Germany, the hereditary reserve legally ensures that decedents bequeath a minimum share of their bequest to their children. The state thereby breaks the structural advantage of the parent to free ride in end-of-life trades with her children. Children in turn may still have an incentive to contribute in order to ensure to receive more than the minimum share.

[26]For a discussion, see *The case for taxing death* in *The Economist*, November 23rd 2017, online, accessed on February 18th, 2018.

members.[27]

As already mentioned, economic theory suggests under certain conditions that inheritance tax rates should be negative to be optimal as both decedent and descendant suffer (benefit) from positive (negative) tax rates. One might thus argue that the actually positive tax rates are particularly bad policies. While this flaw would affect also transfers between non-relatives, the pronounced objection to the inheritance tax is especially linked to families. Arguing that people simply care most for their relatives also does not really solve the riddle as it leaves open why this is the case. It may instead be, that economics does not sufficiently (prominently) address the question in how far individual behavior is shaped by collective identities. Economics rather seeks to explain collective behavior from the individual perspective, i.e. the micro level. While utility functions might well contain other family members' utility, decisions in models are typically taken by the individual in the interest of the individual. The discussion on the inheritance tax however shows the importance of the question in how far the role of collective identities is reasonably (or unreasonably) reflected by legal arrangements.

The German tax code for instance conditions tax rates on the degree of relationship, granting the more advantageous rates the closer decedent and heir are related.[28] The state thus makes it cheaper to pass on wealth to relatives and thereby discriminates testators who would rather give their wealth to non-relatives. The state is nonetheless still confronted with fierce reservations towards the inheritance tax.

In what follows I will try to add to these answers by drawing on the motive of reciprocal behavior. I hypothesize that gift exchange motives strongly impact inheriting practices and explain the otherwise odd dispersal of intentional bequests and the perception of the inheritance tax as particular inappropriate fiscal tool. I do not claim that assuming reciprocity would be superior to the bequest motives prominently used in economics. I rather argue that reciprocal behavior describes well interactions within families and may thus add to the understanding of inheritances as typical family transfer. See Laferrere and Wolff (2006) for an economic discussion of the implications of assuming reciprocal behavior in the context of intergenerational transfers.

[27]See also Bastani and Waldenström (2019) for a very recent study on the attitudes towards inheritance taxation in Sweden. The paper also attempts to explain the decline in political support for inheritance tax schemes.

[28]See Gross et al. (2017) for a brief overview of the German inheritance tax scheme.

1.3.2 Bequest motives: Why would people care to bequeath?

The *gift theorem* suggests that families are not sufficiently understood as networks of loosely connected, merely self-oriented, utility maximizing agents. Families rather resort to a reciprocal strategy of self-organization. The intense cooperation creates trust, a common identity and ensures a high commitment to the group. The precondition for existence and functioning of families is, as discussed above, the denial of individual economic striving as leading motive of familial exchange and the acceptance of genuine familial goals that might well be in conflict with individual goals.[29]

The denial of individual self-interest as leading behavioral motive implies that family members do not claim exclusive individual power of disposal for their formally individual property. Families thus, to some extent, decouple property from the individual and establish "Familienbesitz". I will argue in the following that the described way of familial cooperation can be used to understand bequest intentions. In particular, reciprocal motives help to identify a twofold justification to bequeath within families:[30]

The economic meaning of bequeathing The dying testator may then see himself rather as trustee (and not as exclusive owner) of "his" property. Indeed, the division of labor within families, the risk pooling advantages, the mutual help and particularly the receipts from the own ancestors, all this warrants the perception that the family has significantly contributed to the property of the individual. That is, the family acquired the property together. The institution of the *statutory matrimonial property* regime (*Güterstandsregelungen*) for married couples documents this idea exemplary. Moreover, the idea of a single family member deliberately planning how much wealth to acquire to securely finance its individual life span (and potentially developing a bequest motive) contradicts the familial logic of steady cooperation. An individual bequest motive, isolated from familial plannings would thus be untypical. The family rather accumulates wealth together *for the family.* Hence, bequests can in this stylized representation be seen as byproduct of the cooperative habits and social preferences family members adopt early in life.

The notion of genuine family property *materializes* in the (intentional) inheritance

[29] Arranged marriages are still not uncommon in traditional milieus and an illustrative example for the potential conflict between familial and individual interests. Hollstein (2005) speaks of "family needs", that determined familial behavior before welfare states secured them. While such needs are increasingly secured and familial restrictions on the individual family member seem to become less common, families still might have genuine family goals and tools to enforce them. Hollstein concludes that the notion of families as "Solidargemeinschaften" are still prevalent.

[30] Hollstein (2005) finds evidence for *direct* and *indirect* reciprocity in the intergenerational exchange within families. In terms of inheritances, I refer here to an economic and a symbolic meaning of bequeathing.

to other family members. Bequeathing is acknowledging and sharing the genuine material pay-offs of the family being economically more than the sum of its parts.[31]

The genesis of the inheritance tax legislation in Germany seems to back this presumption: The hereditary reserve (*Pflichtteil*) restricts the freedom of testators to distribute their wealth freely by entitling close relatives to a minimum share of any bequest. Beckert (2005, p. 75ff.) explains that the relation between hereditary reserve and testamentary freedom (*Testierfreiheit*) was highly debated during the introduction of the *Bürgerliches Gesetzbuch* (BGB) and its inheritance law in the 19^{th} century: The BGB was supposed to standardize varying regulations from the German states. The commission in charge based its line of argument on the individual and aimed at strengthening the testamentary freedom. Doing so was widely seen as an extensive liberalization which stood in the tradition of the roman legal culture. Here, the inheritance law was derived from the (last) will of the individual which was seen to endure death. The, according to Beckert (2005, p. 80), actually prevailing "national" law tradition (still shaped by the *Biedermeier*) rather derived the inheritance law from the role of the family in society: Considered as nucleus of society, the well being of the family was paramount to the individual will, the natural continuity of the dynasty as community in solidarity widely considered to stabilize society. Proponents of this view rather wanted to restrict the testamentary freedom further.

Back then inheritances also had a significant role in securing the decedent's family financially. Modern pension systems, mostly independent of family relations,[32] were not yet in place, which certainly added to the support for far-reaching hereditary reserves. Deriving the inheritance law from the viewpoint of the family and considering the family the nucleus of society also opened the debate to reformist proposals who wanted to establish a societal entitlement to the decedents property.[33] Conservative forces prevented such interventions and overruled the public opinion so that the BGB in the end based its inheritance legislation on the idea of the individual testamentary freedom that is only in a second step restricted by the (inferior) hereditary reserve and thus the rights of the family. Beckert (2005, p. 81) considers this a modernization in the sense of the emerging individualism of modern societies.

The hereditary reserve emerged from the understanding of families as economic units, which granted the close family a "natural right" to the possessions of the dece-

[31]Family members do not acquire "rights" to the property of their parents through reciprocal behavior, Hollstein (2005) argues that people rather expect that services equate over the longer term, but decedents might see in their descendants the most legitimate recipients of their property.

[32]The widow's pension actually is an example of how family relations is still maintained in the German pension legislation.

[33]Beckert (2005) mentions that German economists at that time preferred far-reaching hereditary reserves for distributional reasons.

dent. The tax law thereby expressed and manifested a notion of familial rather than individual property. According to Beckert (2005, p. 25) this notion could only change in the wake of the industrial revolution: The increasing division of labor outside of the familial sphere allowed to establish an understanding of individual property. The economically increasingly independent individual could only then claim individual rights of disposal independent of its relatives. Polanyi (1944, p. 171) describes this individual independence as result of the modern market economy which evolved through the industrial revolution and which weakened the social *embeddedness* of the individual: "In practice, this [the application of the principle of freedom of contract] meant that the contractual organizations of kinship, neighborhood, profession and creed were to be liquidated since they claimed the allegiance of the individual and thus restrained his freedom." Bourdieu (2005, p. 152) goes further by stating that the "familial economy" has stopped being "the model" for economic relations when it was replaced by the market economy whose logic keeps on threatening the family.[34]

While these statements certainly describe actual changes in the notion and role of families, the still existing restrictions on the freedom of contract in the contemporaneous inheritance legislation proof that the "liquidation" that Polanyi expected and that Bourdieu diagnosed was at least not fully executed in the realm of inheritance legislation. At the latest with the introduction of the modern pension system in Germany in 1957 inheritances also lost the importance for securing descendants financially.[35] Unstable family relations, as they increasingly evolved during the last decades, and correspondingly increasingly heterogeneous ways of organizing family life might have also contributed to a further loosening of restrictions of the individual that base on descent.[36] People could have started to oppose the inheritance legislation in order to become fully free in choosing the beneficiaries of their inheritances and in order to overcome the family-oriented rules. The principals in the inheritance legislation are, according to Beckert (2005, p. 76), nonetheless still in effect as developed in the 19^{th} century. According to Hollstein (2005), the notion that the property of an individual is partly attributable to its family is also still widespread. Despite the nowadays far-reaching economic independence of individuals the principle of a hereditary reserve is thus maintained.

Testamentary freedom (*Testierfreiheit*) and hereditary reserve (*Pflichtteil*) balance

[34] He even uses the *inheritance* as very symbol for this change: While it is the shared bequest that keeps the family together, the existence of such a bequest provokes competition and calculation and thus the behavioral logic that threatens the familial community.

[35] Beckert (2005) also mentions that the decreasing relevance of the agricultural sector plays a role, as inheritance law determined whether farms could sustain.

[36] As Beckert (2005) argues, the forms in which families live and cooperate keep on changing. Patchwork families obviously might cooperate in the same way as other families do but still do not occur in today's inheritance legislation.

the independence of the individual to do with her belongings what she intents to do against the socially[37] as legitimate perceived entitlements of the family to the donor's property. It is difficult to detect whether today's regulations are rather path-dependent and arbitrary left-overs or whether they actually reflect e.g. the degree of socially perceived economic independence of an individual (which, one would expect, should have decreased over the decades) or in fact the sustaining notion of family property. But the understanding of families as communities in solidarity that share their resources sustains.

Hence, while the current regulation still forces donors to bequeath to their close relatives, this restriction does not evoke much opposition. People regularly accumulate wealth to bequeath knowing that they will have to pass considerable shares to their family. The perception of the family as community in solidarity still seems to play a significant role for the enduring acceptance of this regulation and might thus also give reason to the given incidence of intentional bequests.

The symbolic meaning of bequeathing The gift theorem allows to conceive that a second, a rather symbolic meaning of bequeathing, contributes to the bequest behavior of aging individuals: By bequeathing the testator ultimately and figuratively confirms the existence and her symbolically "eternal" solidarity with the family.

The concept of *generalized reciprocity* comprises that service and consideration can be exchanged between groups and do not necessarily have to be exchanged between the same individuals.[38] Arrondel and Masson (2006) and Hollstein (2005) argue that this idea is expressed when people state "I give to my children, what my parents have given to me". The reciprocal intention of this statement does not directly refer to the behavior of the children but refers to some kind of dynastic bequest motive. Bequeathing here means to reciprocate to his ancestors, not bequeathing occurs as withdrawing genuine dynastic wealth from the dynasties resources.

The decedent thus implicitly participates in two gift exchanges when bequeathing: She is not only part of the exchange process she has in person participated in and benefited from during her life with her contemporaneous family members (the economic dimension of bequeathing), but she is also part of a superior exchange that she has not yet, until death, really contributed to. Preceding generations have passed on their

[37]Assuming that the law actually reflects societal preferences. At least, if the law would clearly contradict the majorities view on the hereditary reserve, one would expect to see pressure on legislators to implement adjustments.

[38]E.g. Two families are related through a gift exchange. Generalized reciprocity decouples giving and reciprocating from specific individuals and relates the obligation to reciprocate to members of the same group, e.g. the family. It thus does not matter which family member reciprocates. In some publications, this characteristic of *giving* is denoted *indirect* reciprocity.

wealth and have thereby advanced their successors the trust to secure the future of the dynasty. Dynastic bequest motives thus decouple material exchanges even from the existence of specific family members (Leopold, 2009, p. 27). Bequeathing becomes a generous act of trust in the family members alive, but actually is an act of giving to the dynasty represented by its living members. This seemingly voluntary act of giving ensures the decedent what one could call the "eternal" gratitude of his successors who cannot reciprocate until they themselves will bequeath. The bequeathing individual thus gives to the dynasty to which it itself will not belong anymore physically. The dynasty, in this sense, becomes more than the sum of its mortal parts.

Again, a gift always seems to be voluntary and generous. The bequest might however be the only one that actually is voluntary: The family has no opportunity to sanction deviating forms of (not) bequeathing (sufficiently), the decedent, in turn, cannot get anything *material* in return for his final sacrifice. Bequeathing thus is not only the final, but the ultimate gift, a sacred act of selflessness that acknowledges the existence of the dynasty. Bequest motives, in this sense, are the consequence of generalized reciprocal exchange practices within families.

1.3.3 Public intervention: Why is the inheritance tax contentious?

This question about the inheritance tax stresses the role of the state in the interplay between family and individual. The state is here the force that ultimately grants and limits the individual right to possess and dispose. Its attitudes in this regard highly depend on the economic and social development: In the wake of the industrialization and the emergence of the market economy, the role of public power grew beyond providing a basic set of public goods, some degree of law enforcement and security (Polanyi, 1944). In particular, the modern state (and partly the market) increasingly substituted tasks formerly in the hand of the family by his welfare services, social insurance schemes and the public educational system. The relationship between individual, family and state thus witnessed considerable changes. The development of the inheritance tax legislation in Germany reflects these changes to some extent, as Beckert (2005, p. 247) argues. The tax thus is not a random fiscal tool but an element in the emotionally charged interplay between family and state: I argue in the following that the strong opposition against inheritance taxes results from a falling apart of the subtly still widespread archaic notion of the role of families and their actual role in societies that define itself as being meritocratic.

As we have seen, the gift theorem suggests that intergenerational transfers in the form of inheritances fit well into the behavioral concept of families. One might thus consider inheritances a typical family transfer. Assessing the inheritance taxation two questions occur: First, why would the state tax inheritances? And second, as follow-up question, how should the state treat families here?

Concerning the first question, scholars usually simply refer to the ability-to-pay principle (i.e. *Leistungsfähigkeitsprinzip*) as inheritances are legally considered a kind of taxable income (Crezelius, 1999; Meincke, 1999).[39] The inheritance tax restricts the right of free disposal of the testator. The taxation according to economic ability thereby implies a redistributive purpose as it partly aims at removing the underlying inequality in resources. Hence, inheritances are taxed as taxable income *of the individual*, i.e. the heir. The actual origin of that income does not seem to play a role for the derivation of the tax.

The current tax scheme is set up as *inheritance* rather than *bequest* tax.[40] The tax scheme thus permits to condition the tax burden on characteristics of the recipient of the transfer. The German tax code grants substantial privileges to family members as recipients, in both the scope of the tax allowances and the tax rates.[41] Just as with the introduction of the modern inheritance legislation, as seen in the previous chapter, the introduction of the modern inheritance tax legislation also grants a special role to families. The question of how the state should tax families thus resumes the question of what role these communities play in society.

Given that the basic principles of taxing inheritances are maintained since the introduction of the tax in the early 20^{th} century, it may be interesting to look at the debates that took place back then: Beckert (2005, p. 264) describes that the introduction of an actual bequest tax for instance failed. The degree of relationship would not have been taken into account. This provoked severe opposition, particularly in the significant agricultural milieu of that time, in which family cooperation and economic fate was strongly linked (Beckert, 2005, p. 265 and FN 86). The public opinion at that time thus wanted to grant privileges to families. As discussed above, families were seen as nucleus of society and their continuous existence as cornerstone for the functioning of society. This view seemed well justified: The sound trust within families allowed for a generalized reciprocal exchange that comprised all economic resources of the family. The inheritance tax thus was a compromise between the necessity to tax (at that time

[39] Compare also the decision of the Federal constitutional court from 1995: BVerfG, BStBI. II 1995, 671, 673.

[40] A bequest taxation has e.g. existed in the US and taxes the entire bequest instead of the individual inheritances.

[41] Tax allowances and tax rates are lower, the closer the familial relationship. Highest tax rates occur for unrelated heirs. Such exemptions are common and occur e.g. also in Belgium, Finland and France.

for fiscal reasons) and acknowledging the positive externalities of family solidarity.

The relevance of the agricultural sector[42] just as the economic relevance of families has however obviously decreased over the last 100 years. Were tribes, families and generally kinship for long the institutions providing some sort of informal social security to the individual, the capacity of these collectives to insure its members greatly declined with the industrialization and the parallel emergence of the market economy (Polanyi, 1944) and was largely substituted by public institutions like social insurance schemes and the educational system, as Hollstein (2005) notes. Beckert (2005) then also illustrates that the introduction of the inheritance tax in the *Deutsches Reich* in 1906 was accompanied by a debate on the relationship between state and family: Adolph Wagner, an economist from the so-called *Junge historische Schule*, called for a progressive inheritance tax, for it was seen to be more capable of financing the increasingly far-reaching public obligations to insure individual life risks.[43] The taxing state is, in this logic, the other side of the coin of the welfare state. The introduction of a tax on "family property" is thus the public response to the declining ability of families to provide for their members.

Today, the welfare state widely secures individuals against the risks of aging, sickness, unemployment and even the break down of families itself.[44] These far reaching welfare services do not depend on the inheritance tax revenues.[45] If the economic role of families however once determined how the inheritance tax was designed, then one might want to take the further decline of the economic role of families since 1906 into account. The welfare expansion since then is not mirrored by corresponding adjustments in the inheritance tax scheme. Taking this decline into account however is difficult as families still have far-reaching economic implications: The extraordinary high at-risk-of-poverty rate of single parents in Germany for instance indicates the financial risk of declining family structures.[46] It then also difficult to say, what share of the maintaining economic advantages of family structures is attributable to e.g. the economies of scope to share a household or the generalized reciprocal behavior or to e.g. tax policies. Hence, while the scope of the tax privileges of families in the inheritance

[42]At least in terms of the share of people in Germany actually generating their income in it.

[43]Wagner was here just spelling out what, according to Beckert (2005) was the intention of many social democrats in the early 20^{th} century debates in the Reichstag.

[44]By e.g. conceding extra allowances to single parents in the tax code, widow's pensions, orphan's allowance or so called "Realsplitting" for divorced spouses in the income tax code.

[45]There does not seem to be an immediate necessity to tax inheritances for fiscal reasons, as the tax only levies a comparably small share of the total tax revenue. While the inheritance tax revenues are cashed by the federal states, the relevance of the tax is visible when comparing it to the total tax revenues of Germany: According to the Federal statistical office, the inheritance tax contributed 6.1 Billion Euro to the German states' households in 2017, which equals 0.8 % of total revenues.

[46]The Federal Statistical office of Germany in 2015 rated roughly 1/3 of all single parents in Germany as living at the risk of poverty.

tax might seem and be arbitrary, couldn't one still argue that tax privileges for families are indeed warranted?

I will oppose this view in what follows and will base my argument on a broader notion of the welfare state: If we consider tax policies as part of the broader welfare state arrangement and its goals, then the legitimacy of inheritance tax privileges of families is questioned, I will argue.

Scope and characteristics of welfare states respond to economic developments and the following working conditions of the working class.[47] The German welfare state for instance increasingly aims at complementing the flexibility requirements of families in today's economy: It extends its effort to help parents to reconcile waged work with e.g. child-care necessities and bears increasing shares of the cost of educating children.[48] The objective of the modern welfare state however reaches beyond reconciling family and work: The welfare policies, for instance, rather aim at equalizing the living conditions for children across families. The ultimate sign for successful policies in that respect would be perfect social mobility and thereby a low degree of familial path dependency. The modern welfare state thus not only secures or provides services that are subsidiary in nature, the modern welfare state rather seems to substitute family structures (Hollstein, 2005, p. 202).[49] Locating the inheritance tax in this welfare objective, it can be considered the monetary complement to e.g. the public educational system in providing equal starting conditions for children.[50] Farhi and Werning (2010) then also interpret public education as negative and progressive inheritance tax.[51]

The inheritance tax has however not been consolidated during the last decades in the scope the public educational system has. Has the tax once been launched as fiscal tool to fund social security, it would have needed to turn into an instrument equalizing the starting conditions of children. The goal of leveling the playing field for children can be derived, e.g. from considering autonomy as normative objective of the

[47] Most western countries developed comparably similar systems, although having, as Beckert (2005) shows with respect to the debate on the inheritance tax, different political cultures. The power of the political left, as champion of welfare development, is then also the consequence of a growing working class, their living conditions that were less bound to their familial environment than e.g. in the more decentralized, more agriculture oriented pre-industrial economic structures.

[48] Daycare centers are e.g. increasingly free of charge. Also the share of children under the age of three in daycare centers increases. These recent reform effort particularly aimed at allowing mothers, who traditionally have a low labor market participation rate in Germany, to enter waged work.

[49] In 2018 France for instance extended the compulsory school attendance to children from the age of three.

[50] The effect of the inheritance tax is de facto limited in this respect as high allowances leave by far most transfers unaffected. The possibility to repeatedly use allowances in inter vivo transfers also allows to pass on considerable fortunes tax free. Braun (2015) for instance calculates an effective tax rate of around 3 %.

[51] The right of heirs to decline inherited debts or in policies encouraging parental investments in the human capital of their children are further examples given by Farhi and Werning (2010).

entity of welfare services (Bothfeld, 2017) or from the economic (efficiency) objective to enable children to take any career path along their initial abilities irrespective of their familial background. In this light, familial privileges in the inheritance taxation occur as anachronistic characteristic of the tax system. While the welfare state has developed massively since 1906, the inheritance tax code still maintains the central principles of those times (Beckert, 2005, p. 263). In this understanding, taxing inheritances limits the negative (societal) externalities from its provision. At the same time, the tax still balances the trade-off between equity in starting conditions of children and efficiency concerns in the incentives of decedents and thus may not reach 100 %. The tax privileges for families however would contradict the purpose of the tax to level the playing field of children by facilitating the wealth transfer exclusively within families.

Such privileges (just as the existence of the hereditary reserve) also discriminate testators who want to bequeath to non-relatives. Everybody would be free to bequeath her property to her family, if wanted. Why should the state incentivize such behavior and disincentivize bequests to non-relatives in a welfare state that aims at enabling individuals to emancipate from their familial descent?

The ongoing heated debates about the legitimacy of taxing inheritances thus may document a falling-apart of the public notion of families' role in society (still linked to "family property", nucleus of society, ...) on the one hand and their actual role in modern societies (background individuals might want to emancipate from even though economic relevance has already declined) on the other.[52] The concept of "family property" as resulting from the generalized reciprocal behavior of families seems to remain present. Family members consider inheritances rather as family property, i.e. already their property, and not as newly acquired taxable income. An inheritance tax levied on intra-family transfers conflicts with the notion of family property and requires to balance potentially legitimate claims of the family against, first, the freedom of disposal of the decedent and, second, the tax interest of the state, who is taxing the inheritance as

[52] A similar discussion is still taking place with respect to the so called *Ehegattensplitting* in the German income tax code: The tax burden of married couples is derived from their aggregated income and thus does not equal the aggregated individual tax burdens which would be higher given the progressivity of the income tax code. While the couple as economic unit saves money, the second earner within the couple faces a higher marginal tax rate due to the splitting and compared to the counterfactual situation of not being married. While proponents of the splitting stress that married couples are a single economic unit whose tax burden should not depend on how spouses decide to share income generating activities, opponents argue that the splitting perpetuates traditional role models in which women (typically still the second earner) are working less and thus remain financially dependent on their husbands. The discussion about abolishing the splitting tariff in the German income tax scheme is going on for long and somewhat culminates in the question, whether individuals should to some degree keep their personal independence even when being married and the related question in how far the state shapes role models or interferes in the division of labor within marriages on the one hand or should strengthen equal societal participation. The scientific board of the *Bundesfinanzministerium* has recently published an interesting expertise on this topic (accessed on October 6^{th}, 2018).

a form of individual income. The notion of inheritances as family property is also expressed when opponents of the tax put forward that the inheritance tax taxes property illegitimately a second time after it has been taxed during its initial acquisition.[53] This idea still lingers in many minds. It is part of role models that might adjust much later than the economic conditions and the policies of the welfare state. The idea of family property thus clashes with the technical understanding the state has of inheritances.

A second justification for reservations against the inheritance tax results from the fact that, even though families' economic meaning declined, people still live in families and resort to the corresponding behaviors. Hence, people still adapt and incorporate reciprocal behavior and make families part of their identity. Resuming the reasoning from the previous chapter, there is thus, next to the just discussed economic dimension, again a symbolic dimension to the act of bequeathing that plays a role: By taxing bequests the state interferes with the sacred act of the decedent to bequeath her legacy to her descendants. By applying tax mechanics, the state confronts the family with the profane logic of bookkeeping in a moment of self-confirmation. The state restricts the sacred act of the decedent to honor its dynasty to a profane act of *individual* enrichment, that, in the public discourse often labeled as "undeserved", gets a shade of being illegitimate. The act of taxing an inheritance thus questions the legitimacy of the existence of families as dynasties by regulating the solidarity between family members and thereby threatens the self-image of the family as economic community which feels entitled to receive the entire bequest. Instead, the state confronts the family with a tax that for proponents is the monetized symbol of a meritocratic society. In that sense, this meaning of the tax negates the symbolic dimension of bequeathing, the ideal of meritocracy clashes with the ideal of familial solidarity. Such an interference seems to violate the understanding of the legitimate tax interests of the state of many people. At least in Germany where, according to Beckert (2005, p. 261), the role of the family always had a central meaning in the debate on the inheritance law.

The specific act of taxing a legacy, however, is the very event in which the archaic identity of families and the profane, modern logic of publicly organized individual freedom ultimately clash and evoke paradoxical reactions.

Interestingly, the anachronistic nature is visible in the professional debate about the inheritance tax where arguments relating to the family have vanished: The German discourse adopts, according to Beckert (2005) arguments that were rather located in US American debates. First, the equality of opportunity that inheritances are contrasting. Second, massive dynastical accumulations of wealth are more and more considered

[53]Meincke (1999) discusses this objection from a legal point of view and concludes that the acquisition through the heir is a taxable event.

a threat to the republican order of the state. In 1906, when the *Reichstag* put the inheritance tax in place, the current ground of Germany still hosted a monarchy and thereby a feudal system that based on a dynastic order and whose economic power crucially depended on land as primary form of capital. Societal modernization swept the former and technical progress massively reduced the meaning of the latter. The inheritance tax code is partly a result of this processes but also partly a testimony of preceding logics. The tax code just as the inheritance law still grant a role to the family that it seems to have lost long ago.[54]

1.4 The main chapters of the dissertation

The present dissertation will not discuss the implications of the *gift theorem* any further. This brief detour was meant to put the narrow notion of transfers as wealth transfers, as they are studied in the following chapters, into perspective: These chapters ignore that families might share resources across households long before parents formally pass on their property. Intergenerational wealth transfers are also only one among several channels through which parents shape the living conditions of their children. The dissertation focuses on the sole channel of explicit intergenerational wealth transfers.[55] The following chapters ignore for example parental investments in children's human capital or the passing on of habits and tastes and the access to networks that family descent might involve. Key factors that determine the productivity of children are thus endogenous to the familial background.

Children are to some extent able and, e.g. by the public educational system, supported to emancipate from their familial starting conditions. The educational system seeks to equalize those differences in the productivity of children that are attributable to their social background.

Inheritances, in contrast to productivity, are resulting primarily from the preferences of parents for bequeathing and are to that extent exogenous to the behavior of the children (and in particular much less under control of a child than its own productivity). The nature of the welfare state is designed to limit the socio-economic link between the generations of a dynasty. The idea of a significant intergenerational social mobility is inherent to a meritocratic and democratic society. The exogeneity of be-

[54] Above it was mentioned that *currently* several countries repeal their inheritance tax codes (Bastani and Waldenström, 2019). This development is in sharp contrast to the expanding meaning of the welfare state. It would be interesting to assess whether the eroding political support for the inheritance tax is a reaction to the substitution of familial patterns through welfare state policies.

[55] In comparison with the multitude of other channels through which the destiny of parents and children are linked, this one is the simplest to observe. Nontheless, it is not necessarily the most powerful one Heckman et al. (2015).

quests to the action of children makes inheritances an “undeserved” (Beckert) income for children which warrants to limit it by the means of taxation. Bequest taxation, in this sense, is a complement to the educational system: Taxes seek to limit the different financial conditions individuals are facing due to their family background. Or, as Farhi and Werning (2010) put it: *One of the biggest risks in life is the family one is born into.*[56] The welfare state and its complement, the inheritance tax, are the insurance against this risk: The compulsory nature of schooling, social insurance schemes and of paying taxes on inheritances are turning society into a risk pooling community, insuring against the risks of one’s family descent. Unborn, not knowing how one’s family background looks like, one would want to limit the uncertainty about inherited life chances.[57] The inheritance tax therefore not only expresses the potentially optimal solution to an equity-efficiency trade-off but also reflects in how far society considers an individual either still as inherently familial or as independent of its dynasty. While the following papers do not try to give a specific answer to this question, they provide some insights about inequalities that are attributable to inheritances and that are relevant when discussing the role of inheritances and its taxation. The issue of the inequality in life time resources, to the extend that it is beyond the control of the individual, is the background to all of the following chapters.

I will now briefly introduce the reader to the four main chapters of the dissertation, their broad topics and some omissions, and, for this, will resume the motive of the ambivalence that *giving* entails, being both, for individuals and societies, blessing and curse.

Chapter 5: Incentives vs. equal opportunities This chapter touches on a key conflict in the discussion about intergenerational transfers: The parental right of disposal on the one hand, that determines the incentives for parents to accumulate wealth. And the principles of a meritocratic society on the other which seek to provide equal opportunities to all children. Chapter 5 models the optimal inheritance taxation in a simple two generations framework with altruistic parents. The model thereby balances the mentioned equity-efficiency trade-off: The social planner enforces an inheritance tax that reconciles equity in living standards among heirs with the efficiency considerations in the parental generation. Our model focuses on the perspective of the parents,

[56] A quote that raises the question whether any part of an individuals existence is independent of the family (in a specific time and context) the individual is born into. That is, whether there is actual anything genuinely individual about an individual, i.e. something truly exogenous. It seems that our limited knowledge of how all factors impacting a child and forming an individual interact suggest individuality. The notion of *equal opportunities*, a widespread ideal for the circumstances, children should be raised in, is thus rather a stylized idea than a truly helpful political goal.

[57] Corneo (2006) develops the idea of the welfare state as insurer of such individual uncertainties and applies it to justify the progressivity of the income tax scheme in Germany.

variations in their preferences for bequests and how the social planner can take these into account. Our model takes income effects into account[58] and characterizes the entire tax system. Our results suggest that variations of the practice of "double counting" the utility of children, variations in parental altruism and the valuation of these through the social planner render a wide range of tax schemes optimal, even regressive ones. The chapter is the result of a collaboration with Robin Jessen and Maria Metzing.

Chapter 3 Individual vs. collective optimum Our model however leaves out the income effects of transfers on labor supply and thereby an important implication of intergenerational transfers. The so called Carnegie effect (Holtz-Eakin et al., 1993), as typically discussed by economists, hypothesizes that transfers tend to spoil the recipients' ambitions: In the absence of substitution effects and assuming that leisure is a normal good, economic theory predicts inheriting children to curb their labor supply. The reaction is individually reasonable, but collectively disadvantageous.[59] The Scottish emigrant Andrew Carnegie became rich by building up an industrial empire in the US and argued that bequeathing large fortunes would even be inefficient: Children of business people are not necessarily as talented as their parents, inheritances rather spoil the offspring, the money would thus rather be invested to the benefit of society. Carnegie became a philanthropist, allegedly donated almost 90 % of his fortune and died in 1919 at the age of 83. The life expectancy of men in the US amounted to 53.5 years[60] in that year. Chapter 3 deals with a variation of the Carnegie effect that is related to the stark increase in life expectancy and the aging of the German society.

The chapter assesses the income effect of bequest receipts on the extensive margin of labor supply of heirs: Together with Tobias Crusius I try to estimate the share of transfers that heirs are willing to give up in order to enter retirement earlier than without transfers. Finding an answer, as always, is cumbersome and our estimation relies on multiple strong assumptions and leaves out various potential adjustment channels, as e.g. the intensive margin of labor supply. Our estimate of the opportunity costs of a shift in the expected retirement age then amounts to roughly, on average, a third of the transfer amount and thus suggests a strong taste for leisure among heirs.

Chapter 4: Increasing absolute vs. decreasing relative inequality: The third ambivalence of intergenerational wealth transfers that plays a role in the dissertation concerns their distributional consequences: Inheritances tend to occur more often and,

[58] A model feature that a number of more complex, recently published studies neglect.

[59] Kopczuk (2013b) argues that income tax revenues decrease. Also, one might consider unfair that heirs are able to retire earlier than non-heirs.

[60] According to numbers of the University in Berkely. Accessed on October 6^{th} 2018.

even conditional on receipt, are larger the richer the receiving household is. Hence, there seems to be some kind of relationship in the capacity to accumulate wealth between parents and children that exists beyond the observed transfers.[61] Transfers thus add to the *absolute* inequality in wealth. Related to pre-transfer household wealth, transfers however tend to be bigger, the poorer the receiving household. Transfers thus do *equalize* the wealth distribution when inequality is measured in relative terms, as it is typically done in economics. Chapter 4 seeks to analyze these ambivalent forces by decomposing the distributional impact of transfers. It suggests to look at the impact of the transfer incidence, the effect of receipt on the savings behavior of households and potential variations in this behavior over the wealth distribution. Results suggest that the equalizing effect of transfers is robust: Neither the consideration of the transfer incidence over the wealth distribution, nor observed variations in the consumption out of transfers over the wealth distribution really question previous findings that intergenerational transfers equalize wealth inequality. The chapter omits the question why we discuss inequality[62] and only briefly discusses how we measure it: The relative measurement of inequality is consistent with the assumption of decreasing marginal utility. Relative inequality measures as the Gini index are thus the main reference in this chapter. Studies however also show that the notion of economic inequality as absolute inequality is widespread in the population (Cowell and Amiel, 2000).

Chapter 2: International Perspective This chapter serves as introduction into the question of how transfers affect wealth inequality. It has a similar thrust as chapter 4 but starts out with a comparison across Euro countries and a rather descriptive empirical analysis. The paper resorts to data from the Eurosystem's *Household Finance and Consumption Survey* and applies a decomposition of the Coefficient of Variation as suggested by Wolff (1987). It decomposes the inequality in observed household wealth in the inequality loadings that are coming from the net-of-transfer wealth, the transfer wealth itself and the correlation of the two. This approach is a simple and illustrative introduction to the relationship of wealth inequality and transfer wealth. The negative correlation between net-of-transfer household wealth and transfer wealth that causes transfers to equalize the relative inequality in household wealth is key to this nexus. The paper provides the decomposition for a number of countries and shows that this negative correlation is a robust pattern that occurs in all countries of the exploited

[61]Driving forces behind this relationship may be correlations in productivity or time preferences, which again may, to some extend be inherited or acquired in the family.

[62]Some studies suggest that inequality also affects efficiency. The *ifo* institute recently questioned that view in this review (accessed on October 6^{th}, 2018). Others argue on normative grounds to appraise different degrees of inequality. An interesting non-economists view on the topic is provided by Beckert (2005).

sample. This finding is in line with the results of the previous applications of the decomposition by Edward Wolff.

Chapter 2

How inheritances shape wealth distributions: An international comparison

2.1 Introduction

Intergenerational[1] transfers are known to be a major factor in households' wealth formation (Piketty, 2011; Piketty and Zucman, 2015). Economists have recently devoted much attention to the question of how intergenerational transfers affect the inequality in aggregated wealth (Elinder et al., 2018; Boserup et al., 2016a; Tiefensee and Westermeier, 2016). Different methodological approaches have so far mainly confirmed previous research in this field: Bequests accrue disproportionally to the benefit of poorer households and thereby tend to reduce relative wealth inequality. Nonetheless, while the literature appears rather conclusive, results often lack comparability over countries as wealth-related research is particularly sensitive to the specifics of the underlying data. The issue of international comparability was substantially improved on the European level with the availability of the Household Finance and Consumption Survey (HFCS). Initiated by the European Central Bank and designed in a similar fashion as the Survey of Consumer Finances (SCF) for the US, the HFCS brings together representative and consistent microdata on household wealth from 15 countries of the euro area. Fessler and Schürz (2015) and Humer et al. (2016) already address the nexus of inheritances and household wealth using the HFCS and find that bequest reception entails a major rise in the households' wealth rank. The pattern of country-specific estimates in these two papers appears to be coherent, the variations in size and loca-

[1]Daniel Waldenström gave me the idea to this paper and furthermore important comments on my work for which I owe him special thanks.

tion are however sizeable over countries. We find it helpful to provide some descriptive underpinning to these works: Differences in the properties of the national wealth and transfer distributions might well account for much of the variation over countries. We resort to an insightful decomposition of household wealth inequality as measured by the coefficient of variation (CV). This method has been developed by Wolff (1987) and has found fruitful applications in Wolff (2002, 2015) and Wolff and Gittleman (2014). The broad methodological consistency with Wolff (2015) finally permits us to compare our European results with those from the US.

2.2 Wealth data

We use the first wave of the HFCS which provides nationally representative data on household assets and liabilities for 15 Euro countries surveyed in 2009/10. From this, we draw the joint distribution of household net worth and wealth transfers received, on which we base our analysis. The HFCS is purposefully designed to improve the comparability on wealth accumulation and portfolio choices over European countries. The nationally conducted surveys nonetheless differ in some respect so that we exclude some countries based on recommendations by Tiefensee and Westermeier (2016) and Tiefensee and Grabka (2014): Finland and Italy are excluded as they lack crucial information on wealth transfers, while the Netherlands are dropped due to a peculiarly low incidence of intergenerational transfers. We further exclude Luxembourg and Malta whose small samples are likely to cause problems when assessing subpopulations on the national level. We finally drop Slovakia, Slovenia and East German observations[2] as these countries were no market economies before 1990. This leaves us with a sample of eight countries comprising Austria, Belgium, Cyprus, France, West-Germany (henceforth Germany), Greece, Portugal and Spain. The HFCS survey design is in many respects built on the SCF, which is why both data sets are considered to be highly comparable (Vermeulen, 2018). In order to put our results in a wider context, we compare them to decomposition results based on the 2010 wave of the SCF (Wolff, 2015). Survey data on wealth is known to be only partially representative due to unit and item non-response and the particularly skewed distribution of wealth. The HFCS deals with these problems by nationally conducted oversampling of wealthy households and multiple imputation. Despite these efforts, the HFCS falls short of covering the very top of the wealth distribution (Vermeulen, 2018).

[2]Hence the analysis is restricted to households with heads aged 21 and older.

2.2.1 Value and size of past transfers

Households report the value, year and portfolio of up to three past inheritances or gifts to HFCS. The calculation of the present values of these past transfers follows Kotlikoff and Summers (1981) and was also adopted by Wolff and Gittleman (2014) and Wolff (2015). This approach attributes returns to bequests fully to the transfer value and may yield negative net-of-transfer wealth if the present value of transfers received exceeds observed net worth. Although the approach has found famous critics in Modigliani (1988) and recently in Piketty et al. (2014), we favor it for the sake of comparability to Wolff and Gittleman (2014) and Wolff (2015). Our results are computed with a real interest rate of 3 % per annum since the year of transfer receipt and are expressed in prices of 2010.[3] We assume that bequests are fully saved and did not displace regular household savings.

Table A.1 presents basic descriptive statistics on wealth transfers including country-specific means and medians as well as national samples. Table 2.1 gives an overview of the inequality in the national net worth and wealth transfer distributions.[4] The Gini values for transfers are comparable over countries and indicate that wealth transfers are most unequally distributed in Portugal and most equally in Germany.[5]

Table 2.1: Inequality of net worth and wealth transfers received

Country	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain	US
Survey Year	2010/11	2010	2010	2009/10	2010/11	2009	2010	2008/09	2010
					Gini coefficient				
Wealth transfers (WT)									
All households	0.901	0.926	0.914	0.948	0.881	0.931	0.977	0.943	0.966
Recipients only	0.723	0.767	0.727	0.87	0.687	0.774	0.915	0.81	0.833
Net worth (NW)	0.758	0.607	0.698	0.675	0.717	0.557	0.669	0.58	0.87
					Coefficient of Variation (CV)				
Wealth transfers (WT)									
All households	4.378	16.4	6.119	12.843	3.324	5.822	26.938	16.284	19.895
Recipients only	2.489	9.19	3.331	8.074	1.895	3.117	13.905	8.898	8.938
Net worth (NW)	2.925	1.625	2.477	3.582	2.825	1.271	3.767	4.068	6.618

Note: Figures based on the net present value of bequests, capitalized with a real interest rate of 3 %. Mean over 5 implicates. Source: Own computations based from HFCS (2013); US figures from Wolff (2015).

[3]We use the country-specific consumer price indices provided by Eurostat. Inheritances and gifts received before 1960 are capitalized as if they would have been received in 1960, which is only affecting few observations and, simultaneously, serves as a cushion for outliers in the oldest cohorts, which would otherwise be generated.

[4]The HFCS (2013) data are officially provided with 5 multiply imputed implicates, compensating for nonresponse biases. Additionally, replicate weights allow for the correct computation of bootstrapped standard errors. If not otherwise noted, all results are standard applications for multiple imputation data and all standard errors are bootstrapped.

[5]Differences in the Gini index of net worth to e.g. the study of Carrol et al. (2017) result from the restrictions we put on our sample, e.g. the exclusion of the former socialist East German states.

2.2.2 Decomposition

The CV is defined as the ratio of the standard deviation and the mean. The inequality of household net worth (NW) equals

$$CV(NW) \equiv \sqrt{VAR(NW)}/E(NW). \tag{2.1}$$

We can understand intergenerational wealth transfers (WT) as one of two components of the observed NW, in the sense that $NW = NWX + WT$, where NWX is the household's wealth net of transfers. Following Wolff (1987), a wealth component contributes to total wealth inequality along three factors: First, by its magnitude relative to total wealth. Second, by its own degree of inequality. And third, by the correlation of this component with the other wealth components. Following the decomposition properties of the variance, Wolff (1987) suggests to lay out the magnitude of these three factors by decomposing the squared coefficient of variation, CV^2:

$$CV^2(NW) = p_1^2 CV^2(NWX) + p_2^2 CV^2(WT) + 2CC(NWX, WT) \tag{2.2}$$

Where $p_1 = E(NWX)/E(NW)$ and $p_2 = E(WT)/E(NW)$ represent the relative magnitudes of the two wealth components. The term CC denotes the coefficient of covariation defined as $CC(NWX, WT) = COV(NWX, WT)/E(NW)^2$ and describes the linear relationship between the two wealth components. Hence, the decomposition breaks down the CV^2 of observed household wealth into a weighted sum of the squared CVs of its components and the components' covariation.

2.3 Results

Table 2.2 displays the main results from the decomposition analysis. The first panel shows the inequality in household NW and the respective inequality loadings of its components WT and NWX. It is striking that inequality in net worth is universally lower than the inequality in either component. This finding mirrors the commonly cited evidence that inheritances tend to equalize the wealth distribution (Elinder et al., 2018; Boserup et al., 2016a). It however also poses the key question: How can adding up two unequal components yield a less unequal aggregate? The coefficient of covariation CC, illustrating the relationship between hypothetical net-of-transfer wealth and wealth transfers, takes negative values over all countries. This finding is well in line with the year-specific results presented in Wolff and Gittleman (2014) for the US and turns out to be the pivotal figure in understanding the distributional effect of inheritances: The negative correlation between the components conveys that, in relative terms, poorer households tend to receive higher transfers. Table A.5, which lists the relative bequest sizes over the national wealth distributions, looks at this finding from another angle: Wealth transfers as a percent of net worth generally decrease with increasing household net worth. Wealth transfers therefore raise the total wealth share of poorer households and entail a reduction in relative inequality. While this pattern is certainly predominant in our country sample, table A.5 indicates some more heterogeneity in the development of relative transfers over wealth distributions than the monotonically decreasing relative transfer sizes suggest that for instance Elinder et al. (2018) present for Sweden.

The second panel of table 2.2 illustrates the relative magnitudes of the wealth components, where $p_2(WT)$ displays the share of inheritance-based wealth in total wealth. Despite the same capitalization rate, all countries in our sample show a higher share of inheritances in aggregate wealth than the US for which Wolff and Gittleman (2014) detect an average share of 23 % between 1989 and 2007. The 2010 share for the US, as reported by Wolff (2015), equals 25 % and still ranks at the bottom. These differences are mainly attributable to nation-specific interplays of inflation and growth: The stable US real annual growth over the last decades comes much closer to the 3 % capitalization than for instance the German or French growth rates. Assuming instead a real growth of 0 % in all countries (reflected by a capitalization of wealth transfers by 0 %), thus pretty much at least halves the share of inheritance-based wealth in total net worth for all countries in our sample and renders them in a range well comparable to the US value. The general pattern in the decomposition results remains stable as displayed in table A.6. Bönke et al. (2016) limit the maximum value of capitalized bequests to the observed household wealth as suggested by Piketty et al. (2014) and then attribute roughly 30 % of German household net worth to transfers. In the original 3 % capitalization scenario, capitalized bequests on average exceed actually observed household wealth in Greece and Portugal. This peculiarity results from the extraordinarily high inflation rates these countries witnessed during the 70s and 80s.[6] The effect of such an outstanding relative role of bequests on e.g. wealth mobility is however unclear as it crucially depends on the consumption and investment behavior that households from different wealth deciles show.

[6] The average annual inflation in the 70s and 80s amounted to 16.3 % in Greece and 17.5 % in Portugal, which boosts the transfer values from these times when converting values to 2010 prices. Keep also in mind that our approach assumes that transfers are fully saved and capitalizes the entire transfer on an annual basis.

Table 2.2: Contribution of inheritances to overall wealth inequality.

Country	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain	US
Coefficient of variation/covariation									
$CV(NW)$	2.926	1.625	2.478	3.582	2.826	1.271	3.767	4.062	6.618
	(0.654)	(0.056)	(0.185)	(0.372)	(0.221)	(0.038)	(0.457)	(0.784)	
$CV(NWX)$	12.265	6.76	3.967	105.574	7.113	-7.683	-93.875	14.143	10.474
	(5.125)	(1.973)	(0.471)	(144.132)	(0.707)	(1.069)	(417.018)	(14.304)	
$CV(WT)$	4.379	16.395	6.121	12.835	3.325	5.823	26.928	16.288	19.895
	(0.460)	(4.105)	(0.791)	(2.087)	(0.106)	(0.906)	(6.184)	(5.870)	
$CC(NWX, WT)$	-7.457	-21.400	-2.492	-127.124	-2.298	-579.070	-1438.810	-55.693	-21.418
	(3.517)	(11.475)	(1.127)	(43.107)	(0.447)	(256.232)	(771.119)	(82.494)	
Shares									
$p_1(NWX)$	0.324	0.712	0.732	0.111	0.418	-3.1	-0.411	0.565	0.745
	(0.087)	(0.031)	(0.035)	(0.037)	(0.035)	(0.352)	(0.183)	(0.109)	
$p_2(WT)$	0.676	0.288	0.268	0.889	0.582	4.1	1.411	0.435	0.255
	(0.087)	(0.031)	(0.035)	(0.037)	(0.035)	(0.352)	(0.183)	(0.109)	
Decomposition of $CV^2(NW)$									
$p_1^2CV^2(NWX)$	14.79	23.177	8.431	136.85	8.847	578.658	1451.619	63.355	60.881
$p_2^2CV^2(WT)$	8.949	22.265	2.694	130.249	3.739	581.098	1440.191	64.574	25.749
$2CC(NWX, WT)$	-14.914	-42.8	-4.983	-254.249	-4.597	-1159.14	-2877.62	-111.386	-42.836
$CV^2(NW)$	8.825	2.642	6.141	12.85	7.989	1.616	14.19	16.543	43.794
$COR(NWX, WT)$	-0.645	-0.942	-0.522	-0.952	-0.4	-0.999	-0.995	-0.805	-0.541
Percentage of Decomposition of $CV^2(NW)$									
$p_1^2CV^2(NWX)$	1.788	8.781	1.372	10.7	1.108	358.504	102.297	3.689	1.39
$p_2^2CV^2(WT)$	1.164	8.435	0.438	10.189	0.469	360.015	101.492	3.721	0.588
$2CC(NWX, WT)$	-1.952	-16.216	-0.811	-19.889	-0.577	-717.519	-202.789	-6.410	-0.978
$CV^2(NW)$	1	1	1	1	1	1	1	1	1

Note: All results based on multiple imputations, bootstrap standard deviations accounting for multiple imputation in parentheses. Pattern of results is robust to trimming at 99 percent. Source: Own computations from HFCS (2013); US figures from Wolff (2015).

2.4 Conclusion

This paper uses the internationally comparable HFCS microdata on household wealth in order to decompose wealth inequality for eight European countries. The decomposition of the coefficient of variation (Wolff, 1987) reveals a stable pattern over the sample nations: Wealth transfers have, at least when judging from the cross-section, an equalizing effect on relative wealth inequality. The effect is crucially caused by a negative relationship between net-of-transfer wealth and inheritances. Our results are in line with the recent works by Wolff and Gittleman (2014) and Wolff (2015), who both resort to the same methodological approach, and to Elinder et al. (2018) and Boserup et al. (2016a). Moreover, the results are robust to the exclusion of the top 1 % of the wealth distributions and to an alternative capitalization rate of past transfers.

A.2 Appendix

Table A.1: Descriptive statistics on wealth transfers.

Variable	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain
Share of households who	35.70%	31.66%	31.46%	38.99%	38.09%	30.72%	26.75%	30.13%
received wealth transfers	(1.28%)	(1.21%)	(1.67%)	0.69%	(1.74%)	(1.5%)	(1.27%)	(1.07%)
Present value of received wealth transfers, recipients only								
Mean	505,009	309,391	571,846	526,702	357,742	1,989,134	807,971	420,968
	(81,955)	(56,005)	(113,155)	(49,578)	(36,967)	(252,827)	(175,228)	(131,085)
Median	168,856	82,342	198,289	61,429	130,906	316,449	58,13	89,127
Present value of received wealth transfers, all households								
Mean	180,279	97,947	179,899	210,048	136,256	611,095	216,105	126,865
	(30,172)	(17,922)	(36,350)	(20,049)	(15,256)	(85,262)	(47,673)	(39,794)
Share of net worth	67.56%	28.78%	26.8%	88.91%	58.16%	410.02%	141.06%	43.48%
	(11.1%)	(5.3%)	(5.86%)	(8.45%)	(7.03%)	(58.12%)	(31.97%)	(13.71%)
Sample size	2,825	2,307	1,234	14,929	2,825	2,915	4,393	6,188

Note: Transfers capitalized with 3% per annum. Standard errors are shown below the respective estimate in parentheses. Source: Own computation from HFCS (2013).

Table A.2: Population share of transfer receiving households.

Decile	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain
1^{st}	10.6	9.4	6.7	14.7	8.0	1.6	5.7	5.0
	(2.9)	(3.0)	(2.8)	(1.8)	(2.5)	(0.6)	(1.4)	(1.6)
2^{nd}	8.7	15.9	17.5	16.4	13.4	5.0	13.8	21.2
	(2.4)	(4.0)	(4.8)	(2.1)	(3.9)	(1.9)	(2.5)	(3.2)
3^{rd}	14.0	29.5	18.5	22.6	17.8	29.0	21.1	25.0
	(3.2)	(5.0)	(5.4)	(2.4)	(4.2)	(3.7)	(2.8)	(3.3)
4^{th}	18.9	20.4	26.2	33.7	22.1	35.6	27.5	26.9
	(4.0)	(4.2)	(6.3)	(2.3)	(3.6)	(4.5)	(3.5)	(3.2)
5^{th}	37.1	29.6	39.8	38.4	33.1	39.3	30.0	27.4
	(4.3)	(4.5)	(6.1)	(2.3)	(4.8)	(4.3)	(3.8)	(2.9)
6^{th}	41.9	29.1	31.5	43.7	44.7	39.2	29.1	27.7
	(4.2)	(4.0)	(6.9)	(2.4)	(5.7)	(4.4)	(3.6)	(3.4)
7^{th}	49.3	40.8	40.7	45.9	49.2	34.8	34.6	36.4
	(4.3)	(4.5)	(6.5)	(2.3)	(4.6)	(3.8)	(3.5)	(3.3)
8^{th}	47.6	42.4	36.2	52.3	61.9	43.6	31.1	37.0
	(4.5)	(4.7)	(5.9)	(2.2)	(4.1)	(3.7)	(3.4)	(3.9)
9^{th}	57.9	52.2	50.8	60.3	65.3	38.0	37.4	40.1
	(3.9)	(5.0)	(6.7)	(2.1)	(3.8)	(3.8)	(3.4)	(3.4)
10^{th}	71.1	47.4	46.9	70.9	65.6	41.1	37.3	54.5
	(3.8)	(3.9)	(5.8)	(1.6)	(4.3)	(3.8)	(2.7)	(3.6)

Note: Standard errors are shown below the respective estimate in parentheses Shares and standard errors in %. Deciles of the net worth (NW) distribution. Source: Own calculations based on the HFCS.

Table A.3: Average wealth transfer of transfer receiving households.

Decile	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain
1^{st}	244,629	27,505	2,969,734	115,393	132,282	154,684	57,941	239,933
	(456,232)	(10,191)	(4,177,901)	(56,601)	(77,737)	(88,407)	(53,095)	(225,784)
2^{nd}	105,552	41,884	1,001,117	115,637	21,977	790,105	113,532	117,461
	(49,297)	(11,073)	(1,457,878)	(44,425)	(10,357)	(664,185)	(63,334)	(91,891)
3^{rd}	65,901	124,769	178,464	556,236	46,781	1,725,225	312,414	176,793
	(50,056)	(63,800)	(118,392)	(374,308)	(23,895)	(487,532)	(187,976)	(36,325)
4^{th}	129,310	116,264	278,454	257,049	85,825	1,996,569	1,119,003	155,669
	(48,269)	(51,227)	(287,099)	(89,269)	(61,435)	(425,093)	(1,448,939)	(36,116)
5^{th}	283,945	194,051	534,379	324,195	99,629	1,846,416	836,112	163,573
	(190,367)	(42,100)	(286,730)	(82,453)	(50,860)	(464,911)	(902,108)	(71,067)
6^{th}	280,858	233,714	394,292	273,842	373,970	1,752,876	1,026,241	172,234
	(101,678)	(72,852)	(238,294)	(96,215)	(134,585)	(665,585)	(1,214,252)	(36,261)
7^{th}	404,198	194,684	299,589	282,050	343,508	2,562,132	644,889	218,967
	(225,629)	(44,454)	(120,853)	(61,634)	(97,203)	(870,926)	(412,124)	(67,170)
8^{th}	480,309	406,148	420,299	449,404	295,426	1,779,020	586,182	243,314
	(108,304)	(256,721)	(156,812)	(134,797)	(42,208)	(389,956)	(272,580)	(78,856)
9^{th}	494,641	245,388	596,529	490,743	353,852	1,723,852	765,955	515,120
	(159,795)	(138,478)	(242,947)	(84,496)	(50,595)	(467,859)	(374,309)	(208,265)
10^{th}	1,120,183	851,514	855,867	1,337,839	823,257	2,752,173	1,433,794	1,249,591
	(287,004)	(325,391)	(246,863)	(204,994)	(97,583)	(1,661,126)	(514,774)	(766,761)

Note: Standard errors in parentheses. Deciles of the net worth (NW) distribution. Source: Own computation from HFCS (2013).

Table A.4: Average wealth transfers for all households.

Decile	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain
1^{st}	25,615	2,583	197,604	16,866	10,583	2,436	3,381	11,748
	(48,516)	(1,136)	(278,322)	(8,239)	(6,745)	(1,405)	(3,485)	(10,618)
2^{nd}	9,144	6,620	177,886	18,852	2,963	39,242	15,590	25,203
	(4,960)	(2,315)	(253,323)	(7,218)	(1,267)	(28,992)	(9,055)	(20,158)
3^{rd}	9,245	37,011	33,806	125,429	8,331	498,518	65,753	44,270
	(6,890)	(19,903)	(26,670)	(87,653)	(4,384)	(151,113)	(39,658)	(10,404)
4^{th}	24,276	24,015	75,190	86,592	18,985	714,066	303,644	42,034
	(9,460)	(12,669)	(85,404)	(30,833)	(14,095)	(186,740)	(385,455)	(11,842)
5^{th}	105,896	57,428	213,737	124,554	32,809	725,868	246,814	44,820
	(73,195)	(13,520)	(120,226)	(32,539)	(16,228)	(170,580)	(253,959)	(20,380)
6^{th}	117,176	67,972	125,212	119,725	167,300	684,873	300,617	47,809
	(41,587)	(24,097)	(82,138)	(41,543)	(68,611)	(254,869)	(353,094)	(11,571)
7^{th}	201,208	79,619	122,072	129,442	169,416	889,864	223,397	79,923
	(119,175)	(20,098)	(53,914)	(29,062)	(53,327)	(295,564)	(147,294)	(25,334)
8^{th}	229,261	174,037	150,885	234,699	182,871	771,528	182,765	89,723
	(60,227)	(116,391)	(54,744)	(73,155)	(25,997)	(183,291)	(86,034)	(28,451)
9^{th}	287,400	128,847	302,510	295,693	231,235	660,301	286,016	205,788
	(99,471)	(77,887)	(126,648)	(51,267)	(37,593)	(207,722)	(137,918)	(82,724)
10^{th}	796,326	402,138	400,514	948,989	539,642	1,126,952	534,751	678,094
	(204,940)	(149,591)	(118,665)	(149,364)	(74,194)	(656,490)	(197,307)	(399,583)

Note: Standard errors in parentheses. Deciles of the net worth (NW) distribution. Source: Own computation from HFCS (2013).

Table A.5: Present value of transfers as percent of net wealth for all households.

Decile	Austria	Belgium	Cypurs	France	Germany	Greece	Portugal	Spain
1^{st}	-144.9	-100.4	-1876.1	-328.0	-98.0	-98.0	-134.3	-137.7
	(189.6)	(1,946.2)	(3,609.8)	(169.0)	(49.6)	(65.2)	(145.2)	(195.7)
2^{nd}	269.6	76.3	586.9	533.0	87.0	492.6	354.9	90.3
	(144.1)	(26.8)	(866.5)	(204.7)	(37.6)	(361.3)	(205.4)	(72.2)
3^{rd}	84.4	79.2	37.2	1085.9	64.7	1533.4	340.6	56.1
	(60.7)	(42.1)	(29.5)	(762.3)	(33.5)	(462.3)	(206.9)	(13.4)
4^{th}	95.9	21.0	47.2	247.8	58.2	1141.4	707.5	35.1
	(37.5)	(11.3)	(52.5)	(88.1)	(42.5)	(299.0)	(894.2)	(9.8)
5^{th}	192.3	31.7	95.4	139.4	49.6	810.2	387.8	27.6
	(140.7)	(7.5)	(54.4)	(36.5)	(24.9)	(191.0)	(399.1)	(12.4)
6^{th}	105.5	28.2	40.4	80.4	147.9	592.2	344.7	23.5
	(39.2)	(10.0)	(26.8)	(27.8)	(60.9)	(222.3)	(404.9)	(5.7)
7^{th}	113.7	25.0	28.5	61.7	94.0	594.2	192.0	31.1
	(70.4)	(6.3)	(12.1)	(13.9)	(30.3)	(196.8)	(126.7)	(9.7)
8^{th}	88.5	41.5	24.0	83.0	69.0	398.1	113.0	26.9
	(22.8)	(27.7)	(8.5)	(25.9)	(9.9)	(94.0)	(53.0)	(8.6)
9^{th}	69.5	22.2	29.0	71.7	58.4	248.7	122.5	43.0
	(22.8)	(13.5)	(12.2)	(12.4)	(9.5)	(78.5)	(59.0)	(17.0)
10^{th}	49.2	26.9	10.4	80.8	41.9	195.7	66.2	53.5
	(13.6)	(10.1)	(3.3)	(12.7)	(7.1)	(116.8)	(25.1)	(31.7)

Note: Standard errors in parentheses. Deciles of the net worth (NW) distribution. Source: Own computation from HFCS (2013).

Table A.6: Contribution of inheritances to overall wealth inequality for $r = 0$.

Country	**Austria**	**Belgium**	**Cypurs**	**France**	**Germany**	**Greece**	**Portugal**	**Spain**
				Coefficient of variation/covariation				
$CV(NW)$	2.926	1.625	2.478	3.582	2.826	1.271	3.767	4.062
	(0.652)	(0.056)	(0.187)	(0.369)	(0.226)	(0.037)	(0.438)	(0.810)
$CV(NWX)$	4.247	2.454	2.831	6.333	3.806	-21.749	15.934	4.968
	(0.854)	(0.309)	(0.212)	(0.596)	(0.315)	(7.494)	(4.607)	(1.158)
$CV(WT)$	3.603	10.258	4.192	8.997	2.722	4.702	20.967	12.776
	(0.397)	(2.371)	(0.381)	(1.213)	(0.070)	(0.598)	(4.722)	(2.907)
$CC(NWX, WT)$	-0.586	-2.054	-0.139	-6.998	0.084	-35.890	-74.033	-3.018
	(0.400)	(1.073)	(0.080)	(2.268)	(0.087)	(13.210)	(37.479)	(4.371)
				Shares				
$p_1(NWX)$	0.68	0.849	0.876	0.679	0.703	-0.280	0.588	0.815
	(0.036)	(0.014)	(0.011)	(0.010)	(0.014)	(0.093)	(0.045)	(0.026)
$p_2(WT)$	0.32	0.151	0.124	0.321	0.297	1.28	0.412	0.185
	(0.036)	(0.014)	(0.011)	(0.010)	(0.014)	(0.093)	(0.045)	(0.026)
				Decomposition of $CV^2(NW)$				
$p_1^2 CV^2(NWX)$	8.644	4.336	6.147	18.529	7.168	36.708	87.557	16.519
$p_2^2 CV^2(WT)$	1.354	2.415	0.271	8.317	0.653	36.688	74.7	6.059
$2CC(NWX, WT)$	-1.173	-4.109	-0.277	-13.996	0.169	-71.780	-148.067	-6.035
$CV^2(NW)$	8.825	2.642	6.141	12.85	7.989	1.616	14.19	16.543
$COR(NWX, WT)$	-0.172	-0.635	-0.107	-0.564	0.039	-0.977	-0.915	-0.260
				Percentage of Decomposition of $CV^2(NW)$				
$p_1^2 CV^2(NWX)$	0.979	1.642	1.001	1.444	0.897	22.748	6.17	0.999
$p_2^2 CV^2(WT)$	0.173	0.915	0.044	0.651	0.082	22.736	5.264	0.358
$2CC(NWX, WT)$	-0.152	-1.557	-0.045	-1.095	0.021	-44.484	-10.434	-0.357
$CV^2(NW)$	1	1	1	1	1	1	1	1

Note: All results based on multiple imputations, bootstrap standard deviations accounting for multiple imputation in parentheses. Pattern of results is robust to trimming at 99 percent. Source: Own computations from HFCS (2013).

Chapter 3

The affluency to quit: How inheritances affect retirement plannings

3.1 Introduction

Economists have recently devoted much attention to the increasing relevance of intergenerational transfers. Piketty (2011) and Piketty and Zucman (2015) for instance find evidence for increasing bequest flows and warn about a return of a rentier society. Elinder et al. (2018) and Boserup et al. (2016b) analyze the immediate distributional impacts of bequest flows and Boserup et al. (2014) and Adermon et al. (2018) relate transfer accrual to intergenerational wealth mobility. All these works point to different dimensions of the consequences intergenerational transfer flows will probably entail. But almost all of these papers fail to take the behavioral adjustments to wealth shocks into account: How are households responding economically to a bequest receipt? A response to these kind of questions is key to a deeper understanding of how the awaited inheritance flows will change living in western societies.

In this paper, we want to quantify individuals' economic responses to wealth transfers.[1] The economic responses can of course materialize in very different dimensions: Among others, Elinder et al. (2012) for instance identify a reduction in the intensive margin of labor supply after bequest receipt. Similarly, individuals might increase their level of consumption (Hrung, 2004) or, having bequest motives themselves, primarily

[1]Our paper thus undertakes a slight shift in the perspective: Typically, the literature uses wealth transfers as exogenous variation in wealth in order to track the individuals' economic responses to wealth shocks. Savings, consumption and labor supply are likely to be planned simultaneously, using such exogenous variation is thus required to estimate behavioral repercussions of changes in wealth on one of these dimensions.

add wealth gains to their savings. The tracking of economic reactions is furthermore complicated by the timing of reactions that are apparently subject to complex life-cycle considerations: Inheritances are certainly among those wealth gains that can be expected. Individuals might thus have adjusted their labor supply, savings and consumption to their loosened intertemporal budget constraint long before the wealth gain becomes visible to the econometrician. Bo et al. (2015), furthermore, convincingly show that economic reactions might still occur several years *after* the receipt.

In face of these methodological challenges, economists have recently focused on a lifetime event that appears particularly well-suited to circumvent some of these problems: The retirement decision of individuals. Retirement is a major change in the individual's economic life-cycle and thereby subject to long standing, deliberate considerations. It is furthermore typically irreversible and comparably simple to track in data. And despite decreasing replacement rates of public pension schemes, most people still face a financially stable and predictable future when leaving the labor force.[2] Brown et al. (2010), Bo et al. (2015), Garbinti and Georges-Kot (2016) and Blau and Goodstein (2016) are recent studies looking at effects of intergenerational transfers on labor supply exits. The literature typically estimates changes in the probability to retire after bequest receipt and devotes much attention to expectations: Brown et al. (2010) presented the first paper controlling for expectations about transfers. While they find that expectations seem to matter for the strength of the economic reaction, they do not find statistically significant differences between the point estimates for expected and for unexpected transfer receipts. Surprisingly, individuals do not seem to adjust to expected transfers *before* receipt. The authors hypothesize that risk averse individuals would only take the certainty equivalent of the expected transfer into account and not its expected value. Garbinti and Georges-Kot (2016) indeed find weak evidence for this presumption: Risk averse individuals seem to show stronger, albeit again not significantly different, reactions to expected transfers than risk neutral ones. The authors also suggest credit constraints as possible alternative explanation for the non-adjustment to expected transfers. To our knowledge Doorley and Pestel (2016) is the only paper experimenting with the impact of being credit constrained on labor market outcomes in this context. With the present paper, we want to tackle two remaining gaps in the literature: First, effect sizes, mostly expressed in changes in the retirement probability following a transfer receipt of non-uniform size, are difficult to compare across studies.[3] Second, most studies dismiss the life-cycle dimension of

[2]In an interesting paper, Dolls et al. (2018) test how informing individuals about their pension entitlements affects the savings behavior.

[3]The calculation of marginal effects also requires the unconditional retirement probability in the sample and is thus highly depending on the data set composition. Many studies also ignore possible

retirement entry and wealth shocks. The corresponding implications might e.g. well explain the ambiguity of expectations in the last publications.

We suggest to look at the effect of intergenerational transfers on the extensive margin of labor supply by using the self-reported individual *expected retirement age* as dependent variable. Doing so comes with some advantages over the regular estimation of retirement probabilities: The retirement decision apparently is a matter of long-term life-cycle considerations. In an optimal setting, we would like to observe the individual from the bequest receipt until retirement to track its economic adjustment behavior in its entirety. When modeling retirement probabilities, however, studies focus on a narrow time span before the typical retirement entry age. The *expected retirement age* instead is available for all age groups and thereby permits to analyze the effect of a wealth gain in a life-cycle perspective. While economic adjustments, as laid out above, can materialize through a multitude of channels, we here focus on the intertemporal optimization with respect to the final labor market exit.[4] What share of a received transfer is an individual planning to give up, when trading off potential consumption, investment and labor supply over the life cycle? Hence, this study bases on the idea that one can take the self-reported *expected retirement age* seriously in that it reflects the economic life-cycle considerations of an individual after bequest receipt, albeit only the *expected* instead of the *revealed* ones.[5] The *expected retirement age* is surveyed in multiple periods and thus permits to exploit the within-individual variation over time. A feature that also helps us to preclude potential biases due to unobserved time-constant heterogeneity that can well introduce a spurious correlation between bequest size and individual behavior.

Hence, we base our analysis on the individual's *expected retirement age* and are able to express the response to bequest receipts in terms of time. We thus contribute to the literature in a twofold way: First, we reproduce results from the ongoing discussion in the literature about the effect of expected transfers. We test whether credit constraints and risk attitudes, as suggested, can explain why people do not fully adjust their life-cycle decisions to expected transfer receipts. Our second contribution is to monetize the individuals' economic response to transfer receipts: Specifically, we use our preferred model from the first section in order to predict individual shifts of the expected retirement entry age. We translate these estimated time ranges into mone-

non-linearities in their specifications.

[4] We focus here on age effects. Since we only have a sample period of 5 years, we do not find relevant differences in the behavior of individuals from different cohorts.

[5] Critics may respond that inheritances typically accrue in the age group close to retirement anyway. While this is true for many individuals, there is a sizable share of individuals inheriting in their prime working age. Also, the temporal proximity of bequest accruals and usual retirement entry bedevils the identification of the causal effect of transfers on the retirement probability when resorting to cross-sectional variation.

tary terms by calculating the opportunity costs of an earlier retirement. These costs are the foregone labor income and the penalized statutory pension income during retirement. Relating these economic costs of earlier retirement to the actually received inheritance amount gives in our opinion a more informative picture of the scale of the economic response to wealth gains. In contrast to previous papers in this field, we are able to answer for instance the question: How much of an intergenerational transfer do households typically spend on an earlier retirement?

We are studying the effect of transfers on the extensive margin of labor supply in Germany using a particularly well-suited, representative panel data set: The SAVE survey data was designed for studying retirement decisions and covers specifically the financial environment of individuals, their labor market history and their expectations about their financial future. Our sample period ranges from 2005 to 2010. A minor downside of the data set is the relatively small sample size. We only observe comparably few cases of retiring individuals with an inheritance reported in our sample period. We therefore only provide basic Probit estimations of the actual retirement probability in order to benchmark our study to the existing literature.[6] These results are however, to our knowledge, the first estimates in this literature for Germany. In general, Germany is currently an interesting case for the analysis of retirement behavior: In the early 2000s the German public pension system experienced a significant period of reform. Formerly equipped with relatively high replacement rates from the statutory pension, the pension system was re-organized and required individuals to more private provision in a multi-pillar system.[7] The de-facto retirement age has been increasing since then with a comparebly stable rate and was approaching 64 years on average in the end of our sample period (Börsch-Supan et al., 2014). Our analysis accounts for this trend.

The SAVE data set also provides us with detailed data on the individual's expectations about its financial situation during retirement, encompassing private and public pension entitlements. We use these information to simulate the full costs of moving the retirement entry forward. The SAVE also contains variables on self-reported and tested risk attitudes of indivduals. Variables on being credit constrained and expectations about size and timing of future transfers are available, too.

Our results are as follows: Coming first to the usual estimation of retirement probabilities, transfer receipt leads to a significant increase in the probability to retire

[6]Probit estimations might be problematic here, as they typically require large sample sizes in order to ensure a consistent estimation of the coefficients.

[7]See Börsch-Supan et al. (2014) and Geyer and Steiner (2010) for a description and evaluation of the major reforms. Also, we are confident that the reform effort does not interfere with our analysis: Most reforms already took effect before our sample period. Only the long-discussed gradual prolongation of the statutory pension age by two years introduced in 2007 might play a role. We control for potential effects of this reform.

immediately after receipt. Our results here are broadly in line with the literature and represent the first such estimations for Germany. Our main analysis then focuses on the effects of transfer receipt on the *expected retirement age*: Transfers lead on average to a moving forward of the retirement entry by about four to five months. The evidence for labor market responses to unexpected transfers is mixed and crucially depends on the considered time horizon: While the reaction to expected transfers is bigger in the period of receipt, reactions to unexpected transfers take only effect later and tend to be stronger overall. We do not find a major impact of either risk attitude or credit constraints on the retirement behavior after transfer receipt. When using our main estimation results in order to monetize the change in the expected retirement age, we find heirs expecting to spend on average one third of their inheritance on a moving forward of their retirement entry. This result reflects a high taste for leisure in the life-cycle plannings of individuals. A finding certainly of interest for policymakers in aging societies who seek to design labor market institutions and statutory pension schemes to prolong working lives.

The remainder of the paper is organized as follows: Section 3.2 gives a more detailed overview of the literature in this field. Section 3.3 covers the description of the SAVE data set, provides some descriptive statistics, and introduces in the methodology used in the analysis. Our results are presented in section 3.4, we conduct some robustness checks in section 3.5 and discuss our results in section 3.6. We conclude in section 3.7.

3.2 Literature

Theoretical models that build on the life-cycle hypothesis predict that (exogenous or unexpected) wealth changes will entail some kind of economic adjustment behavior by the individual that is subject to the wealth fluctuation. These adjustments can be realized through any changes in consumption, savings and labor supply prior to (in case of expected wealth changes) or after the actual receipt. In this study we focus on labor supply related adjustments on the extensive margin and furthermore specifically on wealth changes in the form of intergenerational transfers.

Holtz-Eakin et al. (1993) have provided the first study on this relationship and credibly document that heirs of sizable transfers show a significantly lower labor force participation rate than non-heirs. Joulfaian and Wilhelm (1994) encounter similar, albeit weaker, evidence for labor force drop outs of heirs. These very early studies are however likely to underestimate the true effect of transfer receipt on labor force participation: Both of them ignore the dynamic nature of the economic responses. In contrast to that, Bo et al. (2015) are able to track labor market participation indicators of individuals over several periods before and after the transfer receipt. Their estimates reveal a high degree of heterogeneity in the group of heirs: While some delay their economic reaction and only reduce labor supply with a lag of some periods, the estimations (albeit statistically not significant) also hint to partly anticipated reactions. Most naturally, inheritance receipts will be expected by many heirs which leads to (partly) anticipated economic responses. Doorley and Pestel (2016) test how expectations about intergenerational transfer receipt affect the intensive margin of labor supply in Germany.[8] While small adjustments in labor supply are found, the authors were not able to find a significant impact of whether the transfer receipt was expected.[9] Brown et al. (2010) are also able to differentiate between expected and unexpected transfers and establish that individuals show stronger immediate reactions to unexpected inflows (albeit not being statistically different from the reactions to expected receipts). At the same time, even expected transfers still yield a significant labor supply reduction.

While the first finding parallels theoretical predictions, the second contradicts economic intuition. The authors hypothesize that being credit constrained and/ or being risk averse might prevent individuals from adjusting fully to their expectations. Two recent papers provide interesting tests for both explanations: In their study Garbinti and Georges-Kot (2016) measure risk attitude with self-reported and revealed preference measures (participation in stock market investments and lotteries) and find some evidence that the immediate economic response to transfer receipt tends to be higher the more risk averse individuals are. While not consistently being statistically significant, these findings are well in line with the presumption of Brown et al. (2010): Risk averse individuals rather adjust to the certainty equivalent of their expected transfers and not to the transfers' expected value. The interacting effect of receiving a transfer and being credit constrained has, to our knowledge, not yet been subject to an analysis. Doorley and Pestel (2016) however show that inheritances enable credit constrained individuals to economic adjustment behavior on the labor market.

Most papers in the literature strive to express the economic reactions in terms of changes in the probability to retire. Brown et al. (2010) estimate that an increase in the inheritance amount by 100.000$ increases the probability of retiring within two years by 2 percentage points (given a baseline retirement probability of 19 %). Differentiating between expected and unexpected transfers suggests an effect of that very increase to be even 10.3 percentage points for unexpected and 4.3 percentage points

[8]In contrast to Doorley and Pestel (2016), we look at the extensive margin of labor supply. Our paper also deviates from theirs in that we seek to express the behavioral adjustment in opportunity costs.

[9]Doorley and Pestel (2016) use the German SOEP panel study that surveyed expectations about future transfer receipts only once, i.e. in 2001. The SAVE data set used in the present study provides us with multiple observations of expectations, whereas a generally lower sample size.

for expected transfers. The authors however specify the inheritance amount only linearly and also do not seem to control for heir status. Garbinti and Georges-Kot (2016) are not able to identify whether transfers are expected or not. Their main results suggest a 5 percentage point increase in the probability to retire given a general retirement probability in their sample of 13 %. Blau and Goodstein (2016) find that an inheritance receipt decreases labor force participation by 4 percentage points for men. Similar to the results by Brown et al. (2010), unexpected transfers even render men with a decrease in labor market participation of almost 9 percentage points. Sevak (2002) uses data on a particularly volatile period at the stock market and estimates that an exogenous wealth increase of 50.000$ increases the probability to retire by 1.9 percentage points for the age group between 55 and 60 years.

In this paper we argue that plain probability estimates are difficult to compare across studies and somewhat difficult to grasp. The timing of retirement is a lifecycle consideration. It would thus be helpful to relate the value of the inheritance to lifecycle earnings and consumption. One goal of this study is to monetize the change in the retirement age in order to see what share of received transfers households are actually willing to spend on an earlier retirement entry. A study by Scholz and Seshradi (2012) strives to achieve a similar goal, but by using different means: The authors develop a theoretical model of lifetime consumption with endogenous retirement age and analyze how the retirement decision depends on health status, the statutory retirement age and wealth. They find that a wealth shock reducing household wealth by 20 percent renders individuals at the age of 55 to postpone their retirement entry by one year.

Summing up, the literature consistently finds what economic theory predicts: Wealth changes influence retirement behavior. Whether transfers are expected or not should matter greatly for the timing of the economic response and thus bedevils the measurement of the actual effect size. In general, the literature has not yet provided a coherent judgment of the measured effect sizes: Most papers express the effect size as a change in the probability of retiring following a transfer receipt of unspecified size (Brown et al., 2010; Garbinti and Georges-Kot, 2016) or experiment with expressing the transfer amount relative to the households' income. Most papers also specify the transfer amount only linearly. Sevak (2002) suggests to estimate the elasticity of retirement flows with respect to wealth. The current paper strives at deepening the understanding of the effect size, by monetizing the effect of early retirement fully. This relates the size of the inheritance to the financial loss of an earlier retirement. Doing so permits us to relate the effect size to the actual inheritance size. We can then infer how much of the inheritance is actually spent on an anticipated retirement.

3.3 Data and methodology

3.3.1 The German SAVE study

We use the German SAVE (*Sparen und Altersvorsorge in Deutschland*) panel survey from the Munich Center for the Economics of Aging (MEA) to conduct our analysis. The SAVE has firstly been surveyed in 2001 and was specifically designed for research on retirement planning and old-age provision of households. We use the SAVE waves from 2005 to 2010 as they provide us with 5 consecutive years of panel observations.[10] The survey is conducted on the household level and covers up to 3,000 households. Compared to other data sets, the SAVE is rather small. This prevents us from conducting detailed subgroup analysis. We have however decided to use this data set as it is, to our knowledge, the only panel data set for Germany that permits us to put the labor supply decisions of heirs into a broader perspective: We exploit for instance the multiple variables on old-age provision, the expected retirement age, expectations about future inheritances and future replacement rates during retirement. The SAVE is also very detailed with respect to household finances and socio-demographics.[11]

Labor market variables and expectations about future transfers are recorded at the (quasi-) individual level in that the respondent answers most questions for him and his spouse. For most of our analysis, we treat the adults of observed households as distinct observations on the individual level. We are able to increase the number of observations to roughly 26.000. As survey data, particularly with respect to wealth, is always prone to item non-response issues, the SAVE data provides numerous variables with 5 implicates.

We now briefly describe the key variables of the study and provide the corresponding weighted[12] descriptive statistics:

Actual retirement The SAVE contains a question asking whether individuals are retired. We only use those observations in our further analysis that are not already retired in the first period of our sample. We abstain from classifying individuals as de facto retired who report to receive zero income as we cannot be entirely sure that they will not return to the labor market at some stage. Figure 3.1 summarizes the retirement entrance behavior for men and women in our sample by plotting the cross-

[10]The SAVE study has even been surveyed for more years. However, some control variables have not been surveyed in 2011 so that we limit the time span of our analysis to 2005 to 2010.

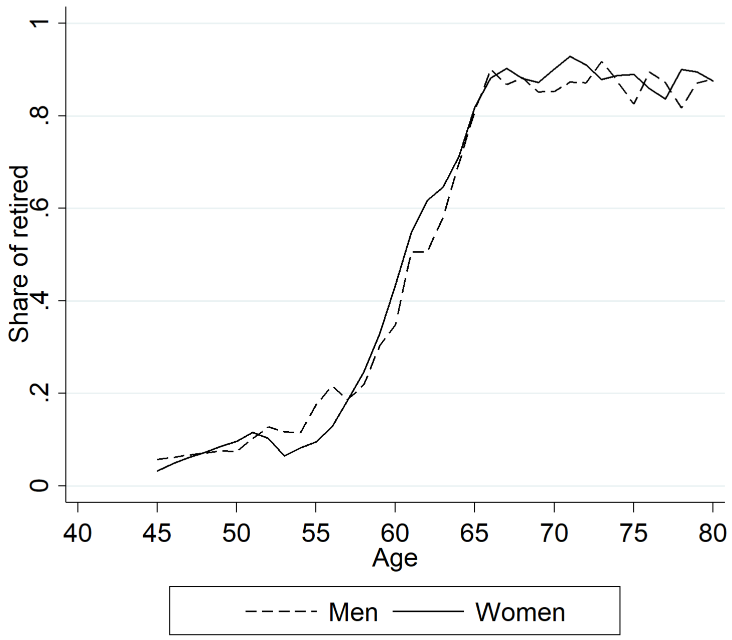
[11]The SOEP data for instance might have provided us with many more observations of actually *observed* retirement entries. It however collects less information on retirement-relevant dimensions and has e.g. only surveyed the *expected retirement age* in 1987. It has also only surveyed expectations about future transfers once, i.e. in 2001.

[12]We use the year-specific calibrated weights provided by SAVE, see Börsch-Supan et al. (2009).

sectional share of retired individuals against age. Conditional on having been part of the workforce, women and men do not differ substantially in our sample with respect to their retirement age. People of the age of 55 start to retire and by the age of 65 most individuals are retired.

We use an indicator variable as *actual retirement* that takes the value one if the individual reports to be retired[13] and reported an employment status other than retired in the year before. We call this variable *switch into retirement*. Panel *a* of table 3.1 summarizes this variable, which describes the actual retirement behavior in our sample. In total 3.4 % of the individuals in our sample retire throughout the sample period. As expected, most individuals retire between the age of 60 and 69.

Figure 3.1: Retirement behavior



Note: Share of individuals that report to be retired.
Source: SAVE 2005-2010, own calculations.

Expected retirement Respondents of the SAVE survey are asked annually, at what age they expect to retire or to receive pension income. Panel *b* and *c* of table 3.1 describe the expected retirement age over age groups for the entire sample and for heirs respectively. The statistics show that the expected retirement age neither varies substantially over age groups, nor are there considerable differences between the full

[13]The SAVE data set does not allow to differentiate between regular pension entry (which is only possible after the age of 60) and different types of early pension schemes (e.g. disability pension, in German *Erwerbsunfähigkeitsrente*). We simply rely on individuals reporting to enter some kind of retirement.

sample and heirs. It is rather conclusively close to the statutory retirement age of 65 years.

The credibility of the stated expected retirement age is key for the policy relevance of our analysis, it is however impossible to truly validate these statements: One would like to compare the age of actually observed retiring individuals with their previously stated expected retirement ages. Such a comparison suffers however from a mechanical bias: As our sample period only covers 5 years, we can merely observe a retiring individual understating its expected retirement age by a maximum of 5 years. In contrast individuals might overestimate their expected retirement age by any margin. In order to convince the reader that individuals in fact plan their retirement entry accurately and state their expectations accordingly, we provide some summary statistics about the stated expectations of observed retiring individuals in appendix B.3.1.1. Mean differences between conditional expectations on retirement entry and observed retirement entry are here shown not to be statistically significant.[14] Note too, that individuals in Germany are annually informed by pension authorities about their claims and the expected monthly future pension payment. Hence, individuals are generally well informed about their entitlements and are continuously reminded about planning their retirement.[15]

Table 3.1: Descriptives - Key variables over age groups

Age group	< 30	30-49	50-59	60-69	70-79	> 80	total
***a. Switch into retirement*:**							
Mean	.0026	.009	.0326	.0838	.0657	.0733	.0342
***b. Expected retirement age*:**							
Mean	65.95	64.93	63.83	64.49	.	.	64.82
St. Dev.	4.14	3.62	2.88	3.08	.	.	3.64
***c. Expected retirement age of heirs[1]*:**							
Mean	64.63	64.86	63.97	64.37	.	.	64.56
St. Dev.	3.08	3.18	2.43	1.65	.	.	2.91
***d. Share of recipients[2] and heirs[1]*:**							
Recipients	.0148	.0280	.0425	.0452	.0355	.0233	.0332
Heirs	.0242	.07	.1014	.1185	.0969	.0654	.0828

Based on SAVE 2005-2010, own calculations. Estimates are weighted.
[1] Heirs are considered heirs if they have received an inheritance in the current or any previous period.
[2] Recipients are those individuals that have received a transfer in the current period.

[14]Furthermore, if we were to believe that individuals systematically overstate their retirement entry age, this does not mean that the shift in the stated expected retirement entry age following the inheritance receipt is also biased. As long as the potential misjudgment is not correlated with the inheritance receipt, we do not expect our estimates to be biased.

[15]Dolls et al. (2018) find that individuals actually react to these information.

Intergenerational transfers The SAVE data surveys inheritances and records the size and the wealth type of transfers on the household level.[16] Overall the data set contains 537 distinct inheritances on the household level. We however do not know which household member is the actual recipient. We assign a transfer that has been received by a household to both spouses in order to measure the individual level effects of the actual respondent. This translates into 901 individuals that live in a household that currently received a transfer, which is equivalent to a share of 3.3 % of the entire sample over the observation period of five years. Blau and Goodstein (2016) find that primarily the actual heir or heiress is most likely to adjust its labor supply after receipt. The assignment of the transfer to both spouses thus introduces a measurement error in the explanatory variable which will tend to bias our estimates downwards (attenuation bias).[17]

In each wave respondents report the probability with which they expect to receive a transfer in the upcoming two periods. We treat inheritances as expected if the stated probability for any household member is above zero.[18] The mean size of transfers ranges from 24,000 to 55,000 Euro over the time span. The average transfer as a share of total current net wealth has a mean of 38 % and median of 8 % for individuals with positive wealth. The mean share of the transfer relative to net wealth less of the transfer size $\left(\frac{TransferAmount}{NetWealth-TransferAmount}\right)$ is around 50 % for individuals with positive net wealth.

Table 3.2 summarizes accrual and size of intergenerational transfers and corresponding expectations. Panel *a* reports for instance that for 2006 we observe 227 individuals living in households that received a transfer. Panel *c* clarifies that of these 227 transfers only 57 were expected. In return, 656 individuals stated in previous periods to expect a transfer with a positive probability in the next two periods. The low fraction of received transfers out of the high number of expected transfers is not necessarily inconsistent with observed receipts since the stated probabilities for receipt agglomerate between 10 and 30 %. While this already reflects the high individual uncertainty potential heirs perceive, table B.2 in the appendix documents that expectations actually deviate from the actually observed (aggregated) relative receipt probability in the succeeding periods. We infer that individuals have problems to reliably judge their receipt prospects

[16] We base our analysis on actually observed inheritances and thus do not use the imputed transfers. We treat implicates as suggested by Rubin (1987). Inter-vivo transfers are not included in our analysis.

[17] As described below, we also adjust the standard errors in our analysis for this double assignment of transfers.

[18] Unfortunately, we cannot analyze the change in expectations about future transfers. Changes in the stated probability over time might either result from arrival of new information about the expected event or simply from the fact that the respondent is chronologically closer to the period of the expected event. Unfortunately, the data set lacks a variable that inquires whether the respondent expects to receive a transfer at all.

but are mostly aware of the underlying uncertainty and behave accordingly.

Table 3.2: Descriptives - Intergenerational transfers

	2005	2006	2007	2008	2009	2010	total
***a. Accrual of transfers*:**							
Number of incidents	95	227	203	151	123	102	901
Share of recipients	.0245	.0419	.0371	.0348	.0300	.0240	.0332
***b. Size of transfers [cond. on receipt, in Euro]*:**							
Mean	34791.23	54190.12	46602.75	24904.05	34724.8	42105.53	41675.65
Minimum	540.54	745.47	624.35	608.52	606.67	700	540.54
Maximum	281081.1	1171459	624349.7	202839.8	328614.8	385000	1171459
***c. Expected transfers[1]*:**							
Individuals expected	.	656	1224	1089	861	874	4704
Thereof receiving	.	57	103	75	59	56	350
Size of exp. transfers	.	49619.33	51739.3	29252.26	39427.17	57725.71	45160.11

Based on SAVE 2005-2010, own calculations. Estimates are weighted.
[1] As we do not observe expectations for 2003 and 2004, we cannot provide the statistics for 2005.

Expected retirement duration In order to get a measure of the expected retirement duration we have to (at least partly) rely on external sources. We use a mortality table[19] that differentiates life expectancy with respect to age, gender and east and west German origin respectively. We combine these data with a SAVE variable that covers how long individuals expect to live compared to their age cohort. Mean and Median of this variable is virtually zero. Generally, by far most people do not expect to deviate from their peers. The difference between the expected retirement age and the calculated individual life expectancy then yields the expected retirement duration.

Expected retirement income The SAVE includes a variable that contains the percentage of current income that the individual expects to receive from the statutory pension scheme during retirement.[20] We obtain the expected retirement income by multiplying this variable with current individual net income.[21] We neglect private and company pension claims, even though the SAVE provides us with such data: Private pension contracts are heterogeneous in many respects and, from the individuals' perspective, contributions and withdrawals are basically a zero sum game. Table 3.3 summarizes the variables underlying the expected retirement income calculation over

[19] The data is provided by the Max Planck Institute for Demographic Research and can be downloaded on the Institute's page.

[20] In order to reduce the number of missing observations we simulate this variable with an OLS model. In total, we gain 12 observations for our analysis.

[21] We can thus also abstain from a further inflation adjustment.

income deciles. The average share of the expected statutory pension income is relatively constant over the income distribution. The stated percentage shares of current income are close to the net pension replacement rates that for instance the OECD is predicting for Germany. We are thus confident that individuals are generally well informed about their entitlements.[22]

Table 3.3: Descriptives - Income and expected pension income

Income quintile	1	2	3	4	5	total
a. Individual monthly net income [in Euro]:						
Mean	260.18	771.03	1177.45	1673.2	3111.55	1396.92
Std. deviation	186.27	133.47	112.47	178.92	1976.73	1322.04
b. Total expected income during retirement[% current inc.]:						
Average share	66.89	66.82	68.35	69.05	69.48	68.26
Std. deviation	17.55	16.68	16.84	15.63	16.01	16.51
c. Expected statutory pension income[% current inc.]:						
Average share	53.67	53.74	55.34	56.15	55.88	55.03
Std. deviation	17.49	16.56	16.37	15.02	15.85	16.27

Based on SAVE 2005-2010, own calculations. Estimates are weighted. Income deciles are based on individual income.

Risk attitudes The SAVE data contains some variables that help to infer the risk attitude of individuals. We use a measure from the 2005 questionnaire in which respondents[23] were confronted with the following type of questions: *Would you rather receive 1000 Euro right away or would you rather take part in a coin flipping gamble of the following form: Receive 2.500 Euro when the coin shows heads and nothing when it shows tails.* The question has been repeated with different payoffs for the gambling option and thus permits us to classify peoples' risk attitudes.

The SAVE data set also enquires the investment behavior of people. We use the share of wealth that has been put in risky assets as a measure for revealed risk preferences. Table B.6 in the Appendix presents a regression that hints at a close relationship of the two risk measures. For our analysis, we resort to the gambling-based risk measure.[24] Most individuals turn however out to be highly risk averse. We thus forgo a further differentiation and just contrast risk neutral individuals with risk averse individuals.

[22] According to the *Pension at a Glance* indicators of the OECD (see Database), a worker with no career breaks earning the mean income faces a net replacement rate of 57.1 % of his last net income.

[23] This risk measure is only available for the respondent and not for the spouse which reduces the sample size of our analysis with respect to risk attitude.

[24] The revealed-preferences measure in contrast runs risk of being biased. Stock market participants might differ from the general population in several regards.

Credit constraints Similar to risk attitudes, being credit constrained has been found in the literature to be a possible explanation for the phenomenon that individuals do not fully adjust their labor supply before inheritance receipt even for expected transfers. This is particularly relevant for inheritances accruing after regular retirement entry.[25] While most studies in the literature are not able to test this hypothesis, the SAVE data also surveys whether people have failed to receive a loan from the bank. The data set also contains a variable that enquires whether people have not tried to receive a loan because they expected to receive none. We define our credit constraint indicator to be equal to unity for both groups.

Control Variables Table B.3 in the appendix presents summary statistics for the control variables underlying our main results (see section 3.4) for the entire sample and the sub-sample of heirs. Our main controls are *age*, *individual net income* (in logs), a dummy set controlling for self-reported *health status*, controls for the *employment type* (civil servant, self-employed, regular employment), *unemployment history* (never unemployed, long term unemployed), *educational achievements*, living in *east Germany* and *time* effects. We furthermore control in all our specifications for the birth-cohort specific statutory retirement entry age. Table B.4 in the appendix shows how the statutory retirement age varies.[26]

Because of endogeneity concerns, we exclude *wealth* as control variable in our main specification, but will explain the concept of *wealth* in the SAVE data in appendix B.3.1.3 and will come back to the role of wealth in the robustness section 3.5.1.[27]

Table B.3 in the appendix summarizes the control variables and shows that the median household *income* is around 2,100 Euro. Heirs are on average a bit older, richer, and have higher income and seem to be better educated than the average individual.

3.3.2 Conceptual approach and estimation methods

This paper primarily addresses the question of how inheritance receipt affects the (early) retirement behavior. In an optimal setting we would observe individuals and

[25]In contrast, it would also be possible that credit constrained individuals already adjust their expected retirement age due to the transfer although being credit constrained, as they expect to receive the relieving transfer *before* retirement entry. Our results however suggest that this concern is no threat to our identification strategy.

[26]The default statutory pension age was 65 for all cohorts before 2007 and depends on birth cohort since then. That is, the *statutory pension age* varies over time and cohorts in our sample. See Buslei et al. (2017) for a recent analysis of the implications of this reform.

[27]Wealth could indeed still be correlated with inheritances: First, by previous transfers, i.e. gifts, that reduce the inheritance and increase the wealth of the children. Second, testators' bequest motives could be driven by the wealth of their heirs. After all, we address these concerns in a robustness check in section 3.5.1.

households over their entire life-cycle.[28] This would allow us to draw conclusions about how individuals and households respond later in life to inheritances received at any earlier stage. In order to deal with the limitations at hand, we will instead ask two related questions: First, how do recent inheritances affect the probability to retire? In order to answer this question, we analyze the actual retirement behavior in our sample, i.e the identification relies here on cross-sectional variation. Secondly, how do inheritances affect the expected retirement age? Our suggestion to look at effects on the *expected retirement age* is also a provisional solution to the missing data problem: Assuming that rational individuals have a specific idea about their economic and financial prospects and plan and adjust their intertemporal behavior accordingly, we replace the necessity of observing individuals over their entire life-cycle by expectations: How do individuals (of all age groups) adjust the economic landmark decision of entering retirement in face of a wealth transfer? The expected retirement age is part of the survey in all periods which allows us to exploit the within variation.

In order to measure the influence of recent inheritances on the probability of switching from non-retired to retired status, we use a standard Probit specification:

$$Pr(switch_{it} = 1|D_{ht}, A_{ht}, X_{it}, W_{i,t-1}) = \phi(\beta_D D_{ht} + \beta_A A_{ht} + \zeta X_{it} + \kappa W_{i,t-1} + \theta_t + u_{it}), \quad (3.1)$$

where $switch_{it}$ is an indicator variable that takes the value one if the individual i reports to be retired but did report a different labor market status in the preceding period. D_{ht} is an indicator if the individual is a member of a transfer receiving household in t, A_{ht} is the respective amount of the transfer in Euro. X_{it} and W_{it-1} are matrices of individual and household specific covariates. The set of control variables X_{it} includes a third order polynomial of the individuals' age, statutory pension age, indicators for sex, having children, as well as the number of children belonging to the household (living with or without the household), self-reported health status (5-point-scale from very good to very bad) and living in East Germany. W_{it-1} contains two dummies on being civil servant or self-employed in the previous period. θ_t captures the year fixed effects, while ϕ represents the cumulative distribution function for the standard normal distribution. u_{it} is the normally distributed error term which is assumed to be uncorrelated with the explanatory variables.

Relying on cross-sectional variation entails two major disadvantages when analyzing the influence of intergenerational transfers on actual retirement behavior: As noted in the descriptive statistics, most inheritances are received at an age between 60 and 69.

[28] Surveys not covering the life-cycle until retirement are right-censored in a sense. Our approach of using the expected instead of the actual retirement age can thus also be understood as a way to overcome this censoring issue.

As this is also the typical age range for retirement entry, it is likely that cross-sectional analysis suffers from spurious correlation. In order not to restrict our analysis on this particular age group, we use the *expected retirement age* which is available for all age groups. Also, individuals are likely to differ with respect to some unobservables that influence both the retirement decision and transfers, studies that fully rely on the cross-sectional variation might suffer from biases in their parameter of interest.[29] For that reason our main results depend on a linear fixed effects (FE) model with the following baseline specification:

$$EAR_{it} = \gamma_1 + \theta_t + \beta_1 D_{ht} + \beta_2 A_{ht} + \beta_3 A_{ht}^2 + Z_{it}\gamma_k + \alpha_i + u_{it}, \tag{3.2}$$

with EAR_{it} as the expected age at retirement of individual i in period $t = 2005, 2006,$ ..., 2010, a set of time dummies θ_t, individual effect α_i, a dummy D_{ht} indicating if the individual i is part of a household h that received an inheritance in period t, A_{ht} and A_{ht}^2 being the linear and squared Euro value of the inherited amount respectively (in 10T Euro). In order to assure a consistent estimation of the standard errors, we cluster on the household and individual level in all specifications. Z_{it} is a smaller list of individual and household specific control variables consisting of a third order polynomial of the individuals' age, logarithmic household net income, the statutory retirement age, a dummy set for self-reported health status (5-point-scale from very good to very bad), and indicators for being self-employed, civil servant, unemployment history and living in East Germany. The error term u_{it} is assumed to be uncorrelated with any of the covariates given α_i. The very nature of our research question entails some potentially omitted variables: Inheritance receipt typically comes along with the death of a close relative.[30] This might also entail that the heir now has to take care of the surviving parent, which might directly affect labor supply. Also the social pressure resulting from parental expectations may have vanished. We are nonetheless confident that our assumption of conditional exogeneity holds: Private nursing insurance is obligatory in Germany and certainly cushions such effects.[31] Individuals could also resort to part-time employment, a possibility we ignore here in order to focus on the typically irreversible labor market exit through retirement. Inheritance receipt also reduces the heirs uncertainty with respect to e.g. medical expenses (for the aging parents) and,

[29] Specifically, we think of earlier inheritances, family background and disutility from work. More such variables are conceivable.

[30] Unfortunately, we cannot observe the source of the transfer, i.e. whether it is received from e.g. a parent or a more distant relative.

[31] Also, many inheritances in Germany follow the logic of the *Berliner Testament*. This is a specific way of married couples to formulate their last will: The wealth of the dying spouse will first fully pass on to the surviving spouse and will only be bequeathed to the children after the death of the second spouse.

most naturally, the size of the inheritance. While we cannot control for the former, we consider the latter effect part of the genuine inheritance effect. The estimated $\hat{\beta}$s are the parameters of interest, that we will employ for our simulation study as described in section 3.3.3.

Equation 3.2 is our main specification. For analyzing some side aspects, we however slightly vary equation 3.2 by interacting the inheritance variables with various dummy variables. The specification then changes to:

$$\begin{aligned} EAR_{it} = &\gamma_1 + \theta_t + \beta_1 D_{ht} + \beta_2 A_{ht} + \beta_3 A_{ht}^2 + \delta d_{hj} + \\ &\epsilon_1 d_{hj} D_{ht} + \epsilon_2 d_{hj} A_{ht} + \epsilon_3 d_{hj} A_{ht}^2 + Z_{it}\gamma_k + \alpha_i + u_{it}, \end{aligned} \tag{3.3}$$

where d_{hj} is a wild card for household h in period $j \in (t-1, t, 2005)$ that takes one of the following three variables: It is either indicating whether the inheritance was expected ($d_{hj} = e_{ht-1}$), or if the individual is credit constrained ($d_{hj} = c_{ht}$), or the risk attitude of the person ($d_{hj} = r_{h2005}$) that was only part of the survey in year 2005. ϵ-denoted variables cover the respective interaction effect.

In a further specification we include lagged inheritance dummies and interact them with the expectations indicator:

$$EAR_{it} = \gamma_1 + \theta_t + \sum_{\tau=t-2}^{t} \left(\beta D_{h\tau} + \delta e_{i\tau-1} + \eta D_{h\tau} e_{i\tau-1}\right) + Z_{it}\gamma_k + u_{it} \tag{3.4}$$

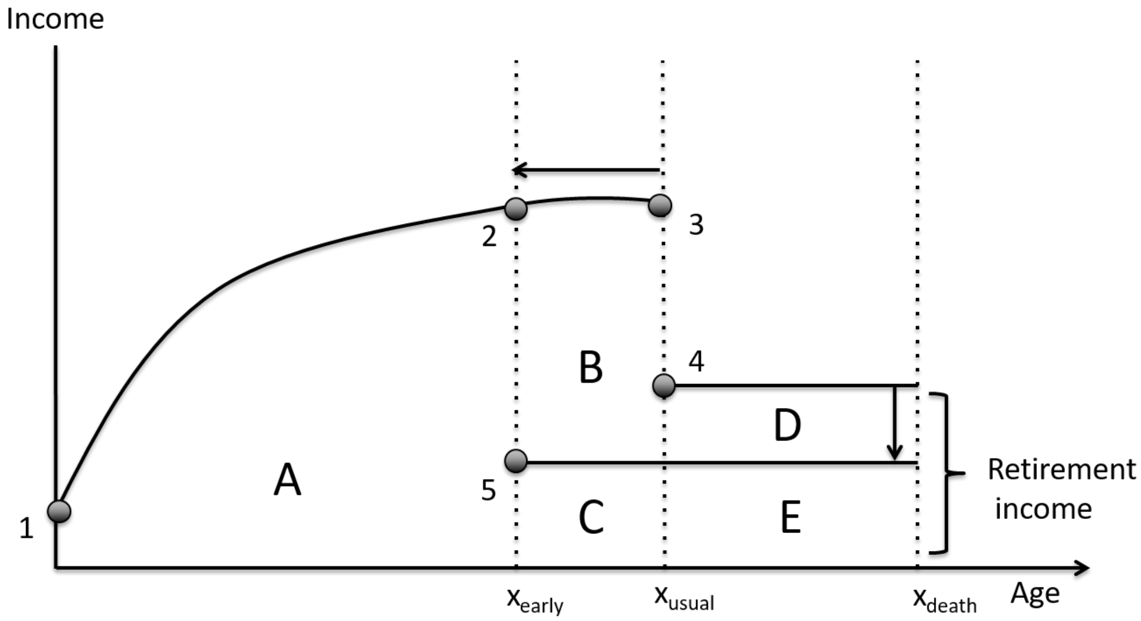
This will allow us to analyze if the adjustment of the expected retirement age after the receipt of an unexpected inheritance takes more time, as for instance the results in Bo et al. (2015) suggest.

3.3.3 Monetary cost of early retirement

3.3.3.1 Problems with direct interpretations of changing retirement durations

In order to interpret the influence of inheritances on early retirement behavior, various approaches come to mind. Most other studies estimate how transfers affect the probability to retire through different econometric models (e.g. Probit (Brown et al., 2010; Joulfaian and Wilhelm, 1994) or survival models (Garbinti and Georges-Kot, 2016)). Similarly, other studies evaluate the labor force participation rate depending on heir status (Holtz-Eakin et al., 1993; Blau and Goodstein, 2016). An estimated probability is difficult to relate to the opportunity costs an early retiring household is facing. The

Figure 3.2: Monetary effect of early retirement



opportunity costs are however crucial for the retirement decision. It would therefore be more instructive to express the effect size on the same scale as the variable of interest, which is money in the case of inheritances.[32]

In other words, retiring a year earlier can mean monetarily different things depending in particular on the expected income path and the expected duration of retirement. A more intuitive way to quantify the results would be to ask what individuals give up in monetary terms when they decide to retire early and relate this to the size of the inheritance. This will give an answer to the question: What part of the inheritance is actually spent on early retirement? In order to illustrate our interpretation more clearly, we will now analyze the monetary effect of early retirement graphically.

3.3.3.2 A graphical illustration of the monetary cost of early retirement

Figure 3.2 is a stylized graphical illustration of our method to measure what households give up when they retire early.[33] It depicts a hypothetical life-cycle earnings profile with the expected alterations after bequest receipt: In the case of retirement at age x_{usual} the individual expects to earn an income stream that follows through points 1,

[32] Expressing the inheritance amount in terms of the households' income or wealth (as e.g. done in Brown et al. (2010)), is certainly preferable over a simple specification, but does not solve the key issue.

[33] We thus interpret the financial quantities here as stocks, i.e. we add up flows as e.g. income to aggregates comparable to the wealth stock of received inheritances. One could of course also translate inheritances in a *fair annuity* and thus in annual payments comparable to the observed flows. Such an approach is e.g. taken by Bönke et al. (2018).

2, and 3 before dropping to the level of the statutory pension entitlement (denoted by 4) which is maintained until death. In contrast to that, the expected income stream after an earlier retirement follows through points 1, 2 and 5, i.e. the individual will earn a lower retirement income but for a longer duration.[34] According to the German statutory pension scheme individuals lose 0.3 % of their pension entitlement for every month of early retirement.[35] The regular pension entry age depends on the birth year and is listed in table B.4 in the appendix. The area under the income stream equals the total income over the life-cycle. In the case of retirement at x_{usual} the individual expects to acquire a lifetime income equivalent to the areas $A + B + C + D + E$. Retiring early, the individual expects to monetarily give up $L = B + D$, which we will call the monetary cost of early retirement. An intuitive way to measure how much of the inheritance is spent on early retirement would be to divide L by the amount of the inheritance. Obviously, individuals also gain from retiring earlier in the form of forgone disutility of work. In a world without uncertainty, discounting and bequest motives our method could provide a way to measure the marginal utility from leisure during the last periods of employment: The marginal utility of a monetary amount that is not spent on retirement should then be close to the marginal disutility of work that results from not spending the amount on retiring even earlier.

In order to estimate to which degree the inheritance is used to retire early, we first of all have to estimate x_{usual} and x_{early}. These are provided by our main estimation in section 3.5. In a second step, we calculate the areas C and D on the basis of the *expected retirement duration* and *expected retirement income* and the penalty term for anticipated retirement entry. We estimate the size of D on the basis of the expected retirement duration in the period before the wealth gain and therefore neglect that inheritances (just as the earlier retirement) might affect the expected life expectancy. This way, our results only reflect the effect of an earlier retirement (and are not confounded by a prolonged life expectancy[36]). Lastly, we simulate the expected foregone income[37] between the two retirement ages (the path between points 2 and 3 in fig-

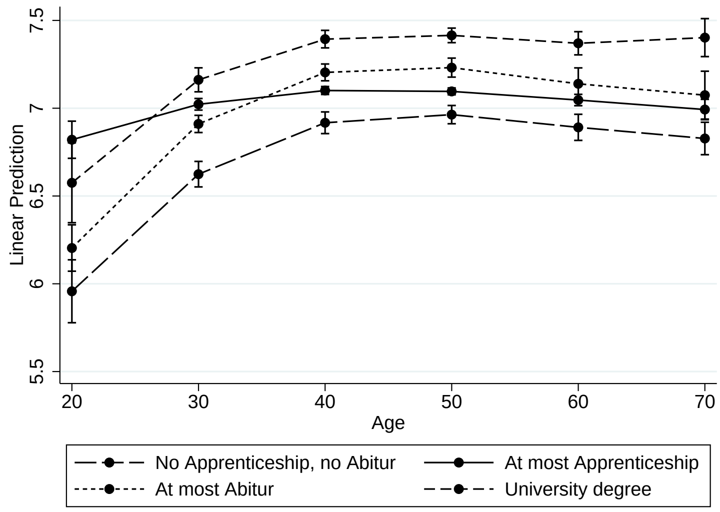
[34]The retirement income of course also includes private and company pension claims. We however abstract from these income sources as it is difficult to assess how earlier pension entries affect the individual claims. The SAVE data set in fact contains a variable reflecting the overall retirement income as percentage of current income, which permits us to calculate the share of retirement income attributable to private and company pensions. Regressing this share on the expected retirement age and control variables gives a rough idea of the relationship. We do not use this information for two reasons: First, private pension contracts are very heterogeneous. Second, from the individual's perspective, private pension contributions and withdrawals can be seen more or less as a zero sum game. The same argument applies to the savings of the household, which we ignore in our life-cycle considerations.

[35]Bönke et al. (2018) and Giesecke (2018) recently analyzed the effect of such penalty terms on the retirement behavior.

[36]See Attanasio and Emmerson (2003) for a detailed analysis between wealth and life-expectancy.

[37]Since individuals currently do not know their future earnings before retirement themselves, our

Figure 3.3: Average income over the life-cycle by educational achievement



ure 3.2). The simulation is based on a cross-section estimation for the net income of non-retired individuals. We regress the logarithmic individual income on a third order polynomial of age interacted with a dummy set of educational achievement and various other control variables (see table B.7 in the appendix for the model and the detailed results). Figure 3.3 shows the simulated logarithmic individual net income for different educational achievement levels. We here follow the approach by Duan (1983) in order to yield the corresponding income in levels. We then use our estimates of x_{usual} and x_{early} in order to simulate the income at the two estimated retirement ages.[38] We average the income at the two simulated expected retirement ages and multiply the result by their estimated difference, i. e. the estimate for $\Delta\hat{x}_i = x_{usual} - x_{early}$. From this we have to subtract C in order to obtain the area B. Adding D to B yields the required estimate for the total costs of a moved forward retirement entry, L.

3.3.3.3 Discounting

In order to make the immediate monetary gain (through the wealth transfer) comparable to the future monetary loss (through an expected change in labor supply), we have to account for inflation and discounting. In our baseline specification we will only account for inflation in order to make the monetary figures comparable. Since the simulated future labor income loss is expressed in *current* Euro and the calculation for the expected income in retirement is based on a stated percentage of *current* income

estimates basically only need to match their expectations about their future income path instead of their actual future earnings.

[38]Since the estimated retirement ages are usually not round numbers we actually estimate the retirement income four times - each year has then two estimates: one for the round year before the simulated expected retirement age and one for the round year after.

that the individual expects to receive in retirement we do not have to further adjust these measures.

We additionally have to account for the fact that a gained current Euro is usually worth more than a future Euro even when accounting for inflation, i.e. the real interest rate is positive. We therefore present a second specification where we capitalize the wealth transfer by 3 % per year until the expected early retirement date. Instead of discounting future foregone income, we therefore translate the transfer amount in future values.

We argue here that a further adjustment (due to the discounting of future values) is unnecessary since we simply compare two monetary amounts and are not interested in the utility of current or future income changes.[39] That said, using a fixed effects estimator, allows us to control for unobserved individual differences in impatience. The estimated change in the retirement age is thus not affected by individual differences in the discount factor, as long as the discount factor is constant over time.

3.4 Results

The results section is structured as follows: We first present new evidence on the effect of transfers on the retirement behavior for Germany using a Probit estimation as it is usually done in the literature.[40] The cross-sectional analysis is prone to omitted variable biases. For example, family background might affect the taste for labor and the inheritance size positively, which would introduce an upwards bias. In general it would be possible to base the analysis on the fixed effect Logit estimator, since the number of observation periods is large enough. This estimator comes with the drawback that the estimation would be based only on individuals for which one observes a change in the retirement status, which only permits to analyze influences for older age cohorts.[41] The present and most other studies are restricted to a comparably short sample period: These studies miss the retirement entry of young recipients who might actually move forward their retirement entry significantly. Similarly, we miss individuals that have received a transfer before the observation period and might have actually adjusted their retirement entry, but we perceive them as non-heirs.

We then turn to our preferred measure of the *expected retirement age*: Its usage

[39] For that reason we also do not have to account for utility gains in the form of reduced disutility of work.

[40] We restrict our sample in the Probit estimation to individuals that are older than 40 and younger than 70. Such restrictions are also common in the literature, see e.g. Brown et al. (2010) who restrict their sample to cohorts born between 1931 and 1941 while using HRS data from 1994 to 2002.

[41] In our case the conditions of the Logit FE estimation leads to a considerable reduction in the number of observations and thereby meaningless results.

circumvents the problem of limited sample periods as it is available for all age-cohorts and thus introduces a life-cycle perspective. As the expected retirement age has also been surveyed in all years, we do not rely in this part of the analysis on the cross-sectional variation but can rather attribute changes in the response to the within-individual variation. We thus control for unobserved individual heterogeneity such as transfers that occurred before the sample period, family background and time constant preferences. We also add to the ongoing discussion on the role of expectations and the surprisingly limited scope to which soon-to-be heirs seem to adjust to their stated expectations. Specifically, we test whether expectations affect the economic reaction to transfer receipt. The work by Garbinti and Georges-Kot (2016) suggests, that the tendency to adjust to future transfers also depends on the individual's risk attitude. An alternative explanation for not fully adjusting to expected transfers would be that individuals were credit constrained. In the following we will test these two hypothesis. Using the *expected retirement age* certainly lacks the advantage of revealed preferences, it introduces a kind of staging post in the decision making of the individual: It will reveal whether individuals at least had the intention to adjust to their expected wealth shocks or whether even the intention to adjust is lacking.

We then use the results of our preferred specification to estimate the change in the expected retirement age (i.e. $\Delta\hat{x}_i = x_{usual} - x_{early}$ in figure 3.2). On the basis of this result, we are able to calculate the opportunity cost of early retirement which we then can compare to the transfer size.

3.4.1 Actual retirement: Probit estimates

The most basic question is, whether transfers significantly enhance an earlier retirement entry and if so, to what extent. To answer this question, we first look at the actual retirement behavior in our sample and estimate in line with the literature the probability of entering retirement in the period after bequest receipt. Column (1) of table 3.4 shows the results of regressing an indicator for having entered retirement in the current period on a dummy for transfer receipt and the linear transfer amount. Dummy and linear term represent here a non-linear specification of the effect. The dummy estimate is, albeit insignificant, negative while the linear term indicates a statistically significant positive effect of transfers on the probability to retire. The estimates are jointly significant at the 10 % level. Both estimates have to be interpreted jointly: For heirs with a small receipt, the effect of the dummy will dominate the positive linear effect. Specifically, only for inheritances above roughly 20T Euro heirs will show a higher

Table 3.4: Actual retirement - Probit estimations

	(1)	(2)
Dependent Variable: Switch into Retirement		
Non-zero Inheritance Received=1	-0.047	
	(0.1297)	
Total Inheritance in 10T Euro	0.025**	
	(0.0125)	
Non-zero Inheritance Received=0 × Expected Inher. Indicator=1		-0.050
		(0.0690)
Non-zero Inheritance Received=1 × Expected Inher. Indicator=0		0.122
		(0.2070)
Non-zero Inheritance Received=1 × Expected Inher. Indicator=1		-0.128
		(0.1715)
Expected Inher. Indicator=0 × Total Inheritance in 10T Euro		0.017
		(0.0175)
Expected Inher. Indicator=1 × Total Inheritance in 10T Euro		0.028*
		(0.0142)
Year FE	YES	YES
Additional Controls	YES	YES
Number of Observations	9515	8362

[1] The table shows results of Probit estimations where the dependent variable is equal to 1 if the individual is retired in the current period and was not retired in the former period. All estimations are based on a sample of non-self-employed individuals that are between 40 and 70 years old and not retired in the first observation period. The estimations include a third order polynomial of age, sex, an indicator for having children, the number of children of the household members, four indicators for self-evaluated health status, indicators for having been self-employed/civil servant in the former period, never having been unemployed/having been longterm unemployed, three educational degrees (apprenticeship, high school degree (Abitur), college/university), region (East/West) as control variables.
[2] Standard errors account for clustering on the household and individual level.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with *,**,*** are statistically significant at the 10, 5, 1 percent level.

probability to retire than non-heirs.[42] Conditional on receipt, the average marginal effect of the linear term implies that the probability to retire increases by 0.24 percentage points as inheritances increase by 10T Euro. Relating this to the unconditional probability to retire in our sample (5.7 %), shows that this effect corresponds to a 4 % increase. These basic results are well in line with previous findings from the literature (see section 3.2) and also meet the predictions from economic theory: People react to this positive wealth change partly by resigning earlier and thus demand more of the normal good leisure.

[42] We derive this by comparing the *predictive margins* of retirement entry for, c.p., $D_{h,t} = A_{h,t} = 0$, which yields a probability to retire of 5.74 %, and $D_{h,t} = 1, A_{h,t} = 20.000$, which yields 5.78 %.

Brown et al. (2010) provide the first study to credibly control for expected transfers and their effect on the retirement behavior. They find stronger, albeit not clearly statistically different, reactions from unexpected transfers. Column (2) of table 3.4 replicates this test with our data set: We interact the inheritance dummy and the linear transfer amount variable with an indicator that equals one, when individuals have stated in the previous period that they expect to receive a transfer with positive probability within the next two years. Interestingly, our results contrast those of Brown et al. (2010): We find a statistically significant impact of expected transfers while not observing a statistically significant effect of unexpected transfers. As discussed in the literature, risk attitudes and credit constraints are a potential explanation for observing that individuals did not adjust fully to expected transfers before receipt. The counterintuitive finding of not seeing any significant effect of unexpected transfers rests somewhat puzzling. However, as we will see later, the corresponding effects might only show their influence with a time lag. Bo et al. (2015) have found some similar evidence, suggesting that retirement behavior only adjusts after some periods.

3.4.2 Effects on the expected retirement age

We begin this section by an FE estimation of the expected retirement age on the inheritance dummy and the set of controls as described in section 3.3.2. The estimate in column (1) of table 3.5, representing the average planned retirement response of all heirs (in the first period after receipt), shows that the expected retirement age decreases by pretty much 1/3 of a year. Hence, receiving a transfer reduces the expected retirement age by four months on average.

Column (2) from table 3.5 is our main specification and adds a linear and a squared term to the previous model and thus corresponds to equation 3.2. Note that the three estimates have to be interpreted jointly.[43] We see that also this specification hints at a strong, nonlinear effect of inheritances on the moving forward of the expected retirement entry age: The dummy estimate is negative, albeit insignificant. The transfer amount estimates suggest that increasing transfers reduce the expected retirement age (up to very high transfers), however with a decreasing pace reaching the highest reduction at transfers with slightly above 420.000 Euro. Figure 3.4 plots the linear prediction depending on different values of the inheritance. The three transfer-related estimates

[43]This specification requires a careful interpretation: The dummy itself can be interpreted as a counterfactual denoting the effect of an inheritance on the expected retirement age of a heir when the inheritance amount equals zero. While this might occur counter-intuitive, the dummy is necessary as the inheritance variable contains many zero values, the dummy thus makes the identification of the effect more flexible. The linear and squared terms of the inheritance amount, isolated interpretation, describe the effect of an inheritance of the size of 10T Euro on the expected retirement age *conditional* on being a heir in this period.

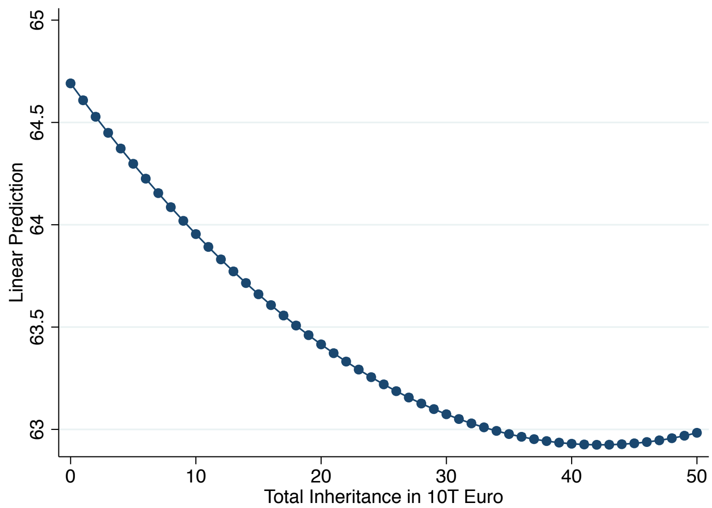
Table 3.5: Expected retirement age - FE estimations

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable: Expected Retirement Age						
Specificaiton						
Baseline						
Non-zero Inheritance Received=1	-0.348**	-0.111				
	(0.1663)	(0.1817)				
Total Inheritance in 10T Euro		-0.084***				
		(0.0266)				
Total Inheritance × Total Inheritance		0.001***				
		(0.0002)				
Expectations						
Non-zero Inheritance Received=0 × Expected Inher. =1			0.066	0.111		
			(0.1047)	(0.1717)		
Non-zero Inheritance Received=1 × Expected Inher. =0			-0.254	-0.404		
			(0.3362)	(0.3718)		
Non-zero Inheritance Received=1 × Expected Inher. =1			0.458*	0.412		
			(0.2735)	(0.5100)		
Expected Inher. =0 × Total Inheritance in 10T Euro			0.142			
			(0.2241)			
Expected Inher. =1 × Total Inheritance in 10T Euro			-0.143***			
			(0.0552)			
Expected Inher. =0 × Tot. Inherit. × Tot. Inherit.			-0.010			
			(0.0195)			
Expected Inher. =1 × Tot. Inherit. × Tot. Inherit.			0.003**			
			(0.0013)			
Various Periods						
One Lag						
Non-zero Inheritance Received=0 × Expected Inher. =1				-0.062		
				(0.1708)		
Non-zero Inheritance Received=1 × Expected Inher. =0				-0.847		
				(0.5653)		
Non-zero Inheritance Received=1 × Expected Inher. =1				0.337		
				(0.3625)		
Two Lags						
Non-zero Inheritance Received=0 × Expected Inher. =1				0.015		
				(0.1701)		
Non-zero Inheritance Received=1 × Expected Inher. =0				-1.194***		
				(0.3803)		
Non-zero Inheritance Received=1 × Expected Inher. =1				0.196		
				(0.3966)		
Risk Preferences						
Non-zero Inheritance Received=1 × risk neutral=0					0.241	
					(0.2626)	
Non-zero Inheritance Received=1 × risk neutral=1					-0.383	
					(0.5005)	
risk neutral=0 × Total Inheritance in 10T Euro					-0.237*	
					(0.1241)	
risk neutral=1 × Total Inheritance in 10T Euro					-0.583**	
					(0.2905)	
risk neutral=0 × Total Inheritance × Total Inheritance					0.006	
					(0.0049)	
risk neutral=1 × Total Inheritance × Total Inheritance					0.017**	
					(0.0086)	
Credit Constraints						
Non-zero Inheritance Received=0 × cconstraint=1						-0.011
						(0.1365)
Non-zero Inheritance Received=1 × cconstraint=0						-0.071
						(0.1935)
Non-zero Inheritance Received=1 × cconstraint=1						-0.901
						(0.7300)
cconstraint=0 × Total Inheritance in 10T Euro						-0.088***
						(0.0273)
cconstraint=1 × Total Inheritance in 10T Euro						0.566
						(1.0023)
cconstraint=0 × Total Inheritance × Total Inheritance						0.001***
						(0.0002)
cconstraint=1 × Total Inheritance × Total Inheritance						-0.086
						(0.1837)
Year FE	YES	YES	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES	YES	YES
Number of Observations	16766	16766	10568	4679	16766	10944
Number of Groups	4798	4798	3334	2117	4798	2846

[1] The table shows results of Linear Fixed Effect estimations where the dependent variable is the expected retirement age. All estimations are based on a sample of individuals that are not retired in the first observation period. The estimations include a third order polynomial of age, Log(Net Household Income), an indicator for having children, the number of children in the household, for indicators for self-evaluated health status, indicators for being self-employed, civil servant and region (East/West) as control variables.
[2] Standard errors account for clustering on the household and individual level.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with *,**,*** are statistically significant at the 10, 5, 1 percent level.

are jointly significant at the 1 percent level. The effect of the mean inheritance ($\approx 40T$ Euro) on the expected retirement age equals -.33 years ($\approx$ 4 month) and is significant at the 1 percent level. The average marginal effect yields -0.08. That is, increasing the transfer by 10T decreases the *expected retirement age* on average by 1 month.[44]

Figure 3.4: Estimated influence of inherited amount on the expected retirement age



From a theoretical point of view, individuals who expect a transfer should adjust prior to the receipt while individuals who have not had such expectations should show stronger economic responses in the period of receipt. We now interact both the dummy and the transfer amount variables with an indicator equalling one if the individual stated to expect a transfer with a positive probability. The results are presented in column (3) of table 3.5: Generally, the results from our main specification seem to be driven by expected transfers. Expected transfers reduce the *expected retirement age* with a decreasing margin. The effect of expected transfers is jointly significant at the 5 % level. Increasing an expected transfer by 10T reduces the expected retirement age by 1/7 of a year. This confirms previous findings from the literature that recipients do not fully adjust to expected transfers *before* the receipt. Additionally, unexpected transfers do not significantly reduce the expected retirement time, at least immediately after receipt. Similar to the findings in Brown et al. (2010), the estimates for the expected transfers do not significantly differ from those of the unexpected transfers.

Bo et al. (2015) find that reactions to transfer receipt sometimes only take a lagged effect.[45] We want to check whether unexpected transfers will perhaps result in a lagged

[44]This effect holds conditional on receipt, that is, when only increasing the transfer size. In contrast, when increasing the transfer from zero to 10T, one has to consider also the transfer dummy: The average marginal effect then amounts to -.19 which corresponds to a reduction of slightly more than two months.

[45]Note, that Bo et al. (2015) look at the difference between heirs and non-heirs using early retirement schemes, i.e. actual retirement.

adjustment of the expected retirement age. We thus estimate a model in which we regress expected retirement age on the dummy for bequest receipt from period t, period $t-1$ and period $t-2$. We interact all of these three dummies with the correspondingly lagged dummies that are equal to 1 if the individual has stated in the previous period to expect a transfer receipt. In this specification (reported in column (4)), none of the estimates for the current period is significant.[46] The lagged estimates however, suggest significant reductions in the expected retirement age for unexpected transfer receipts. The effects for both lagged estimates for unexpected transfers are strong and highly significant. Hence, apparently individuals need some time to decide how to treat their unexpected positive wealth shock. The results by Bo et al. (2015) might therefore well be driven by the hidden expectation status of the observed transfers. In contrast to Doorley and Pestel (2016), we however do not find significant effects in labor supply before the actual transfer receipt. The results show that unexpected transfers rather entail a lagged response. Hence, expectations about transfers determine the reaction time after receipt.

We might however underestimate the effect of expectations: The data does not allow to estimate whether individuals already adjust their expected retirement age when they learn about the future inheritance. Even a change in the perceived probability from zero to positive over two periods does not necessarily preclude that individuals have already adjusted to their expectations. The core problem here is that the survey question asks with what probability a person expects to receive a transfer *in the next two periods* (and not if a transfer is expected at all, i.e. even if only in the distant future).

3.4.3 Credit constraints and risk attitudes

In this subsection we want to test two potential explanations for the observation that individuals do not fully adjust to *expected* transfer receipts. Brown et al. (2010) hypothesize that risk averse individuals would only adjust to the certainty equivalent instead of the expected value of the transfer. Garbinti and Georges-Kot (2016) find some confirming evidence for this: They show that more risk averse people react stronger to the receipt of expected inheritances than less risk averse individuals. Our data set also allows us to classify individuals with respect to their risk attitude. We will thus first try to replicate the results from Garbinti and Georges-Kot (2016). We will then test whether being credit constrained might serve as an alternative explanation. In fact, it could be that heirs expecting a transfer simply cannot fully adjust to the *expected*

[46] The reasons for the insignificance of current receipts in this specification does not necessarily mean that our previous model is misspecified. Note that the previous model specified the transfer amount in a linear and a squared term next to the dummy. Also, the lags in the model of column (4) reduce the number of observations.

value of the transfer as banks do not give loans on expectations.

We first run our main model with the dummy for transfer receipt and the linear and squared term of the transfer amount and interact all three variables with an indicator for being risk neutral, i.e. the base category for this estimation are risk averse individuals.[47] The point estimates suggest that risk neutral individuals show stronger reactions to transfer receipts. We can however not exclude that there is no difference in the reaction based on risk attitude. Garbinti and Georges-Kot (2016) suppose that risk attitude plays an important role, their results however do not show statistically significant differences between individuals with high and low levels of risk aversion. Hence, our results also do not back the hypothesis of Brown et al. (2010) that risk attitude explains the non-adjustmet to expectations. The results are likely to depend on the measurement of risk attitudes, as also Garbinti and Georges-Kot (2016) suggest.

Column (5) of table 3.5 shows the results when we discriminate between transfers that are accompanied by a change in credit constraints and those which are not. The interaction does not lead to substantial changes of the main results: The main effects still resemble the estimates from the non-interacted specification. We have also experimented with time-lags and a further interactions with the expectations indicator. The results are however consistent: Credit constraints do not seem to be a major cause for a lack of adjustment to expected transfers.

3.4.4 Simulating the share of the transfer spent on retirement

We here estimate to what degree inheritances are used to retire early. In order to calculate the expected monetary effect of early retirement, the monetary equivalents of the areas $B + D = L$ in figure 3.2 have to be estimated. Since we are focusing on how inheritances finance early retirement, we exclude observations for which our model predicts an extension of the working life after inheritance receipt.[48] Table 3.6 summarizes our results table 3.6 summarizes our results (we report some additional quantities of the simulation in table B.9 in the appendix) and is divided in three parts referring to different sub-samples: The first panel shows the results for all possible observations. Panel *b* restricts the results to only those observations for which we can calculate the opportunity costs of early retirement for heirs. The third panel presents the results for the same subsample of observations under the restriction that the costs of early retirement may not exceed the nominal transfer amount.

First of all, we use our main results from column (2) of table 3.5 for predicting

[47] We assume here that risk attitude is exogenous to expectations on future transfers. Running a three-way interaction with the expectations indicator is not possible due to the sample size.

[48] We thereby exclude 6 observations.

the individual change in the expected retirement age caused by the transfer receipt, i.e. Δx_i (the difference between x_{usual} and x_{early}). For each heir in the dataset we simulate the (hypothetical) expected retirement age if the household had not inherited and deduct from this the estimated retirement age that the model predicts with the actual inherited amounts. Δx_i has a mean of roughly 0.39 years and a median of 0.22 years, as described in column (1) of table 3.6.

Based on the estimate of Δx_i, we calculate the reduction in retirement income as described in section 3.3.3. This is the first component of the costs of early retirement. The second is represented by the foregone labor income: The simulated monthly mean net income at x_{usual} amounts to roughly 1830 Euro.[49] Columns (3)-(5) present different measures for the monetary costs of early retirement in levels: The median of the plain Euro amount of estimated opportunity costs revolves around slightly more than 3500 Euro, the mean varies between 6600 and 6900 Euro.

The mean of area C (reported in the second panel of table B.9) equals 4770 Euro, the mean of area D is 3028 Euro. Our simulation thereby suggests that the decrease in the aggregated statutory pension income, D, is more than offset by the expected prolonged pension receipt for heirs, C. This somewhat surprising finding has also been established by a more detailed study on the penalty term in the German pension system by Bönke et al. (2018) based on administrative pension data.

Relating the costs of early retirement (L) to the size of the inheritance on the individual level yields our estimates in column (4). For 10 % of the sample we observe that the estimated cost of early retirement exceeds the nominal inheritance amounts. Since we focus on the share of the inheritance that is spent on early retirement (which by definition cannot exceed unity), we consider the estimates in the first two panels upwards biased and limit the costs of the early retirement to the inheritance amount. Limiting the costs of early retirement does of course not affect the median which is constantly 36 % of the inheritance. Limiting the costs of early retirement to the transfer amount yields a lower estimate of 50 % for L. That is, we estimate that heirs on average expect to use up half of their receipt for retiring earlier than initially planned. This estimate might appear high, it is however noteworthy that we look here at opportunity costs: It is likely that the expenditure that individuals have to finance in order to retire earlier is below the total foregone income during the early retirement period and therefore the share of the bookkeeping costs to the inherited amount is likely to be much lower. Individuals might thus not perceive to spend half of the inheritance on

[49] Note, that this is the simulated average income at the initial retirement age. Hence, this figure refers to different years and also different ages. The number indicates what individuals can expect to earn, on average, in the period of their initially stated retirement entry age. This figure on average hardly deviates from the income at x_{early} since Δx_i is typically low.

their earlier retirement. Also, the uncertainty that is attached to the estimated future income might lead people to devalue the future income stream. Similarly, the value of the future income stream is subject to the individual's discount rate.

Table 3.6: Simulation results (main model)

	(1) Δ Expected Retirement Age ($\Delta x_i = x_{usual} - x_{early}$)	(2) Estimated Income (at x_{usual})	(3) Cost of Early Retirement (Area $L = B + D$)	(4) Share of Inheritance (L/Inherited Amount)	(5) Share of Capitalized Amount (L/Capitalized Inherited Amount)
Panel a. Baseline					
Mean	.39	1788	6905	.76	.43
Median	.22	1755	3916	.36	.22
Obs.	807	807	262	262	262
Panel b. Subsample					
Mean	.38	1830	6905	.76	.43
Median	.22	1716	3916	.36	.22
Obs.	262	262	262	262	262
Panel c. Subsample with limited loss					
Mean	.38	1830	6602	.50	.30
Median	.22	1716	3550	.36	.22
Obs.	262	262	262	262	262

Based on SAVE 2005-2010, own calculations. Estimates are weighted.
Labelling follows figure 3.2

The last column of table 3.6 shows an attempt to treat the potential discounting problem. Under the assumption that individuals did not fully discount when adjusting their expected retirement age, we capitalize the transfer amount with 3 % per annum until the expected retirement age. This calculation leads to an estimated income loss that has an average size of 43 % of the capitalized inherited amount (panel *b*). Limiting again the costs of early retirement to the inheritance amount yields an estimate of 0.3 (panel *c*). The median equals almost a quarter of the inheritance. Hence, our preferred estimates for the opportunity costs of a moved forward retirement are displayed in the last two columns of panel *c* of table 3.6: We estimate that heirs on average spend one third to one half of their inheritance on an earlier retirement.

Table 3.7 reports the simulation results based on the interaction model (eq. 3.3). Recall that this model extends the main model by interactions between inheritance variables and indicators on having expected to receive a transfer (see table 3.5, column (3)). The reported results should be interpreted with caution, though, as both the estimation of the model and the simulation base on a particularly low number of observations. We report the simulation results here nonetheless for completeness. Note that table 3.7 only contains the *sub-sample with limited loss* case but reports the simulation results separately for heirs that expected to receive a transfer (panel *c*), heirs that did not expect to receive a transfer (panel *b*) and all heirs that stated their expectations (panel *a*). These results are thus conceptually comparable to panel *c* of table 3.6.

Table 3.7: Simulation results (expectations model), sub-sample with limited loss only

	(1) Δ Expected Retirement Age ($\Delta x_i = x_{usual} - x_{early}$)	(2) Estimated Income (at x_{usual})	(3) Cost of Early Retirement (Area $L = B + D$)	(4) Share of Inheritance (L/Inherited Amount)	(5) Share of Capitalized Amount (L/Capitalized Inherited Amount)
Panel a. All possible observations					
Mean	.39	1803	6803	.44	.27
Median	.17	1753	3354	.22	.15
Obs.	110	110	110	110	110
Panel b. Heirs not expecting a transfer					
Mean	.15	1763	2476	.67	.42
Median	.16	1753	2101	.75	.45
Obs.	64	64	64	64	64
Panel c. Heirs expecting a transfer					
Mean	.72	1860	12877	.11	.07
Median	.75	1856	11960	.10	.06
Obs.	46	46	46	46	46

Based on SAVE 2005-2010, own calculations. Estimates are weighted.
Labelling follows figure 3.2

The pattern in panel *a* strongly resembles the corresponding results in panel *c* of the main simulation with a mean of a little less than 1/3. The results however seem to vary massively based on the expectations status: While heirs that expected to receive a transfer react strongly in absolute terms (col. (1), panel (*c*)) and thus also face high absolute costs (col. (3)), their relative costs, measured in the inheritance, are much lower than those for the non-expecting heirs. The main reason for this divergence is the size of inheritances in the two groups: The average expected inheritance amounts to 111T Euro in contrast to an average unexpected transfer of only 5500 Euro.[50] Also, the point estimate for the average expected retirement age is slightly smaller for the group of expecting heirs *before* receipt, what suggests that they might have already counted in a part of their expected inheritance. While admittedly based on weak evidence, the simulation might however help to solve the riddle about heirs not adjusting to their expectations: The strong absolute reaction suggests that heirs did not adjust to their expected transfers. The low relative share of the inheritance that these heirs then actually raise for an earlier retirement is however small, which suggests that they either already did adjust in some respect[51] or that they prefer to spend their inheritance on other goods.

3.5 Robustness

3.5.1 Endogenous wealth

Our main results are based on estimations in which we excluded wealth[52] as a control variable due to the high likelihood of endogeneity of this variable. Individuals might save a lot over their life-cycle and therefore acquire more wealth *in order to leave the workforce early.* Including wealth as an additional control might be problematic as the inclusion of an endogenous variable can render our estimates for the influence of the transfer biased. On the other hand, excluding wealth as control variable can introduce a bias, too: Wolff and Gittleman (2014) show that the chance of receiving a transfer correlates with wealth. Hence, when households that have other large changes in wealth are also more likely to receive large transfers, then our inheritance estimate will be biased. A similar argument could be made with respect to income. In this subsection we present a robustness check to see how severe the problem might be for

[50] Again, note that the low number of observations leads to somewhat misleadingly low average inheritances. These values however provide the intuition behind table 3.7.

[51] This might also be through already lowered expected retirement ages. If this logic would apply, we would however also expect the dummy estimate in a more accurately estimated model to indicate a lower expected retirement age of expecting heirs (irrespective of the size of the inheritance).

[52] We explore the concept of wealth in the SAVE data further in the appendix section B.3.1.3.

our baseline results.

Columns (1)-(3) of table 3.8 show the results for our baseline fixed effect specification that correspond to the model underlying column (2) in table 3.5, i.e. including an inheritance dummy and the respective amount in linear and squared terms. We exclude $log(Net\ Income)$ here as control variable in column (1), column (2) again shows the results from table 3.5 (i.e. our main results), and column (3) additionally includes the inverse hyperbolic sine transformed[53] wealth of the household. Overall the results are reassuring that the coefficients and standard errors of our main variables of interest remain almost identical across the three estimations. Excluding wealth (and including income) in our main specification therefore seems unlikely to cause problems. The fixed effect estimator already should control for general wealth and other changes in wealth seem to be orthogonal to transfers.

Table 3.8: Expected Retirement age - Endogenous wealth

	(1)	(2)	(3)
Dependent Variable: Expected Retirement Age			
Estimation Method:	FE	FE	FE
Non-zero Inheritance Received=1	-0.110	-0.111	-0.096
	(0.1817)	(0.1817)	(0.1809)
Total Inheritance in 10T Euro	-0.084***	-0.084***	-0.082***
	(0.0266)	(0.0266)	(0.0266)
Total Inheritance in 10T Euro × Total Inheritance in 10T Euro	0.001***	0.001***	0.001***
	(0.0002)	(0.0002)	(0.0002)
Log(Net Income)		-0.072	-0.064
		(0.0870)	(0.0864)
Log(Wealth+Sqrt(Wealth^2+1)			-0.076*
			(0.0426)
Year FE	YES	YES	YES
Additional Controls	YES	YES	YES
Number of Observations	16766	16766	16766
Number of Groups	4798	4798	4798

1 The table shows results of Linear Fixed Effect estimations, where the dependent variable is the expected retirement age. All estimations are based on a sample of individuals that are not retired in the first observation period. The estimations include a third order polynomial of age, an indicator for having children, the number of children in the household, for indicators for self-evaluated health status, indicators for being self-employed, civil servant and region (East/West) as control variables.
2 Standard errors account for clustering on the household level in columns.
3 Estimations are based on a multiple imputed dataset (5 imputations).
4 Estimations are based on SAVE 2005-2010.
5 Coefficients marked with *,**,*** are statistically significant at the 10, 5, 1 percent level.

[53] The inverse hyperbolic sine transformation is an alternative to log-transformations, that prevents us from discarding wealth-observations with non-positive values.

3.5.2 Longevity of effect

One might ask whether the effect of a received inheritance on the expected retirement age sustains or whether the individual behavioral reaction after transfer receipt is only of a temporary nature. Assuming that the individuals in our data set are rational and optimize behavior over their entire life-cycle, we expect to see lasting effects. We try to test the longevity of the effect by using a simple distributed lag model as illustrated by the results in table 3.9: Column (1) replicates the dummy regression result from table 3.5, in which the effect of the transfer receipt is only captured by a single dummy indicating transfer receipt. Column (2) then adds a lagged dummy to the model, column (3) another lag.[54] Note that the sum of the point estimates of the lagged parameters yields the *long term* effect of the transfer receipt. In fact, adding the first lag does not warrant concerns of an only temporary effect. The point estimate remains rather stable, albeit losing its statistical significance (the estimates are jointly insignificant on all conventional levels). Specifying additionally the second lag does also not point to changes in the effect direction. Introducing the lags however naturally reduces the number of observations strongly. The lack of statistical significance may thus be attributable to a power issue. In this case, we would expect to see the long term effect being statistically significant and continuously negative with sufficient observations.

3.5.3 Household level: Controlling for the behavior of the partner

As described in section 3.3, we run our analysis on the individual level and assign transfers of the household level to both spouses. Household members might well act as a single economic unit, responding in a coordinated manner to the transfer receipt. If spouses however do not react to transfers on the household level (which would be in line with the findings by Blau and Goodstein (2016)), we might underestimate the effect. Also, the sequence of the retirement decision might matter: Having an already retired partner might make an earlier retirement much more desirable. We try to accommodate such concerns by, first, analyzing the impact of transfer receipt on the behavior of single households and, second, by collapsing our sample along the household dimension and focusing on the response of the household's head in the expected retirement age while controlling for characteristics of the partner. Results are presented in table 3.10. The reader should note that all of the following tests entail significant reductions in the sample size and partly focus on specific sub-samples as singles.

[54] We choose to illustrate the longevity of the effect by this simple model. Using the more complex main specification would require to lag both dummy and linear and squared terms which leads to a quite cumbersome interpretation. The results are similar.

Table 3.9: Longevity of effect

	(1)	(2)	(3)
Dependent Variable: Expected Retirement Age			
Estimation Method:	FE	FE	FE
Non-zero Inheritance Received=1			
Receipt in period t	-0.348**	-0.163	-0.226
	(0.1663)	(0.1743)	(0.2442)
Receipt in period $t-1$		-0.219	-0.263
		(0.1559)	(0.1960)
Receipt in period $t-2$			0.004
			(0.1940)
Year FE	YES	YES	YES
Additional Controls	YES	YES	YES
Number of Observations	16766	12084	8596
Number Groups	4798	3647	3031

[1] The table shows results of Linear Fixed Effect estimations, where the dependent variable is the expected retirement age. All estimations are based on a sample of individuals that are not retired in the first observation period. The estimations include a third order polynomial of age, an indicator for having children, the number of children in the household, for indicators for self-evaluated health status, indicators for being self-employed, civil servant and region (East/West) as control variables.
[2] Standard errors account for clustering on the household level in columns.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with *,**,*** are statistically significant at the 10, 5, 1 percent level.

Retirement behavior of partner Generally, already retired partners or partner currently retiring may reinforce the impact of a transfer receipt, strengthening the desire for an earlier labor market exit. Columns (1)-(4) of table 3.10 present results for testing different scenarios of the partner's retirement behavior. Column (1) here serves as a baseline for the household level analysis: It is restricted to the sample used in column (2) but does not control for the retirement behavior of the partner and, in this, is comparable to the main results. First, compared to the main specification, these household level results base on less than half of the original sample.[55] Most of the parameters are not statistically significant anymore. The effect size is slightly reduced, the effect direction, however, carries over: Receiving the average inheritance of roughly 40.000 Euro reduces c.p. and on average the expected retirement age (of the household head) by 0.16 years ($\approx$ 2 months). Controlling then for the partner having been retired in the previous period (col. (2)), the partner having retired in the previous period (col. (3)) or the partner retiring in the very period of receipt (col. (4)) does virtually not alter the effect. This finding suggests that individuals already take the plans of their

[55] Recall that additionally to restricting to the household level, the lag, as it is used in the model underlying col. (2), further reduces the sample size. Singles are not excluded.

partner into account when stating their expected retirement age.

Singles In order get an understanding of the effect independent of interactions and economic coordination with partners, we can resort to the analysis of households of singles only, i.e. households of unmarried individuals.[56] Column (5) of table 3.10 displays the corresponding result: While the shape of the effect appears different to the main results, there is still a strong negative intercept. While being particularly inaccurately estimated, the effect size does not suggest that our individual level analysis tends to underestimate the results considerably. We are rather confident that our individual level analysis provides us with a more accurate depiction of individual responses.

Expectations of the partner Lastly, column (6) of table 3.10 presents results for regressing the expected retirement age of the household head on the usual controls and the expected retirement age of its partner. The effect of the transfer receipt on the expected retirement age decreases strongly and is, for example, virtually zero when assuming that the household receives the mean inheritance. This observation is however not surprising: Conditioning on the partners expected retirement age may mean to condition on the effect itself, when partners optimize the common behavior.[57]

3.5.4 Excluding individuals close to retirement

The reader might also suspect that our results are mainly driven by those individuals who are already close to their expected retirement age and thus have a more specific notion of retiring soon. This would question our results, as we argue that our results generally reflect the behavioral adjustment over the entire life cycle. We thus exclude the individuals above 60. The results are presented in table B.8 in the appendix. The results are robust to the exclusion of this age group: Shape and accuracy of the effect are virtually unchanged, albeit slightly less pronounced.

3.5.5 Simulation

The simulation results from our main model (see table 3.6) suggest that the area C is only slightly bigger than D. The reduced public pension entitlement is typically fully compensated by the prolonged pension receipt. The calculation of these areas,

[56] While many couples might coordinate their economic behavior even without being married, marriage still seems to be the key indicator for the economic coordination of couples (compared to e.g. analyzing households with only a single member, which is not done here).

[57] The estimation is in anyway only reasonable when assuming the exogeneity of the partners expected retirement age. Otherwise, the estimation will clearly suffer from a severe simultaneity bias. This is also the reason why we abstain from a detailed discussion of this estimation.

Table 3.10: Household level analysis

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable: Expected Retirement Age (ERA) Household Head						
		Retirement Partner			*Singles*	*ERA Partner*
Inheritance Received	0.292	0.288	0.263	0.258	-0.350	0.279
	(0.2348)	(0.2347)	(0.2895)	(0.2893)	(0.3535)	(0.2412)
Inherited Amount	-0.119*	-0.118*	-0.112	-0.112	0.016	-0.068
	(0.0692)	(0.0691)	(0.0691)	(0.0693)	(0.0536)	(0.0445)
Inherited Amount squared	0.004	0.004	0.005**	0.005**	-0.000	0.001**
	(0.0027)	(0.0027)	(0.0021)	(0.0021)	(0.0004)	(0.0003)
Partner was retired in $t-1$		0.263				
		0.3038				
Partner retired in $t-1$			0.294			
			0.3437			
Partner retires in t				-0.152		
				(0.2454)		
ERA Partner						0.302***
						(0.0365)
Year FE	YES	YES	YES	YES	YES	YES
Additional Controls	YES	YES	YES	YES	YES	YES
Estimation Method:	FE	FE	FE	FE	FE	FE
Number of Observations	7012	7012	5819	5819	3880	6045
Number Groups	2074	2074	1918	1918	1268	1814

[1] The table shows results of Linear Fixed Effect estimations, where the dependent variable is the expected retirement age. All estimations are based on a sample of individuals that are not retired in the first observation period. The estimations include a third order polynomial of age, an indicator for having children, the number of children in the household, for indicators for self-evaluated health status, indicators for being self-employed, civil servant and region (East/West) as control variables.
[2] Standard errors account for clustering on the household level in columns.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with *,**,*** are statistically significant at the 10, 5, 1 percent level.

however, comes at the cost of losing a considerable amount of observations. The reason for this is that we use the information on the pension income from the period before the transfer receipt. Table 3.11 shows our results when swapping areas C and D which increases the sample size for our simulation considerably.

Table 3.11: Robustness simulation results

	(1) Change in Expected Retirement Age ($x_{usual} - x_{early}$)	(2) Estimated Income (at x_{usual})	(3) Foregone Labor Income (Area $B+C$)	(4) Share of Inheritance ($(B+C)$/Amount)	(5) Share of capitalized Inheritance ($(B+C)$/Capitalized Amount)
Panel a. Baseline					
Mean	.39	1788	8612	.94	.68
Median	.22	1755	5023	.47	.34
Obs.	807	807	782	782	782
Panel b. Subsample					
Mean	.39	1804	8612	.94	.68
Median	.22	1792	5023	.47	.34
Obs.	782	782	782	782	782
Panel c. Subsample with limited loss					
Mean	.39	1804	8140	.55	.46
Median	.22	1792	4597	.47	.34
Obs.	782	782	782	782	782

Based on SAVE 2005-2010, own calculations. Estimates are weighted.

Our preferred estimates in panel *c* are slightly bigger than our previous estimations. Note however, that this robustness test will slightly overstate the costs of an earlier retirement as area C on average is bigger than area D (see table B.9 in the appendix). We interpret these results thus as an upper bound result which would prevail if the penalty term in the statutory pension system would not allow retirees to benefit from early retirement. After all, the estimates are still close to our main simulation results.

3.6 Discussion of results

3.6.1 Main findings

The main purpose of this paper is to quantify the effect of inheritance receipts on the extensive margin of the labor supply of heirs. One of the most remarkable findings in the literature is the ambiguous role of expectations: No paper has so far succeeded in fully backing up the theoretically obvious presumption that unexpected transfers should have a stronger effect on labor market participation than expected transfers (which could have no effect at all if heirs would be risk neutral). While there is only weak empirical evidence in this regard in the literature (Brown et al., 2010; Garbinti and Georges-Kot, 2016), also our paper cannot credibly establish such a relationship. Whether risk attitudes and credit constraints qualify to explain this finding would have required to interact *expectations on transfers* with e.g. *risk attitude* and the actual transfer amount. The sample size of our data set does not allow such an analysis. Our tests with *credit constraints* and *risk attitudes* nonetheless suggest that neither of these variables has a major explanatory power for the labor supply reaction of heirs.

Our analysis however contributes to the understanding of the role of expectations in the retirement behavior: First, we do not look at the actual retirement, but at the *expected* retirement age, which allows us to take reactions of younger age groups into account. And also here, individuals that received an expected inheritance adjust *after* the actual receipt. Only then they adjust their life-time consumption plan. When receiving inheritances without having expected to do so, individuals do not react immediately, but rather seem to need some time to consider the opportunities of this wealth shock. Further difficulties might be that inheritances can also have a genuine value for the specific family. Own bequest motives and the expectations of the preceding generation might thus prevent individuals from an immediate adjustment. Uncertainty (instead of calculable risk) about the wealth of parents might add to the complex situation the heir is in.

We thus base our simulation of the opportunity costs of an earlier retirement on the model that is not specifying whether transfers might have been expected. The model predicts that individuals expect to retire on average four to five months earlier than initially stated due to their wealth gain. Following Brown et al. (2010), we can interpret this as indication that leisure is a normal good: The transfer receipt loosens the intertemporal budget constraint and renders people demanding more free time. Rescaling these estimates by taking the corresponding financial losses into account then reveals that this is a quite sizable effect. The average effect of five months translates into costs that amount to one third of the total inheritance. Among all items of potential consumption, leisure seems to be especially popular.

One might oppose, that this estimate is too high. And, indeed, it only reflects *expected* and not yet actual changes in the retirement age. As argued above, it is also well possible that individuals do not perceive to implicitly spend one third of their transfer on a moving forward of early retirement: They only give up labor income, that they do not yet have earned in return for the very certain gain of leisure. While these losses are costs from an economic point of view, individuals might also rather focus on the sheer bookkeeping costs, which are presented by the difference between area D (representing the decreased statutory pension entitlement) and C (representing the gains of a longer receipt of the statutory pension) in figure 3.2. Our calculations however predict that these areas are, on average and given the most likely development of life expectancies and given the individually expected deviations from these estimations, of almost the same size. The bookkeeping costs of an earlier retirement are thus surprisingly low for the average estimate of anticipated retirement entry (Δx_i).

3.6.2 Policy implications

We introduced the paper with a brief overview of the recent discussion about the consequences of future inheritance flows in western societies for dimensions like inequality, efficiency and social mobility. In this regard, the economic costs of earlier retirement entries of heirs are most interesting. Our estimates reveal a high taste of individuals for leisure. Heirs thus apparently work less and in consequence are likely to accumulate less income and lower savings. The consequences of the awaited inheritance boom in western societies might therefore be strongly balanced by the strong taste of heirs for leisure. The inequality introduced through inheritances thus partly materializes in the retirement behavior (and to a lesser extend in dimensions like wealth inequality): Heirs will be better able to compensate decreasing replacement rates in statutory pension schemes and will rather be able to benefit from early retirement.

If inheritance flows increase and heirs widely decide to move their retirement entry age forward, then this clearly counteracts recent political attempts in Europe's societies to extend working lives and to foster employment rates of elderly people. In view of this political goal, it seems odd that individuals can extend their total pension wealth by retiring early.[58] Increasing inheritance flows might reinforce early retirement and might thus exacerbate the demographic burden on public pension funds. An adjustment of the penalty term on statutory pension entitlements for early retirement entries thus appears conceivable.

Finally, if individuals expect to spend a third of their inheritance on a moving forward of their retirement entry, still 70 % of the wealth gain remains. Life-cycle theory predicts that individuals will also increase their life-time consumption level. Empirical papers suggest that also the intensive margin of labor supply is decreasing after transfer receipt (Elinder et al., 2012). The unknown remaining share of the transfer then might eventually be bequeathed again.[59] An interesting task for future research would thus be to further decompose how individuals treat the remaining 70 % of their inheritances.

3.7 Conclusion

The current paper uses the SAVE panel data set from Germany in order to estimate the effect of wealth shocks on the extensive margin of labor supply decisions. Specifically, we exploit the receipt of intergenerational transfers as variation in wealth and use actual retirement entry and the stated *expected* retirement age as variation in labor supply.

We develop our paper closely to the results of the quickly growing literature in this field and find confirming evidence for the general finding: Intergenerational transfers translate in a significant reduction of the actual labor market participation. Our results show that individuals on average leave the labor market four to five months before their actually planned retirement. Our paper also tests the robustness of this general finding to expectations about transfer receipt, risk attitude and credit constraints. While expectations about transfers primarily matter for the timing of the behavioral response, also the effect size seems to be stronger for unexpected transfers. We however do not find evidence that risk attitudes or credit constraints have significant explanatory power for the adjustment behavior to expected receipts.

We finally provide a simulation study for which we use predicted wages on the verge to retirement in order to monetize the financial costs of the estimated moved forward retirement entry. Specifically, we calculate the pension losses for the rest of

[58] Our calculations also already take the increasing statutory pension entry age into account.
[59] The SAVE data, in fact, also surveys whether individuals save in order to bequeath.

the remaining life expectancy and the income losses due to the earlier retirement. We find that heirs on average are willing to spend, ceteris paribus, around 30 % of their transfer on the anticipated pension entry.

The early exit from the labor supply remains only one among several channels through which individuals can respond to wealth gains. It would be particularly worthwhile to study in further detail how heirs allocate the remaining share of their wealth gains.

B.3 Appendix

B.3.1 Data

B.3.1.1 Expected retirement age and actual retirement

As explained above, the plain comparison of expected retirement age and observed retirement is mechanically biased toward an overestimation of the retirement age. We try to partly purify this statistic in the following: For all individuals that we observe entering retirement, we calculate the difference between their actual retirement age and their previously stated expected retirement ages for all available time periods. The unconditional mean of this variable is due to the described mechanics significantly negative. Excluding however observations that enter retirement already before 55[60] and conditioning on health status (as health shocks might force individuals to deviate from their expectations), leaves the difference between expected stated retirement ages and observed retirement age insignificant. The point estimate equals −3 with a standard error of 2.14. The inaccuracy in this estimate is considerable. Note however that the set of individuals actually observed entering retirement is only a small sub-sample (comprising 851 individuals) of the total sample stating their expected retirement age.

Table B.1: Observed retirement

	2005	2006	2007	2008	2009	2010	Total
a. All cases							
Incidents	.	110	202	181	165	193	851
b. Age of observed retired							
Mean	.	65.26	63.7	62.33	64.11	62.78	63.49
Std. Err.	.	10.56	10.34	10.97	11.47	12.87	11.32
c. Mean of previously stated expected retirement ages							
Mean	.	63.46	64.36	64.44	65.45	64.22	64.22
Std. Err.	.	3.26	4.66	4.09	4.81	3.66	4.67

Based on SAVE 2005-2010, own calculations. Estimates are weighted.
Due to the lack of preceding labor market information, we ignore cases of individuals retired in 2005.

Table B.1 summarizes information about the actually observed cases of retiring individuals, the average of their stated expectations over time and their actual retirement age. The given statistics can hardly proof that individuals state their expectations with the desired caution, they however seem to indicate that there are no major systematic differences between stated expected retirement ages and the actual behavior of

[60] Which is an extraordinary early age for our sample, as depicted by figure 3.1 in the appendix.

individuals. Generally, people seem to plan rather accurately when to retire.

B.3.1.2 Expectations of transfers

Table B.2: Share of receiving individuals, by previously stated probability:

Stated probability to receive within 2 periods:	.0	.1	.2	.3	.4	.5	.6	.7	.8	.9	1
Cases	11482	950	512	260	113	420	75	88	91	50	212
Mean	.05	.05	.10	.11	.05	.17	.17	.19	.22	.24	.17
St. Dev.	.22	.23	.30	.31	.20	.37	.37	.39	.41	.43	.38

Based on SAVE 2005-2010, own calculations. Estimates are weighted.

B.3.1.3 The wealth concept in the SAVE data

The wealth information in the SAVE data covers assets and liabilities on the household level and differentiates between the main wealth types. The SAVE data generally differentiates between financial, real estate wealth and business assets. Financial wealth covers deposits, building society and life insurance assets, value of other private retirement savings, value of bonds, stocks and real estate funds, state-subsidized savings (so called *Riester Rente*), value of other financial savings. Real estate wealth contains the value of the households main residence and other real estates. Liabilities comprise value of mortgage loans, value of building society loans, value of consumption loans (cars, credit cards, ...), value of family and other loans. In a robustness check, we use net wealth which is the sum of all assets net of all liabilities of the household as control variable in the regressions. As reported in table B.3 the median wealth is around 68,000 Euro.[61]

[61] Generally, it seems difficult to compare wealth measures across different data sets. While the median wealth in the SAVE deviates from the SOEP wealth estimate ($\approx$ 15.000 Euro in 2007), it comes close to the estimate based on the PHF data (67,900 Euro in 2013)(Deutsche Bundesbank, 2013).

B.3.1.4 Descriptives control variables

Table B.3: Descriptives - Control variables (Part I)

	Mean	St. Dev.	Median	Min	Max
a. All Observations:					
Age	50.92656	15.74711	50	18	98
Wealth	185431.1	569364.6	67706.9	-4204975	27000000
Individual Net Income	1397.354	1322.675	1171.459	0	43243.24
HH Net Income	2403.055	1817.404	2122.471	0	43243.24
East Germany	.2821663	.4500625	0	0	1
Male	.4752042	.4993944	0	0	1
Number of Children	1.784322	1.393685	2	0	13
Married	.6723296	.4693729	1	0	1
Educational Attainment					
Tertiary	.1527594	.3597623	0	0	1
Abitur	.2627476	.4401349	0	0	1
Apprenticeship	.6938056	.4609203	1	0	1
No Regular Employment					
Selfemployed	.0391806	.1940281	0	0	1
Civil Servant	.036205	.1868034	0	0	1
Unemployed	.0815199	.2736371	0	0	1
Health Status					
very good	.0927334	.2900641	0	0	1
good	.455824	.4980542	0	0	1
mediocre	.346289	.4757958	0	0	1
rather bad	.083024	.2759238	0	0	1
bad	.0221295	.1471075	0	0	1
Risk Aversion and Credit Constraints					
Riskneutral	.0655312	.2474683	0	0	1
Riskavers=1	.0296791	.1697055	0	0	1
Riskavers=2	.1204586	.3255069	0	0	1
Riskavers=3	.7759013	.417	1	0	1
Constrained	.1254346	.3312174	0	0	1

Based on SAVE 2005-2010, own calculations. Estimates are weighted.

[1] Heirs are considered heirs if they have received an inheritance in the current or any previous period.

Descriptives - Control variables (Part II)

b. Heirs[1]:					
Age	54.8437	13.66648	55	21	93
Net Wealth	288228.8	589289	177939.7	-419093.3	1.18e+07
Individual Net Income	1705.381	1668.929	1460.446	0	24750
HH net Income	2878.702	1985.444	2591.051	250	25000
East Germany	.2309154	.4215075	0	0	1
Male	.5460219	.4979827	1	0	1
Number of Children	1.931367	1.288192	2	0	12
Married	.7559775	.4295969	1	0	1
Educational Attainment					
Tertiary	.2231429	.4164414	0	0	1
Abitur	.3163508	.4651499	0	0	1
Apprenticeship	.6681641	.4709719	1	0	1
No Regular Employment					
Selfemployed	.0433705	.2037328	0	0	1
Civil Servant	.0520162	.2221067	0	0	1
Unemployed	.084976	.2788519	0	0	1
Health Status					
very good	.0983533	.2978547	0	0	1
good	.452897	.4978815	0	0	1
mediocre	.3368957	.4727488	0	0	1
rather bad	.0919253	.2889815	0	0	1
bad	.0199286	.1397845	0	0	1
Risk Aversion and Credit Constraints					
Riskneutral	.0447226	.2067608	0	0	1
Riskavers=1	.0282696	.1657955	0	0	1
Riskavers=2	.1843174	.3878679	0	0	1
Riskavers=3	.7392302	.4391962	1	0	1
Constrained	.0727873	.2598419	0	0	1

Based on SAVE 2005-2010, own calculations. Estimates are weighted.

[1] Heirs are considered heirs if they have received an inheritance in the current or any previous period.

Table B.4: Regular retirement entry in Germany by birth year

Birth Year	**Regular Retirement Age**
<1947	65
1947	65 and 1 month
1948	65 and 2 months
1949	65 and 3 months
1950	65 and 4 months
1951	65 and 5 months
1952	65 and 6 months
1953	65 and 7 months
1954	65 and 8 months
1955	65 and 9 months
1956	65 and 10 months
1957	65 and 11 months
1958	66 month
1959	66 month and 2 months
1960	66 month and 4 months
1961	66 month and 6 months
1962	66 month and 8 months
1963	66 month and 10 months
>1963	67

[1] Source: Deutsche Rentenversicherung

B.3.2 Auxiliary regressions

Table B.5: Expected percentage of income in retirement simulation - OLS results

Dependent Variable: Expected Percentage of Current Income in Retirement	
BC 1	3.266
	(2.3623)
BC 2	7.362**
	(0.8756)
BC 3	7.301**
	(0.7000)
BC 4	3.563**
	(0.6314)
Civil	8.198**
	(0.6418)
Selfemployed	-9.884**
	(1.8990)
Expected Retirement Age	1.394
	(0.8710)
Exp. Retir. Age × Exp. Retir. Age	-0.012+
	(0.0065)
Unemployed	0.457
	(1.0224)
Fulltime Employment	3.763**
	(0.6375)
Income	-0.000
	(0.0003)
Income × Income	-0.000
	(0.0000)
Children Dummy	2.248**
	(0.7209)
Number of Children	-0.437*
	(0.2189)
Married and Living Together	-0.328
	(0.4899)
College/University Degree	0.253
	(1.2578)
abitur	-2.866**
	(0.6478)
Apprenticeship	1.189
	(0.9320)
Never Unemployed	1.491**
	(0.5306)
Longterm Unemployed	-1.854*
	(0.7453)
east=1	-0.618
	(0.5772)
Jahr=2006	1.325+
	(0.7894)
Jahr=2007	2.808**
	(0.7487)
Jahr=2008	3.765**
	(0.7444)
Jahr=2009	4.374**
	(0.8424)
Year FE	YES
Additional Controls	NO
Number of Observations	5168

[1] The table shows the result of a OLS estimation when the dependent variable is the expected percentage of current income during retirement.
[2] Standard errors account for clustering on the household and individual level.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with +,*,** are statistically significant under the 10, 5, 1 percent significance level.

Table B.6: Risk measure credibility check - OLS results

Dependent Variable: Indicator for Owning Risky Financial Assets	
Risk Preferences	
riskavers=1	-0.052**
	(0.0170)
riskavers=2	-0.052**
	(0.0123)
riskavers=3	-0.055**
	(0.0108)
Other Variables	
Male	-0.033**
	(0.0047)
Age	0.011**
	(0.0041)
Age × Age	-0.000**
	(0.0001)
Age × Age × Age	0.000**
	(0.0000)
Log(Net Income)	-0.009*
	(0.0036)
Log(Wealth)	0.024**
	(0.0016)
Health Status 'very good'	-0.017
	(0.0182)
Health Status 'good'	-0.007
	(0.0170)
Health Status 'mediocre'	0.003
	(0.0169)
Health Status 'rather bad'	-0.005
	(0.0183)
Never Unemployed	0.003
	(0.0056)
Longterm Unemployed	-0.007
	(0.0067)
Selfemployed=1	0.048**
	(0.0135)
civil=1	-0.041**
	(0.0100)
east=1	0.022**
	(0.0053)
Constant	-0.035
	(0.0657)
Year FE	YES
Additional Controls	NO
Number of Observations	16368

[1] The table shows the result of a OLS estimation when the dependent variable is an indicator for owning risky financial assets (stocks, funds, certificates, etc.).
[2] Standard errors account for clustering on the household and individual level.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with +,*,** are statistically significant under the 10, 5, 1 percent significance level.

Table B.7: Income simulation - OLS results

Dependent Variable: Log(Individual Net Income)	
Age	0.239**
	(0.0326)
Age × Age	-0.004**
	(0.0007)
Age × Age × Age	0.000**
	(0.0000)
education=1	3.099**
	(0.5670)
education=2	0.343
	(0.6775)
education=3	0.916
	(0.7645)
education=1 × Age	-0.168**
	(0.0372)
education=2 × Age	-0.011
	(0.0458)
education=3 × Age	-0.027
	(0.0494)
education=1 × Age × Age	0.003**
	(0.0008)
education=2 × Age × Age	0.000
	(0.0010)
education=3 × Age × Age	0.000
	(0.0010)
education=1 × Age × Age × Age	-0.000**
	(0.0000)
education=2 × Age × Age × Age	-0.000
	(0.0000)
education=3 × Age × Age × Age	-0.000
	(0.0000)
Male	0.542**
	(0.0126)
Children Dummy	0.038*
	(0.0190)
Number of Children in HH	0.068**
	(0.0152)
Number of HH Members	-0.069**
	(0.0130)
Married and Living Together	-0.163**
	(0.0158)
Health Status 'very good'	0.240**
	(0.0707)
Health Status 'good'	0.192**
	(0.0681)
Health Status 'mediocre'	0.140*
	(0.0683)
Health Status 'rather bad'	0.093
	(0.0718)
Selfemployed	0.053
	(0.0325)
Civil	0.261**
	(0.0248)
Never Unemployed	0.043**
	(0.0138)
Longterm Unemployed	-0.285**
	(0.0179)
East	-0.155**
	(0.0138)
Year FE	YES
Additional Controls	NO
Number of Observations	14934

[1] Result from an OLS estimation with the log of the individuals' net income as dep. var. (if the individ. is not retired).
[2] Stand. err. account for clustering on the household and individ. level.
[3] Estimations are based on a multiple imputed dataset (5 imputations).
[4] Estimations are based on SAVE 2005-2010.
[5] Coefficients marked with +,*,** are statistically significant under the 10, 5, 1 percent significance level.

Table B.8: Expected retirement age - FE estimation - Plus 60 excluded

Dependent Variable: Expected Retirement Age	(1)	(2)
Specificaiton	Baseline	Plus 60 excluded
Non-zero Inheritance Received=0	0.000	0.000
	(.)	(.)
Non-zero Inheritance Received=1	-0.111	-0.096
	(0.1817)	(0.1940)
Total Inheritance in 10T Euro	-0.084**	-0.078**
	(0.0266)	(0.0271)
Total Inheritance in 10T Euro × Total Inheritance in 10T Euro	0.001**	0.001**
	(0.0002)	(0.0002)
Age	0.808**	0.218
	(0.3022)	(0.3106)
Age × Age	-0.017*	-0.002
	(0.0078)	(0.0077)
Age × Age × Age	0.000+	-0.000
	(0.0001)	(0.0001)
rag	0.126	0.087
	(0.0906)	(0.1118)
Log(Net Income)	-0.072	-0.070
	(0.0870)	(0.0889)
Health Status 'very good'	1.092+	0.841
	(0.5767)	(0.5846)
Health Status 'good'	1.091+	0.853
	(0.5678)	(0.5738)
Health Status 'mediocre'	1.078+	0.816
	(0.5662)	(0.5692)
Health Status 'rather bad'	1.171*	0.895
	(0.5460)	(0.5629)
never UnEmployed	0.005	-0.021
	(0.1160)	(0.1202)
longterm UnEmployed	0.018	0.055
	(0.1163)	(0.1210)
College/University Degree	-0.128	-0.128
	(0.2221)	(0.2338)
abitur	0.234	0.250
	(0.2055)	(0.2235)
Apprenticeship	0.103	0.079
	(0.1723)	(0.1749)
Selfemployed	-0.104	-0.149
	(0.1832)	(0.1931)
civil	-0.229	-0.314
	(0.3785)	(0.4349)
Jahr=2005	0.000	0.000
	(.)	(.)
Jahr=2006	0.337**	0.529**
	(0.1302)	(0.1386)
Jahr=2007	0.592**	0.922**
	(0.1900)	(0.2680)
Jahr=2008	0.447*	0.809*
	(0.2255)	(0.3296)
Jahr=2009	0.522+	0.913*
	(0.2857)	(0.4108)
Jahr=2010	0.291	0.736
	(0.3351)	(0.4878)
east=0	0.000	0.000
	(.)	(.)
east=1	0.107	0.007
	(0.3768)	(0.3566)
cons	42.321**	53.691**
	(6.6550)	(8.9606)
Number of Observations	16766	15626
Number of groups	4798	4397

Standard errors account for clustering on the household and individual level.
Estimations are based on a multiple imputed dataset (5 imputations).
Estimations are based on SAVE 2005-2010.
Coefficients marked with +,*,** are statistically significant under the 10, 5, 1 percent significance level.

B.3.3 Simulation: detailed results

Table B.9: Detailed simulation results (main model)

	Estimated Income (at x_{usual})	*Costs of early retirement* Total[1] Cost ($L = B + D$)	Foregone income (B)	Pension loss (D)	Extended pension take up (C)	*Relative costs of early retirement* Share of Inheritance (L/Inherited Amount)	Share of Capitalized Amount (L/Capitalized Inherited Amount)
Baseline							
Mean	1788	6905	4088	2192	4867	.76	.43
Median	1755	3916	2503	473	2467	.36	.22
Obs.	807	262	373	364	383	262	262
Subsample							
Mean	1830	6905	3845	3028	4770	.76	.43
Median	1716	3916	2503	1177	2472	.36	.22
Obs.	262	262	262	240	262	262	262
Subsample with limited loss							
Mean	1830	6602	3656	3028	4770	.50	.30
Median	1716	3550	2195	1177	2472	.36	.22
Obs.	262	262	262	240	262	262	262

Based on SAVE 2005-2010, own calculations. Estimates are weighted.

[1] Note that the areas L, B, C, D are calculated individually, hence summing up average areas $\bar{B} + \bar{D}$ does not necessarily yield $\bar{L}$. Labelling follows figure 3.2

Chapter 4

Intergenerational transfers: How do they shape the German wealth distribution?

4.1 Introduction

Recent research in economics has paid a lot of attention to wealth and its transmission through inheritances and gifts. While the studies of Piketty (2011) and Piketty and Zucman (2015) enquire into the scale of future aggregate transmissions, other studies have focused on the effects of intergenerational transfers[1] on the inequality in the distribution of households' net wealth.[2] Particularly the contributions by Boserup et al. (2016a), Elinder et al. (2018) and Wolff and Gittleman (2014) reveal the ambivalent nature of intergenerational transfers: Transfer accrual and transfer scale typically correlate positively with the net-of-transfer wealth of households (a pattern I will refer to as the *incidence effect* of transfer accrual). Richer households are hence more likely to receive transfers and are more likely to receive sizeable transfers than poorer households. Inheritances thus disequalize the absolute inequality in the wealth distribution. The corresponding effect on relative wealth inequality however is different: As the relative transfer size tends to decrease with net-of-transfer wealth, poorer households are more likely to receive higher relative bequests. The cited papers consistently show that wealth inequality, as usually measured in economics by relative means, decreases with

[1] I summarize inheritances and gifts as *intergenerational* transfers. The SOEP data from 2001 include the source of these transfers and show that individuals typically receive gifts and inheritances, as one would expect, from their parents (roughly 70 %, all transfers included). Less than 5 % from e.g. spouses, which would actually not qualify as intergenerational transfer. As the source of transfers is not reported after 2001, I ignore the fact that transfers are partly intragenerational.

[2] Wealth in this study always refers to the concept of net wealth calculated as the sum of all assets minus all liabilities of a given household.

intergenerational transfers.[3]

Despite this compelling evidence, a further look at the matter appears worthwhile: The distributional effect of transfers on wealth depends strongly on the behavioral response of households to the transfer receipt. Brown et al. (2010) and Elinder et al. (2012) for instance establish that individuals demand more leisure after having received a transfer and thus even anticipate their retirement entry.[4] Hence, one might actually ask what share of a receipt households actually end up saving.

The bulk of the literature on intergenerational transfers and their impact on wealth inequality dismisses these behavioral adjustments, even though it may well have immediate repercussions on inequality (Wolff, 2002, 2015; Crawford and Hood, 2015; Bönke et al., 2017). Wolff and Gittleman (2014) hypothesize for instance that poorer households are prone to save less out of or after transfer receipt than richer households. They show that such heterogeneities might revert the general finding that intergenerational transfers tend to equalize wealth. The authors nonetheless only present hypothetical evidence from plausible, albeit empirically not founded heterogeneities in the savings behavior across the wealth distribution. Their main analysis of the impact of transfers on wealth inequality bases on a decomposition approach which neglects potential behavioral adjustments and assumes that households save 100 % of their transfers. Karagiannaki (2015) even presents some important, albeit weak, empirical evidence that the savings behavior in fact varies over the wealth distribution. While this alone is a step forward, the results are potentially biased (see discussion below). Karagiannaki does also not show how such heterogeneities might affect wealth inequality. Lastly, the studies of Elinder et al. (2018) and Boserup et al. (2016a) resort to the tools of treatment analysis in order to evaluate the effect of transfers on wealth inequality. Their studies implicitly control for (potential heterogeneities in) the savings behavior of households. The result that transfers equalize wealth persists, they however do not explicitly estimate the savings behavior and thus do not quantify nor illustrate the effect of transfers on the savings behavior.

The present paper aims at contributing to the literature in a twofold way: First, I provide causal estimates of how transfer receipt affects the savings behavior of households. The underlying model allows for dynamic adjustment and, in a second step, also for variations in the savings behavior over the lagged wealth distribution. The estimates reach beyond previous attempts to estimate the effects of receipts on the savings

[3]Further purely descriptive studies come to the same result, see for instance Kohli et al. (2006), Tiefensee and Westermeier (2016) or Klevmarken (2004).

[4]Similar evidence is provided by Bo et al. (2015), Garbinti and Georges-Kot (2016), and for Germany by Doorley and Pestel (2016) and Crusius and von Werder (2017), here in chapter 3 of the present dissertation.

behavior, as undertaken by Wolff (2015) and Karagiannaki (2015), by allowing for time constant heterogeneity and by instrumenting the wealth endowment of the household in the period of receipt. Secondly, I provide a simulation of how the estimated variations in the savings behavior contribute to the inequality effect of intergenerational transfers. Using a tobit model, I estimate the transfer incidence and decompose the overall effect of transfer wealth on wealth inequality.

I suggest to decompose the overall effect of intergenerational transfers on wealth inequality in three components: First, the effect of the total transfer volume that determines the relation of accruing transfers to the given wealth endowment of households. Second, the effect of the transfer incidence, which describes that inheritances do not accrue randomly over the wealth distribution, but that (1) transfer accrual, i.e. $P(B > 0)$, and (2) transfer size, i.e. $E(B|B > 0)$, depend on the net-of-transfer wealth.[5] Third, the effect resulting from the savings behavior of households out of their transfer receipts. Households may differ considerably in the capacity to transform transfer wealth into their regular stock of household wealth.

The results of my study are as follows: Estimating the average savings behavior out of transfers, while granting more attention to potential endogeneity issues, leads to substantially smaller estimates than presented by previous studies. On average and ceteris paribus households tend to save only 60 Cents of an inherited Euro[6] (conditional on receipt, not controlling for whether the transfer is expected) within a two years period after receipt. At the same time, households do not show a further significant dynamic adjustment. In contrast to the considerations of Wolff and Gittleman (2014) and the results of Karagiannaki (2015), I do not find systematic differences in the savings behavior out of transfers over the wealth distribution. The observed differences do also not necessarily suggest that richer households tend to save more out of transfers than poorer households. The corresponding simulation then also does not allow to infer that the effect of transfer receipt on the savings behavior itself has a disequalizing effect. This is even true when resorting to potentially biased estimates of an OLS regression that would suggest that richer households save most out of their transfers. Eventually, the decomposition exercise shows that the aggregated transfer volume effect and the behavioral response of heirs in savings take such a progressive form that even the strongly regressive transfer incidence is more than offset. Relative transfers tend to be bigger for poorer households so that intergenerational transfers have in total an equalizing effect on the households' net worth distribution.

The remainder of the paper is organized as follows: Section 4.2 provides a brief

[5] Throughout the paper I will refer to net-of-transfer wealth as net wealth.

[6] Note that this is equivalent to say, that households save their entire transfer but displace 40 Cents of savings from other sources for each Euro inherited.

overview of the recent literature in the study of intergenerational transfers. Section 4.3 introduces the reader to the statistical concepts shaping the distributional effect of transfers on wealth. Section 4.4 derives and discusses the econometric approach for estimating the savings effect of transfer receipt while section 4.5 gives a brief introduction in the data structure. Section 4.6 provides the corresponding descriptive statistics and leads to section 4.7, in which I present the results for the estimations and the simulation. Section 4.8 presents tests on the robustness of the estimation and section 4.9 concludes. The appendix provides further details.

4.2 Literature

The question of how intergenerational transfers affect inequality in the net wealth distribution is cumbersome and has found different types of responses in the literature. I will here provide a brief overview of some:

- The most long-standing discussion related to this matter is probably the one between Kotlikoff and Summers (1981), Kotlikoff (1988) and Modigliani (1986, 1988) about the share of inherited wealth in total wealth. Kotlikoff and Modigliani primarily disagreed on whether returns to transfers shall be counted as transfer wealth or as savings effort of the individual: Modigliani related un-capitalized transfers to observed wealth and obtained much lower estimates of transfer wealth in aggregated wealth than Kotlikoff who attributed returns to inherited wealth fully to inherited wealth. The discussion was rather recently revived by Piketty et al. (2014): The authors suggest to basically use capitalized transfer amounts while limiting the value of capitalized transfers at maximum to the observed wealth of individuals. Individuals are then counted as *heirs* when their observed household wealth is at most as much as the capitalized inheritance value. The corresponding share of transfers in wealth thus amounts to 100 %. Individuals whose capitalized transfers do not exceed observed wealth are counted as *savers* (with a respective share of x % inherited wealth). This approach bears the clear advantage that the share of inherited wealth cannot exceed observed wealth while taking into account the returns to inherited wealth. Hence, Piketty et al. (2014) base their argument directly on the inter-temporal budget constraint of individuals. Bönke et al. (2016) apply the Piketty approach to German data and find that roughly 1/3 of household wealth is attributable to intergenerational transfers. The main beneficiaries of intergenerational transfers, the paper reveals, is the upper middle class, where the proportion of inherited wealth is highest on average.

This approach certainly improves the understanding of intergenerational transfers in current wealth statistics and provides an interesting distinction between *savers* and *heirs*. It is also helpful in putting receipts into perspective that have accrued long ago (a disadvantage of the approach presented in this paper, which I will discuss in more detail in section 4.5). The approach by Piketty et al. (2014) does however base on hypothetical relations as it does not take into account how much of a transfer an individual actually had saved over time. It thereby only implicitly covers the behavioral reactions of individuals to transfer receipt and provides, in turn, rather a point of reference (of how much an individual could have saved out of a transfer if it had not consumed) rather than a solid estimate of how transfers *de facto* affect the wealth accumulation of individuals.

- Another branch in the literature attempts to retrace the distributional effect of transfers on the inequality in household wealth by primarily using a decomposition approach that has been suggested and applied by Edward Wolff to American data sources (Wolff, 2002; Wolff and Gittleman, 2014; Wolff, 2015), by Bönke et al. (2017) to multiple Euro-countries and by Karagiannaki (2015) and Crawford and Hood (2015) to British data. The approach applies the decomposition of the *variance* to the coefficient of variation (CV), which is a commonly used inequality measure for wealth data. The inequality in household wealth is then decomposed in inequality loadings stemming from initial household wealth, transfer wealth and a term describing the correlation of these wealth components. The decomposition illustrates typically that transfer wealth correlates negatively with initial household wealth and thus causes a reduction in the relative inequality of household wealth. Bönke et al. (2017) provide decomposition results for Germany that are fully in line with the findings of other applications of the decomposition.

  The decomposition by Wolff also serves as an interesting illustration of how transfer wealth interacts with initial household wealth. The approach however crucially depends on the assumption that households save the entire intergenerational transfer. Wolff and Gittleman (2014) discuss this shortcoming in detail and raise concerns that differing savings patterns over the wealth distribution might severely bias the results of the decomposition. The present paper takes these concerns up and seeks to estimate, whether such a variation in the marginal propensity to consume across the wealth distribution exists and is suited to challenge the results of the above cited papers.

- A third approach in the literature uses regression analysis in order to tackle the main weakness of the previously mentioned approaches: How much of a transfer do households actually save or consume, respectively? The literature in this branch is diverse,[7] I will here mainly refer to four papers: Elinder et al. (2018) and Boserup et al. (2016a) analyze inheritance receipts in an event study framework. The former e.g. defines the totality of heirs in year t as *heir cohort* t. The authors can show that the inequality in wealth within cohort t decreases substantially compared to the inequality in the cohort $t+1$, which is only soon to inherit. The approach has the merit that results are likely to be correct as long as savings behaviors do not differ between cohorts. The impressive database underlying this study contains information on all bequests of Swedes dying between 2002 and 2004 and their heirs. It however does not encompass wealth information of the full Swedish population, it is thus hard to generalize the findings of this study or to infer the total inequality effect. The finding that transfers tend to equalize wealth inequality thus seems to be robust against savings patterns within a cohort. The treatment-based analysis however still misses to quantify savings behaviors, a shortcoming accommodated by the last two papers briefly mentioned in this literature review:

Karagiannaki (2015) and Gittleman in Wolff (2015) provide estimates of regressing household savings (defined as difference between a household's net wealth in two periods, i.e. $W_t - W_{t-1}$) on transfers and controls. The resulting (linear) estimate illustrates how many cents a household saved, on average, from an inherited Dollar. Gittleman estimates that households save between 80 and 90 Cents of an inherited Dollar.[8] While the author controls for a number of possibly related factors, the results are potentially biased. For example, time-constant omitted variables like the parental background can matter as they are likely to relate the size of the inheritance and the wealth accumulation behavior of the individual. Thrifty parents pass on particularly high transfers to their similarly thrifty, and thereby richer, children. The estimate of interest would be upwards biased. The estimation also falls short of testing the hypothesis of Wolff and Gittleman (2014) as it does not allow the savings coefficient to vary over the wealth distribution. The paper by Karagiannaki (2015) contains the estimation of a very similar model and comprises two approaches used to test whether the saving out of transfers varies over the distribution: The quantile regression estimates suggest that households in upper parts of the *conditional* savings distribution tend

[7] Several papers seek to estimate labor market reactions after transfer receipts: Elinder et al. (2012); Brown et al. (2010); Bo et al. (2015); Crusius and von Werder (2017); Doorley and Pestel (2016).

[8] The author uses the PSID for this estimation. Wealth is observed in 5 year intervals, so that the consumption/saving estimate from transfers reflects the behavior during, supposedly, 2.5 years, on average.

to save more. This finding is however not directly illustrative for the question whether households vary in their savings behavior over the unconditional wealth distribution. The author thus interacts a dummy indicating the wealth quintile of the respective household in the previous period with the inheritance amount. She concludes that the propensity to save from the transfers "decreases (...) with initial wealth", although differences in estimates are not significant across quintiles. The results are interesting and seem to partly confirm the hypothesis of Wolff and Gittleman (2014). The estimation however is likely to suffer from the same omitted variable bias as the one in Wolff (2015). Moreover, interacting the dummy indicators is likely to introduce an endogeneity issue in a regression of savings: While the dummies convey information from the lagged wealth distribution, the dependent variable also includes lagged wealth. As the reader will see below, this paper resorts to a similar empirical approach as Karagiannaki, but attempts to apply a more suitable identification strategy.

The above presented three branches of literature are the major references for this paper: It seeks to provide a causal estimate of the propensity to save out of transfers in a fashion similar to e.g. Karagiannaki (2015). It also tries to track down the distributional implications as done in the contribution by Elinder et al. (2018). The literature has however brought along some further contributions: Westerheide (2005) regresses wealth on transfers and some controls using the same data set as the present paper. The regression however lacks control variables as age and seems to interpret wealth transfers as stocks. Kohli et al. (2006) provide a descriptive analysis on the distributional effects of transfers on wealth also using SOEP data.

4.3 The distributional effect of transfers

The literature consistently suggests that intergenerational transfers tend to equalize the inequality in household wealth.[9] Transfers will reduce the inequality in household net wealth if the following condition holds:

$$\left(\frac{P(B_{H,t}>0)\times E(B_{H,t}|B_{H,t}>0)}{E(W^{net}_{H,t-1})}\right)_{\tau=s} < \left(\frac{P(B_{H,t}>0)\times E(B_{H,t}|B_{H,t}>0)}{E(W^{net}_{H,t-1})}\right)_{\tau<s} \tag{4.1}$$

where τ denotes the respective quantile of the lagged wealth distribution. Transfers B for household H in period t will tend to equalize the wealth distribution as long as the *expected* transfer in this quantile, defined as the probability $P(B_{H,t}>0)$ to

[9] At this stage measures of absolute inequality are neglected, which typically indicate higher inequality after transfer accrual.

receive times the average receipt $E(B_{H,t}|B_{H,t} > 0)$ relative to the wealth quantile's mean wealth, is higher for households from lower wealth quantiles. Or, measured in initial wealth, expected transfers are typically higher for poorer households than for richer households.[10] Under this condition, the share of total wealth hold by poorer households will increase through transfer receipts. The effect will maintain as long as

$$\frac{P(B_{H,t} > 0) \times E(B_{H,t}|B_{H,t} > 0)_{\tau=s}}{P(B_{H,t} > 0) \times E(B_{H,t}|B_{H,t} > 0)_{\tau<s}} < \frac{E(W^{net}_{H,t-1})_{\tau=s}}{E(W^{net}_{H,t-1})_{\tau<s}}.$$

Hence, when the ratio of expected transfers between rich and poor is smaller than the ratio of net wealth between rich and poor. The effect that intergenerational transfers have on the inequality in household wealth can apparently be decomposed. I suggest to decompose it into the following sub-effects:

- **Aggregated transfer volume**: Given the observed lagged wealth distribution, the aggregated transfer volume[11] is the first channel determining the relation between households' transfers and their wealth:[12] The higher the aggregated transfer volume, the potentially stronger can the inequality effect of transfers be. In order to illustrate this channel, I will generate a counterfactual wealth distribution after transfer receipt and distribute equal absolute shares of the aggregated transfer sum to the quantiles of the wealth distribution. The inequality effect of the aggregated transfer volume will thus be mechanically equalizing as poorer households will receive relatively higher transfers than richer households, which is often mentioned as the key characteristic of transfer accrual that explains why transfers equalize wealth. The rationale for the decomposition is here is that this counterfactual distribution illustrates the maximum equalizing potential of the aggregated transfer volume, i.e. the equalizing effect *this* sum of transfers could take if it would basically be randomly distributed over the lagged wealth distribution. Section 4.7.4 explains in more detail how these equal shares of transfers are generated.

- **Incidence**: Bequests do however typically not accrue randomly over the wealth distribution, but rather accrue more often and with higher amounts the higher the position of the receiving household in the lagged wealth distribution (Kara-

[10] Relative transfers in the literature are expressed in lagged (Karagiannaki, 2015) or net-of-transfer (Kohli et al., 2006; Klevmarken, 2004) wealth distributions. I here resort to the lagged distribution.

[11] Or, as Wolff (1987) calls it, the magnitude of transfers relative to total wealth.

[12] This paper basically resorts to three periods of aggregated transfers over a total period of 15 years. While studies by e.g. Piketty and Zucman (2015) suggest increasing aggregate bequest flows, I will neglect this factor and will pool wealth and inheritances over time for the distributional analysis. The *aggregated transfer volume* effect is expected to be stronger, the bigger the inherited wealth is in relation to household wealth.

giannaki, 2015; Wolff and Gittleman, 2014; Kohli et al., 2006). Hence, a larger share of aggregated bequests accrues to the advantage of richer households. I denote this leaning of the unconditional expected value of transfers the *transfer incidence* and consider it particularly interesting: The transfer incidence indicates the intergenerational wealth immobility between dynasties. This is the channel through which a dynasty's capacity to perpetuate its class materializes. In other words, the transfer incidence represents the intergenerational relationship of wealth within dynasties beyond the observed monetary transfers. It is basically the channel illustrating the unobserved link in wealth between generations of the same dynasty (as heirs' *net-of-transfer wealth* correlates with the testators' wealth, represented by the observed transfer). It might encompass effects from different dimensions, e.g. previous parental investments in the human capital of their children, access to parental networks, valuable habits and values and the impact of genes (Adermon et al., 2018; Black et al., 2015).[13]

- **Savings behavior**: Lastly, one has to take into account the behavioral adjustment of receiving households. Transfer receipt is likely to affect the savings behavior, which can either be understood as saving out of the transfer itself or as displacing other savings. These economic reactions may well differ across the wealth distribution: More affluent households may have a lower propensity to consume out of transfers. Richer households may also acquire higher returns to their investments, as has been discussed in the literature (Bönke et al., 2016; Piketty, 2014). The results presented by Karagiannaki (2015) suggest that systematic variations along the wealth distribution in the capacity to save out of transfers are conceivable. Wolff and Gittleman (2014) discuss that such heterogeneities can overturn the equalizing effect of transfers on the wealth distribution. The relevant quantity for retracing the distributional impact of intergenerational transfers on the wealth distribution would then no longer be B_{Ht}, as in eq. 4.1, but rather the saved share[14]

$$B_{H,t}^{saved} = \beta_\tau \times B_{H,t}.$$

In section 4.4 a more detailed explanation of the β_τ parameter will follow. For

[13] Perhaps using the metaphor of a regression analysis helps to clarify this point: The economic status of the children depends on a number of here unobserved factors and observed monetary intergenerational transfers. The incidence effect reflects the average effect of all unobserved factors, i.e. the constant in a regression model. The effect of the transfers itself is controlled for, in the sense that we identify the incidence effect *before* transfers impact the children's wealth level.

[14] Apparently this would also require representing β_τ in equation 4.1 above. I abstain from doing so for the sake of clarity.

the moment it is crucial that it captures the economic reaction of households to receiving a transfer, i.e. $\beta_\tau \neq 1$. If $0 < \beta_\tau < 1$, estimates relying on the logic of inequality 4.1 may be biased: Obviously, then $B^{saved}_{H,t} < B_{H,t}$,[15] whereas variations of β_τ over the wealth distribution further bias the analysis. Additionally, some papers derive $W^{net} = W_{H,t} - B_{H,t}$ and, by implicitly assuming that $\beta = 1$, are overestimating household wealth net of transfers.

Hence, intergenerational transfers can easily take a progressive or a regressive effect on wealth. While the sheer volume of transfers has no immediate distributional implication, the transfer incidence can develop either a progressive or regressive effect, depending wholly on the correlation of transfer size and household wealth. Assuming that poorer households save less out of transfers than richer households, this effect would rather take a regressive impact on wealth inequality.

4.4 Methodology

At the core of the analysis in this paper is the estimation of the share that households typically save from received intergenerational transfers. This share is denoted β. In what follows, first the estimation of the average β is derived, thereafter the procedure of how to consistently estimate variations of β over the wealth distribution is discussed.

4.4.1 Average effect

Estimating the average saving from intergenerational transfers starts with assuming a data generating process of the following form:

$$W_{H,t} = \alpha_H + \beta_1 B_{H,t} + \beta_2 B^D_{H,t} + \gamma W_{H,t-1} + \delta_1 I_{H,t} + \delta_2 A_{H,t} + \epsilon_{H,t} \tag{4.2}$$

Equation 4.2 describes the level formulation of the model: Current household wealth $W_{H,t}$ is a function of intergenerational transfers, household income, $I_{H,t}$, household wealth in the preceding period, $W_{H,t-1}$, and age as control variable.[16] Transfers are modeled by $B^D_{H,t}$,[17] which is a dummy indicating bequest receipt, and $B_{H,t}$ which denotes the linear bequest amount.[18] α_H is a time-constant individual effect, $\epsilon_{H,t}$ is

[15] Note, that $\beta > 1$ is also conceivable. For instance, if households save the entire transfer and earn returns to their capital. Estimates of β however typically yield values of $\beta < 1$ (Karagiannaki, 2015; Wolff, 2015).

[16] Further control variables (e.g. being self-employed or retired) have been tested but do not impact the conditional savings behavior significantly.

[17] $B^D_{H,t}$ equals 1 only in the period of receipt and is 0 otherwise.

[18] Transfers are thus modeled as interaction of the transfer amount $B_{H,t}$ and the receipt indicator $B^D_{H,t}$. Zero receipts are thus included.

the common white noise error term.[19]

The β estimates are the parameters of interest in this specification and capture the economic response of the household to a transfer receipt. Conditional on receipt, the following can be stated about β_1: If $\beta_1 < 1$, households on average tend to consume a share $1 - \beta_1$ (in the short term)[20] from the transfer amount.[21] If $\beta_1 > 1$, households' wealth increases by more than the transfer amount, which is well possible, when re-investments bear immediate returns. Note too, that $W_{H,t}$ contains, as it is common in the literature, the observed wealth values, i.e. is including transfers. This way, the coefficient measures the propensity to save from transfers. Deducting transfers from $W_{H,t}$, i.e. regressing the net-of-transfer wealth, would yield a coefficient measuring the displacement of other wealth components through transfers. For example, if transfers cause households to save less from other sources (e.g. income) in view of the transfer, then $\beta_1^{W_{H,t}-B_{H,t}}$ would quantify this effect. The estimates are however fully exchangeable in that the here used coefficient $\beta_1 = \beta_1^{W_{H,t}-B_{H,t}} + 1$.

As intergenerational transfers are considered a *flow*, W_{t-1} is subtracted from both sides of equation 4.2 yielding

$$S_{H,t} = \alpha_H + \beta_1 B_{H,t} + \beta_2 B_{H,t}^D + (\gamma - 1)W_{H,t-1} + \delta_K \mathbf{C}_{H,t,K} + \epsilon_{H,t} \tag{4.3}$$

where the dependent variable now is the flow[22] $S_{H,t} = W_{H,t} - W_{H,t-1}$ and $\mathbf{C}$ contains K polynomials of age and household income and interactions of the two. Rewriting $\gamma - 1 = \rho$ and taking first differences in order to eliminate the individual effect, leads to

$$\Delta S_{H,t} = \beta_1 \Delta B_{H,t} + \beta_2 \Delta B_{H,t}^D + \rho \Delta W_{H,t-1} + \delta_k \Delta \mathbf{C}_{H,t,K} + \Delta \epsilon_{H,t}. \tag{4.4}$$

The underlying assumption that $\Delta B_{H,t}$ is exogenous given the elimination of the individual effect α_H is further discussed below in section 4.4.3. The dynamic structure of this model however makes estimating equation 4.4 prone to being biased due to a

[19]Using panel data, we might encounter correlations between households' error terms. I thus use cluster-robust standard errors in all specifications and cluster standard errors on the household level.

[20]Recall that dynamic specifications allow to derive the long term effect as $\beta^{long} = \beta/(1-\gamma)$, where $\gamma = 0$ implies $\beta^{long} = \beta$.

[21]Note that it is unclear whether households consume out of the transfer itself or whether transfers displace other savings. For the distributional effect of transfers however, this distinction does not matter.

[22]Note that the data set only provides 3 periods of wealth observations. Hence, writing equation 4.2 with a flow as dependent variable *and* adding a lagged dependent variable, which would perhaps be a more common dynamic specification, would not leave a further lag as needed as instrument.

correlation between $\Delta W_{H,t-1}$ and $\Delta\epsilon_{H,t}$:

$$\Delta W_{H,t-1} = W_{H,t-1} - W_{H,t-2} \tag{4.5}$$

$$\Delta\epsilon_{H,t} = \epsilon_{H,t} - \epsilon_{H,t-1} \tag{4.6}$$

In order to circumvent endogeneity issues, $\Delta W_{H,t-1}$ is instrumented by the level value $W_{H,t-2}$. The second-stage regression equation is thus represented by

$$\Delta S_{H,t} = \beta_1 \Delta B_{H,t} + \beta_2 \Delta B^D_{H,t} + \rho\Delta\hat{W}_{H,t-1} + \delta_k \Delta\mathbf{C}_{H,t,k} + \Delta\epsilon_{H,t} \tag{4.7}$$

where $\Delta\hat{W}_{H,t-1}$ is predicted from the first-stage regression

$$\Delta\hat{W}_{H,t-1} = \hat{\xi}W_{H,t-2} + \hat{\theta}_1\Delta B_{H,t} + \hat{\theta}_2\Delta B^D_{H,t} + \hat{\eta}_k\Delta\mathbf{C}_{H,t,k}. \tag{4.8}$$

Note that the model simplifies considerably in case there are no dynamic effects. If estimating reveals $\rho \approx -1$ then this implies $\gamma = 0$ (leaving the subtracted $W_{H,t-1}$) and thus a static version of equation 4.2. If the estimation yields $\rho \approx 0$, then this suggests $\gamma = 1$ and also induces the omission of $W_{H,t-1}$ from the estimation. Reformulating the level equation then yields:

$$W_{H,t} = \alpha_H + \beta_1 B_{H,t} + \beta_2 B^D_{H,t} + \delta_K \mathbf{C}_{H,t} + \epsilon_{H,t} \tag{4.9}$$

If no dynamic specification is required, an observation period is saved so that I can test an alternative level specification in which dependent and key explanatory variable again occur as flows:

$$S_{H,t} = \alpha_H + \beta_1 B_{H,t} + \beta_2 B^D_{H,t} + \delta_K \mathbf{C}_{H,t} + \epsilon_{H,t} \tag{4.10}$$

Which turns to

$$\Delta S_{H,t} = \beta_1 \Delta B_{H,t} + \beta_2 \Delta B^D_{H,t} + \delta_k \Delta\mathbf{C}_{H,t,k} + \Delta\epsilon_{H,t} \tag{4.11}$$

in first differences.

4.4.2 Heterogeneity in the saving effect

Karagiannaki (2015) finds some evidence for a variation in β over the wealth distribution. Equation 4.7 is thus slightly extended:

$$\Delta S_{H,t} = \beta_1 \Delta B_{H,t} + \beta_2 \Delta B^D_{H,t} + \sum_{q=2}^{5} \beta_{2+q-1} \Delta (B_{H,t} \times W^{q-1}_{H,t-1}) + \sum_{q=2}^{5} \beta_{6+q-1} \Delta (B^D_{H,t} \times W^{q-1}_{H,t-1}) + \rho \Delta \hat{W}_{H,t-1} + \delta_k \Delta \mathbf{C}_{H,t,k} + \Delta \epsilon_{H,t} \quad (4.12)$$

Where $W^{q-1}_{H,t-1}$ is a dummy set of $q-1 = 4$ quantile indicators, indicating in which wealth quintile the household has been located in the previous period's wealth distribution. These dummy variables are obviously also endogeneous and are thus instrumented with $(\Delta B_{H,t}) \times W^q_{H,t-2}$. As the reader will notice below, further variations of equation 4.7 and eq. 4.12 will be estimated.

4.4.3 Exogeneity of Transfers

The consistency of the regression results hinges on the assumption that transfers are exogenous. I want to briefly state, why I consider this assumption plausible:

- **Gifts**: Intergenerational transfers include gifts. While it is conceivable that many inheritances accrue accidentally (Dynan et al., 2002), inter vivo transfers could occur primarily on purpose: If for instance households in need are more likely to receive gifts, then the β coefficient would be biased downwards. I will provide descriptive evidence whether such concerns seem warranted. Similarly, if gifts have accrued earlier, household wealth will be higher while actual inheritances will be lower. Most specifications therefore include w_{t-1} as control variable. Other specifications rely on using fixed effects in order to control for the impact of such earlier transfers. Lastly, I will also provide robustness tests excluding gifts.

- **Reverse causality**: The just mentioned issue is a variation of a potentially more general reverse causality problem. As it was mentioned in section 4.3, transfer accrual and size is partly a function of household wealth. This relationship could introduce a simultaneity issue with respect to β in eq. 4.2. I argue however, that the relationship is attributable to family characteristics whose impact vanishes in the fixed effects specifications. Most estimations also use *savings* as dependent variable for which the reverse causality issue seems to be less evident.

- **Previous inheritances**: In section 4.5 I will discuss in detail what transfers we are able to observe. Note however already, that the present study only resorts to inheritances received after 1998, dismissing most of the retrospectively observed transfer data.[23] The data set in use does not provide consistent wealth data for the transfer observations before 1998. Using fixed effects estimations, however, the previous transfer accruals should play no role.

4.5 Data

The analysis is based on data from the Socio-Economic Panel (SOEP) which is a longitudinal panel study from Germany covering roughly 11 000 households each year. The data contains information on wealth stocks on the individual and household level for the survey waves of 2002, 2007 and 2012. Wealth covers real estate holdings, financial wealth (savings, stocks and shares, any type of private insurance based wealth[24]), company assets, tangible assets and any kind of debts. This study resorts to the net wealth, as calculated by the SOEP by subtracting liabilities from assets. As thoroughly discussed in the literature (Vermeulen, 2018), surveys on wealth commonly suffer from non-random item non-response issues. In order to accommodate such problems, the wealth data in the SOEP is edited and imputed with 5 implicates.[25]

Inheritances and gifts are systematically surveyed in the SOEP since 2001 when the SOEP contained an extended module about inheritances. This module enquired households about (up to three) transfer receipts in the past and present. Only for the 2001 wave, however, the source, the recipient within the household and the nature of the transfers were surveyed. After 2001 the SOEP covers intergenerational transfers annually only on the household level and records the value[26] and type of the transfer. According to the SOEP, the inheritance values are net of taxes.[27]

Despite the commonly acknowledged high quality of SOEP data, some concerns remain: Vermeulen (2018) shows that even imputations and weighting strategies might fail in representing the top 1 % of the wealth distribution.[28] In the same way, non-

[23]Westerheide (2005) uses all retrospectively observed inheritances: To do so, he assumes that inheritances are fully saved and capitalizes them over the period between receipt and period of wealth observation. Considering that inheritances partly accrued many years ago (and values thus grow high), this approach introduces a high degree of uncertainty.

[24]The data does not cover claims against public insurances as e.g. public pensions. At the end of this section I briefly discuss this issue.

[25]The SOEP imputation strategy is documented e.g. in Frick et al. (2010). I follow the procedures suggested by Rubin (1987) for adjusting standard errors and for calculating point estimates in imputed data sets. Specifically, I resort to the STATA environment for imputed data and, if necessary, apply the procedures by hand.

[26]Until 2004 the SOEP only covered transfers above 2 500 Euro, since then all transfers above 500 Euro are allegedly reported.

[27]Due to high allowances and exemptions for e.g. business capital, most intergenerational transfers are not taxed anyway. See Braun (2015) for an estimate of the effective tax rate and Bach and Thiemann (2016) and Bach and Mertz (2016) for an evaluation of the German inheritance and gift tax statistics.

[28]Further work on the full depiction of household wealth dealing with non-observation bias and

random item non-response issues may also occur in the inheritance data where the remedy of imputations is lacking.[29]

The data availability requires some aggregation: Transfer data are aggregated over the 4 years prior to and the year in which wealth was observed, i.e. in 2002, 2007 and 2012 respectively. As transfers are only observed on the household level, the analysis uses the respective wealth data on the household level.[30] This yields a data set with 3 time periods containing the households' net worth and the aggregated intergenerational transfers spanning from 1998 to 2012. All amounts are expressed in 2010 Euros.

Some conceptual issues remain with the given data set that are worth being discussed briefly:

- **Expectations:** Ideally, the analysis here would control for expectations regarding future transfer receipts as households are theoretically expected to adjust their behavior accordingly. The SOEP surveyed expectations in 2001: Respondents stated how likely they perceived to receive a transfer in the (not further specified) future[31] and whether the expected transfer will be below 50 000 DM ($\approx$ 25 000 Euro) or above. After all, the *expectations* data are likely to be very noisy. Also, being only surveyed in 2001, no corresponding information is available for transfers received between 1998 and 2001. Also, it is questionable whether the reported expectations bear still instructive information for transfers received up to 10 years after expectations had been stated. I therefore ignore the information on expectations in the main analysis and will resume the topic in section 4.8 in detail.[32]

- **Wealth type of transfer:** Westerheide (2005) uses the SOEP wave of 2001 in order to estimate a similar model as the one that will be estimated in this paper and shows that the wealth type of a transfer affects the consumption behavior out

differential non-response bias is provided by e.g. Eckerstorfer et al. (2015), or with special focus on Germany by Westermeier (2016).

[29]While the PHF data may be more accurate in terms of wealth (Bartels and Bönke, 2015), they are only available for two waves and would thus restrict the scope of the analysis severely and are, taking Vermeulen (2018) as benchmark, still understating the top wealth. Access to the inheritance and gift statistics data is slowly liberalized but represents only an upper part of the inheritance distribution. See otherwise Bartels and Bönke (2015) for an overview of the available wealth data sets from Germany.

[30]Where individual information are needed in the analysis (e.g. age information), I resort to the characteristics of the household head.

[31]Respondents could reply by "No", "Don't know", "Yes, that is likely", "Yes, that is certain".

[32]Doorley and Pestel (2016) also use the SOEP expectations for a study of the effect of wealth shocks on the intensive margin of labor supply. Brown et al. (2010) and also Crusius and von Werder (2017) resort to data sets with more detailed information on expectations about future transfers and analyze the impact of transfers with respect to the extensive margin of labor supply. The results in this literature appear nonetheless fuzzy and do not fully reflect the behavioral reactions that economic theory would predict.

of intergenerational transfers. In line with what one would expect, consumption out of real estate and business capital seems to be less pronounced than out of more liquid wealth types. After 2001 wealth types of transfers are however not recorded anymore and will enter my estimation as an omitted variable.

- **Retirement wealth:** The SOEP wealth data do not yet contain information about public pension claims. While the wealth stocks we observe might e.g. well contain the old age provision of self-employed, many employees will have mainly saved for retirement by the statutory pension scheme. Hence, taking into account such claims would reduce wealth inequality strongly as shown by Bönke et al. (2016). It is nonetheless disputable whether pension claims should be taken into account even if it would be possible: In contrast to the wealth so far reported in the SOEP, pension claims are not fungible and thereby lack a crucial criterion of what is typically rated as wealth.

- **Non-monetary transfers:** Wealth might well be transmitted over generations by other means than monetary transfer.[33] Parents, for instance, might invest strongly in the human capital of their children which might affect children's wealth and future monetary transfers at the same time. Such transfers are not observed but seem to be unlikely to bias the estimations results here: First, the estimation technique presented in section 4.4 allows for time constant heterogeneity. Second, I control for *household earnings* which is the most obvious channel between parental investments in human capital and the ability to acquire wealth. Not observing such transfers however might translate into a misleading result of the simulation in section 4.7.4 underestimating the degree to which intergenerational transfers shape the wealth distribution. I will resume the discussion of this point in the conclusions.

- **Previous intergenerational transfers:** In fact, the SOEP does report inheritances in retrospect, thereby covering theoretically all transfers ever received by a household. I am however not using such information if the accrual was before 1998 as corresponding observations on wealth are lacking. Note, however, that households of course can receive inheritances more than once, as inheritances must not exclusively occur from parents (and even if they did, the analysis on the household level permits multiple inheritances). Hence, even when households have received transfers before 1998 they still can receive further transfers.[34]

[33]The point here of course also holds for unobserved prior concessions that children might provide to their parents for receiving transfers. Strategic bequest motives are for instance discussed in Cremer and Pestieau (2006).

[34]Westerheide (2005) attempts to consider all reported transfers, no matter how long ago they

4.6 Descriptive Statistics

This section introduces the characteristics of the sample underlying the analysis. Table 4.1 and 4.2 provide summary statistics for intergenerational transfers and household wealth, respectively. Note that the tables break down summary statistics to the three time periods, the analysis is based on. Hence, numbers referring to e.g. 2002 reflect the respective statistic of those transfers observed between 1998 and 2002. Table 4.3 then introduces to the analysis by descriptively depicting the statistical relationship between transfers and wealth over the wealth distribution.

4.6.1 Summary statistics

Table 4.1 summarizes some statistics about intergenerational transfers. Panel *a* for instance shows that the mean transfer, including inheritances and gifts, varies around 70 000 Euro (conditional on transfer receipt) over the three time periods. Panel *b* then captures the distribution of intergenerational transfers, suggesting that the median transfer is much lower than the mean, equaling roughly 17 000 Euro over all transfers. Panel *c* gives the absolute number of observed transfer incidents, distinguishing between inheritances and inter vivo transfers: In total, the analysis is based on 2 142 cases. Relating to the absolute number of observations, less than 10 % of the households report to have received a transfer over these 15 years.[35] Interestingly, almost half of the observed incidents are actually gifts. The share of recipients seems to slightly increase over time. While this would be in line with expectations concerning aggregate inheritance flows, the small increases here are probably not statistically significant.

Table 4.2 presents some descriptive statistics of the households' net wealth over time. Panel *a* shows that average wealth is around 155 000 Euro. The median is well below that, revolving around 50 000 Euro. Panel *b* reports the mean wealth over quintiles.[36] Note that a significant share of the sample is indebted, meaning that the average wealth for the poorest 20 % of the population is negative. Table C.2 in the appendix reports on the wealth composition over time.

4.6.2 Transfers accrual over the wealth distribution

Table 4.3 touches on the relationship between transfers and wealth. Panel *a* column (1) for instance reports the number of observed transfer receipts over wealth quintiles

have accrued. Typically, results will then crucially depend on the capitalization rate applied to older receipts (see also chapter 2 in the present dissertation).

[35] Note that this does not include the intergenerational transfers that accrued before 1998.

[36] Table C.1 in the appendix includes the cut-off points for the wealth quintiles used in the main analysis.

Table 4.1: Descriptive statistics intergenerational transfers (in Euro):

	2002	2007	2012	Total
Panel a. Summary (conditional on receipt)				
Mean	81,957	61,114	83,205	75,491
Std. Deviation	153,574	131,008	195,580	168,641
Min	151	520	480	151
Max	1,789,820	1,502,987	2,523,150	2,523,150
Panel b. Distribution of transfers (conditional on receipt)				
p10	5,643	3,122	1,970	2,699
p25	9,076	6,292	6,152	7,159
p50	28,570	15,994	16,843	16,930
p75	93,835	52,029	48,584	56,433
p90	203,160	175,843	233,195	192,123
Panel c. Transfer receipts				
Cases	587	874	681	2142
Share recipients	0.059	0.098	0.119	0.094
Inter vivos (thereof)	258	440	366	1064
Share (thereof)	0.405	0.515	0.522	0.497

SOEPv30, own calculations. Data is weighted using longitudinal weights. Sample restricted to estimation sample.

from the preceding period, column (2) adds the share of recipients. Both indicators tend to increase over the wealth distribution, reflecting that it is more likely to receive a wealth transfer, the richer the household initially is. The mean transfer amount, as reported in column (3), indicates somewhat of a u-shape, showing high receipts for households from the bottom quintile of the wealth distribution. Mean transfers for the succeeding 20 % of the population are at first lower, but increase monotonically over the rest of the net wealth distribution.

Column (5) includes the key statistic in the analysis of the distributional effect of wealth transfers, that was introduced in inequality 4.1, the relative transfer size. In fact, the relative transfer size tends to decrease over the wealth distribution, which entails that the relation of transfer sizes and wealth stocks tends to yield an equalizing effect of intergenerational transfers. This pattern is commonly found in the literature: Wolff and Gittleman (2014) (table 3) and Karagiannaki (2015) (table 6) find the same relationship. Decreasing relative transfers over the wealth distribution imply that the wealth *share* of poorer parts of the population is increasing thus inequality is decreasing.[37]

There are however some reasons why the ratios in the last column of panel *a* in

[37]Note, again, that the absolute difference in wealth is typically increasing through transfers. Which is also documented by Wolff and Gittleman (2014) and Karagiannaki (2015) in the respective tables.

Table 4.2: Descriptive statistics household net wealth (in Euro):

	2002	2007	2012	Total
Panel a. Summary				
mean	162,634.05	156,612.24	134,031.31	149,974.52
p50	44,920.99	51,729.87	46,718.35	47,647.99
sd	397,786.46	348,858.01	267,501.84	337,776.35
min	-2,313,555.10	-1,510,926.13	-1,177,238.79	-2,648,154.88
max	12,799,097.00	8,964,804.50	9,855,908.00	12,920,548.40
Panel b. Mean wealth				
Quintile 1	-8751.502	-10765.71	-11505.11	-10459.01
Quintile 2	7598.68	9063.165	7523.368	8085.435
Quintile 3	49602.53	55361.64	51179.69	52056.41
Quintile 4	173223.8	167042.3	156903.6	165101.1
Quintile 5	595256.5	563793.9	471665.8	538840.4

SOEPv30, own calculations. Data is weighted using longitudinal weights. Sample restricted to estimation sample.

Table 4.3: Relationship of wealth and transfers (in Euro):

	Cases	Share of recipients	Mean amount[1]	Relative value[1,3] $E(B_t/W_{t-1})$
Panel a. Transfers over wealth quintiles from W_{t-1}				
Quintile 1	128	4.66	95,449	519.00
Quintile 2	214	7.88	43,208	477.20
Quintile 3	354	16.34	47,014	91.28
Quintile 4	363	13.55	52,831	32.18
Quintile 5	373	12.78	148,291	25.14
Panel b. Transfer receipts over age groups[2]				
< 30	840	9.40	31,735	.
30-45	4,446	13.74	69,176	85.68
45-60	4,656	11.45	82,798	36.71
60-75	2,526	6.71	74,725	22.59
> 75	384	2.09	127,190	37.08
Panel c. Transfers over HH income quintiles				
Quintile 1	1,056	3.74	36,197	35.76
Quintile 2	1,590	6.58	46,472	35.96
Quintile 3	2,064	8.40	108,683	62.49
Quintile 4	3,474	14.20	50,137	33.68
Quintile 5	4,350	16.92	99,527	37.35

SOEPv30, own calculations. Data is weighted using longitudinal weights. Sample restricted to estimation sample.

[1] Conditional on receipt.

[2] Number reflects *observed* receipts in respective age group, i.e. individuals receiving more than once count more than once.

[3] Number reflect the absolute values, thus, negative ratios for the first wealth quintile appear as positive numbers. Values in %.

table 4.3 appear somewhat huge and jumpy: First, as noted in the table, the quintiles originate from $t-1$, thus relating the aggregated transfers of the last 5 years to wealth as observed 5 years ago. Quintile 1 is furthermore obviously a heterogeneous group: As shown in table 4.2, the mean wealth of this group is negative, encompassing all indebted households, irrespective of whether these are systematically short of resources or just temporarily indebted due to e.g. investments in human capital.

Panel *b* then presents the same indicators, albeit calculated across age groups. Age matters in some respects: First, while heirs receive their inheritances typically in the mid 50s, the numerous gift recipients in the sample are in their mid 40s (compare table C.3 in the appendix). Second, young recipients either receive gifts, which are typically lower than inheritances, or inherit from young relatives, which then could not accumulate wealth over their entire life cycle. Consequently, column (3) shows that the mean transfer amount increases over age groups. Thirdly, life cycle theory predicts increasing wealth until retirement entry. This effect may contribute to the pattern that relative transfers are particularly high for young recipients. The various interrelations of age with both, wealth and transfers, seem to confirm earlier considerations to control for the impact of age in the regression analysis.

Panel *c* gives the indicators over the current quintiles of the household income distribution. While the mean amounts as presented in column (3) do not indicate a systematic variation (contrasting somewhat the statistics provided by Wolff and Gittleman (2014)) over the income distribution, the probability to receive seems to be correlated positively with income levels. Again, the summary statistics reflect the expected pattern and suggest to control for household income in the estimation.

Considering the statistical relationships between wealth, transfers, age and income, the correlation of wealth and intergenerational transfers might well be misleadingly overstated by the results in table 4.3. In order to descriptively show whether there is a systematic incidence effect as argued in section 4.3 , I will briefly present the estimation results of a tobit model regressing the transfer amount on a dummy set indicating the households' wealth quintile in $t-1$ controlling also for age and household income with third order polynomials. Using the McDonald and Moffit (1980) decomposition in order to derive, first, the marginal effect on the intensive margin (i.e. the amount received)[38] and, second, the marginal effect on the extensive margin (i.e. the probability

[38]Formally, using dummy variables the effect on the intensive margin equals

$$E_{q=i}(y|y^* > 0, x)] - E_{q=1}(y|y^* > 0, x)$$

and on the extensive margin

$$P_{q=i}(y^* > 0) - P_{q=0}(y^* > 0)$$

with $i = (2, ..., 5)$

Table 4.4: Tobit estimation of incidence effect (marginal effects displayed):

Basis 1st Quintile	2nd	3rd	4th	5th
Panel a: All transfers.				
Extensive margin	0.0004	0.0022	0.0021	0.0027
se.	0.0168	0.0160	0.0164	0.0167
Intensive margin	8,429	45,775	44,514	57,519
se.	22,421	18,604	20,797	17,915
Overall effect	11,552	62,774	61,043	78,890
se.	30,736	25,504	28,514	24,559
Panel b: Inter vivos only.				
Extensive margin	0.0007	0.0027	0.0025	0.0018
se.	0.0195	0.0187	0.0194	0.0202
Intensive margin	5,731	21,743	19,978	14,390
se.	2,977	201	836	691
Overall effect	7,843	29,768	27,350	19,697
se.	4,074	272	1,144	945
Age controls	✓	✓	✓	✓
Income controls	✓	✓	✓	✓

Table includes marginal effects from Tobit estimations in which the transfer amount is regressed on a dummy set indicating the households' wealth quintiles in the previous period and polynomials of age and income. SOEPv30, own calculations. Data is weighted.

to receive), I estimate the results as depicted in table 4.4.

Panel *a* reports the descriptive results for regressing all transfers. For instance, having been in the 5^{th} wealth quintile in the previous period increases the probability of households to receive a transfer by 0.27 percentage points[39] compared to households who have been in the 1^{st} quintile. Considering the unconditional probability to receive a transfer when having been in the bottom 20 % of 4.7 %, the estimate suggests an increase of the probability by almost 6 %. The second row displays the effect on the intensive margin: Households who have recently been in the 3^{rd} wealth quintile are, conditional on receiving a transfer, likely to inherit a transfer that is on average 45 700 Euro higher than a transfer received by households who were in the bottom quintile. The third row of panel *a* then presents the overall difference between households coming from different wealth quintiles. Panel *b* contains the same set of estimates, albeit resulting from excluding inheritances from intergenerational transfers. Generally, the differences between households from different quintiles seem less pronounced. The results in the extensive margin of panel *b* then somewhat accommodate concerns, inter

[39] Evaluated at the means of the control variables and conditional on age and household income.

vivo transfers are predominantly needs-driven. Even if there is such an effect, poor households are, conditional on age and household income, far less likely to receive a transfer than more affluent households. After all, the estimates in table 4.4 suggest that there is an incidence effect in transfer receipts independent of age and income effects: The richer households are, the higher is their probability to receive a transfer and, conditional on receipt, the higher will this transfer be. Hence, the distributional analysis of transfers with respect to wealth inequality should take into account the heterogeneous transfer accrual.

4.7 Results

At first I will present the estimated average effects of transfer receipt on the household savings behavior. Thereafter, the results of checking up on potential heterogeneities over the wealth distribution are provided. I will then discuss in the last subsection whether these heterogeneities translate into a disequalizing effect of transfers with regard to household wealth inequality.

4.7.1 Regression results: Average effect

Table 4.5 contains the results of regressing variations of the model derived in section 4.4.1. In particular the OLS specification (eq. 4.3) whose results are presented in column (1) is comparable to the estimations in Karagiannaki (2015) or by Gittleman in Wolff (2015).[40] The estimates are read as follows: First, the transfer dummy is negative and highly significant implying that only transfers beyond 30 000 Euro[41] will typically raise heirs' savings. The estimates for the linear and squared transfer amount seem to suggest a non-linear relationship with a decreasing slope. As noted above, the estimates require a joint interpretation: Conditional on receipt, the OLS model implies an average marginal effect of 7 758.77 Euro. Note that gifts and inheritances are expressed in 10 000 Euro in all regressions so that the estimates describe the effect of an increase in transfers by 10 000 Euro. The average transfer in the sample equals roughly 75 500 Euro which, according to these estimates, would entail an increase in savings by roughly 36 600 Euro. Just as the joint significance of the three transfer variables, this effect is significant on the 1 % level.

Looking at the publications using a resembling model, the results appear rather similar: Wolff (2015) lists estimates, which indicate that a 10 000 Dollar transfer causes

[40] Both other publications model transfers only linearly, though.

[41] The quadratic nature of the equation brings along a second zero: Transfers beyond 1 349 727.3 Euro will entail a negative savings effect of transfers.

Table 4.5: The average saving effect after transfer receipt:

Dep.: Savings	OLS[1]	FD[1]	FD[1]	FD with IV[1,2]	FD with IV[1,2]
Amount	8712.12***	5997.70***	655.97	3074.80**	1760.27
	(2313.22)	(1814.32)	(3793.31)	(1532.32)	(1792.13)
Amount squared	-63.14***		70.61*		17.42
	(16.06)		(36.36)		(27.18)
Transfer Dummy	-25568.60***	-10080.74	8968.42	-7315.82	-2619.10
	(9436.01)	(14106.40)	(14028.51)	(9564.40)	(9173.46)
W_{t-1}				-1.06***	-1.06***
				(0.16)	(0.16)
Controls	✓	✓	✓	✓	✓
Number of observations	10400	5200	5200	5200	5200

The table displays estimates of regressing savings on intergenerational transfers (specified by a dummy indicating transfer receipt, the linear and partly the squared amount) and the households' wealth in the previous period and further controls.
[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Standard errors are clustered on the household level. Complete estimation results are reported in the appendix. Intergenerational transfers are expressed in 10 000 Euros.
[2] First stage results reported in the appendix.
Estimations based on SOEP v30.

savings to increase by slightly above 8000 Dollar.[42] The underlying PSID data also only surveyed wealth in 5 year intervals, thus implying a similar distance between transfer receipt and observation of wealth. Hence, the estimates are very much comparable to the one of the here estimated OLS model. Karagiannaki (2015) uses the British household survey panel and compares estimates implying an assumed average distance between receipt and wealth data point of 4.5 years. The estimates are accordingly lower, taking 0.67 (mean) and 0.62 (median). In a back-of-the-envelope calculation she infers an average propensity to consume of 7.3 % per annum. Applying this logic to the estimates in the present study would yield a slightly higher average propensity to consume of 12 % per annum.[43]

After all, the given kind of OLS model seems to consistently yield similar results. As argued above, however, these estimates are likely to suffer from omitted variable biases. I thus present further estimates, seeking to control for confounding factors. For the sake of comparability to the literature and simplicity, the following models are reported with and without squared term. Column (2) of table 4.5 presents a first

[42] Wolff (2015) specifies transfers linearly, the marginal effect is thus constant.
[43] Since there is no strong temporal variation in the accrual of transfers, the average distance in the present sample is expected to be (0+1+2+3+4)/5=2 years, where 0 means that people inherited in the year in which wealth was also observed. Empirically, the average distance in the sample is 1.8 years on average. The estimated average marginal effect given the average conditional transfer of 75 500 Euro equals .78 implying that $1 - 0.78 = 22$ % of an inherited Euro were consumed. Hence, 22/1.8=12.2 % per annum. Due to the inaccuracy in the estimates, however, the present estimate for the marginal propensity to consume is not significantly different from the one presented by Karagiannaki (2015).

differenced variation of the model already suggesting that the parameter of interest is upwards biased in the OLS estimation: The FD estimate suggests that, conditional on receipt, slightly less than 2/3 of an inherited Euro are saved. Column (3) adds a squared term to the previous model,which causes a sharp shift in the shape of the effect: The transfer dummy turns positive, just as the squared term. The linear term, however, decreases. The average marginal effect (conditional on receipt) equals 1 722 Euro. This implies that the propensity to save is estimated to be tremendously low for small transfer values, albeit increasing with transfer size (compare figure 4.1 below). While heirs, on average and ceteris paribus, tend to save almost the entire first 10 000 Euro (i.e. 9 694 Euro), the average conditional transfer of 75 500 Euro only entails an average increase in savings of 17 944 Euro. Note that the three estimates are jointly significant on the 1 % level.

Following the reasoning of section 4.4, it however appears important to control for lagged wealth when evaluating how transfers affect the savings behavior of households.[44] Wolff (2015) controls for wealth in his estimation linearly and Karagiannaki (2015) uses wealth quintiles from the previous period, both not dealing with potential endogeneity issues arising from these control variables. The estimates in column (4) (dummy and linear effect) and (5) (dummy, linear and squared term) control for lagged wealth by instrumenting it as shown in equation 4.7. While the exogeneity of the instrument can obviously not be tested, the first stage results suggest that the instrument is relevant.[45] Naturally, using first differences and instrumental variable techniques reduces the accuracy of the estimation.[46] Neither the estimates in column (4) (p-value of 0.1285), nor those in column (5) are jointly significant on conventional levels. If anything, the estimates also rather speak for low saving rates from transfers. Interestingly, however, the lagged wealth parameter is very close to -1. Recalling from section 4.4 that the parameter γ, as defined in equation 4.3, equals $\gamma = \rho + 1$, a Wald test reveals that γ does not differ significantly from 0 (p-value of 0.71). Controlling for lagged wealth does thus *not* impact the savings behavior out of transfers, $W_{H,t-1}$ is thus dropped. In order to take dependent and key explanatory variable as flow variable into account, I estimate the model from equation 4.11 with, first, dummy and linear term and, second, with dummy, linear and squared term and report the corresponding estimates in columns (2) and (3).[47]

[44]Note that once lagged wealth is controlled for, it does not matter anymore whether *wealth* or *savings* is chosen as dependent variable. Except for the estimate of W_{t-1}, which will vary by 1, the estimates will remain the same.

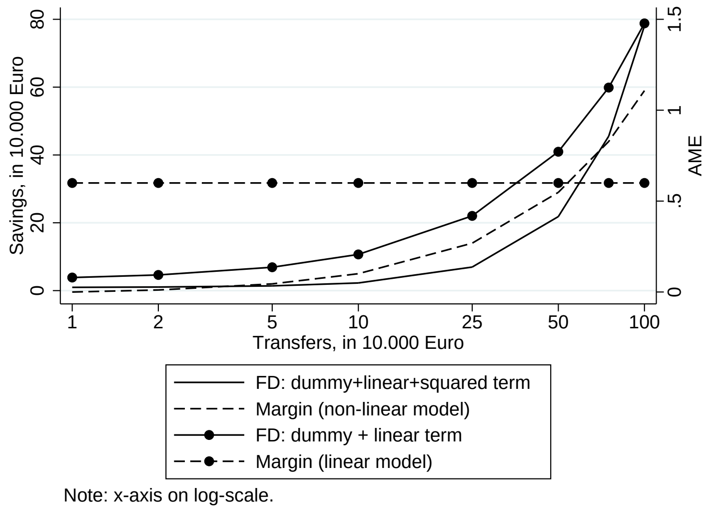
[45]Table C.5 in the appendix provides the first stage results of this estimation.

[46]Note that standard errors are clustered on the household level. Also, they take into account the additional uncertainty due to multiple imputations.

[47]See results for estimating equation 4.9 in levels and in first differences in appendix, table C.6.

The two sets of estimates might look different at first sight, figure 4.1 suggests that they actually behave rather similarly over the full range of transfers in the sample.[48] The figure displays the effects of both models (the model from column (2) with dots, the model from column (3) without), the margins on the right y-axis (the two dashed lines) and the predicted savings on the left one (the two solid lines).

Figure 4.1: Effect and Margins of FD Models



The main difference between the two is the difference in marginal effects: The model from column (2) implies a constant and fairly plausible marginal effect. The model from column (3) implies very low saving rates for low transfers and increasing, substantially higher saving rates from high transfers. Such a shape seems plausible for sizable transfer, for most transfers in the present sample, though, the saving rates appear rather low. After all, the model from column (2) (which is depicted in equation 4.11) appears to be simpler to interpret and more illustrative for the common transfer sizes in this sample.[49] The two parameters are jointly significant on the 1 % level and predict that roughly half of the average transfer in the present sample is saved. Transfers above 16 800 Euro on average and ceteris paribus will translate into increasing savings of recipients. Households also tend to save 60 Cents of an inherited Euro once they receive a transfer. The results presented in the literature are thus likely to be slightly upwards biased. The main driver for this bias could simply be the family background: Richer parents foster the wealth accumulation of their children (e.g. by investments in their human capital or by setting an example of living an economical life) and bequeath higher transfers. Controlling for time constant heterogeneity accommodates this flaw.

[48] Note that 99 % of the non-zero transfers in the given sample are below 1 000 000 Euro.

[49] In particular, the model with dummy, linear and squared term provides implausibly low saving rates for transfers between 20 000 and 50 000 Euro which encompasses 75 % of all observed transfers.

4.7.2 Regression results: Effect heterogeneity

Nonetheless, non-linearities could conceal that lagged wealth still matters for the current savings behavior of households out of transfers. The purpose of this sub-chapter is to test, whether there is evidence for the hypothesis that richer households do save more from transfers than poorer households. This presumption is often stated in the debate on the effect of intergenerational transfers on wealth and in fact may have far-reaching implications for the distribution of wealth. Table 4.6 presents a number of specifications using interactions of the households' position in the lagged net wealth distribution (indicated by quintile dummies) and the transfer amount, both linearly and squared. The model interpretation thereby becomes increasingly cumbersome. Columns (1) to (3) present potentially endogenous results and are rather presented for pedagogical reasons:

Column (1) contains the results of an OLS regression of wealth (instead of savings) on the usual controls and interacting transfers with (not instrumented) indicators for the last period's wealth position of households. The estimation is conceptually problematic, as the dependent variable is a stock and the key explanatory variables indicate flows.[50] The estimation also fails to allow for individual fixed effects and is thus most likely to yield biased estimates. The results are nonetheless reported as this specification might be considered representing the most intuitive approach to display descriptively the differences between households from different wealth quintiles in saving from transfers. The estimated savings pattern over the wealth distribution roughly coincides with the often stated expectations: The poor save comparably little from transfers, the rich are much more capable of transforming wealth transfers into wealth.[51] These estimates are economically not necessarily illustrative, but will serve below as an extreme scenario in the simulation chapter (i.e. an upper bound for the disequalizing potential of saving patterns and thus the maximum disequalizing effect of transfers).

Replacing the dependent variable *wealth* by *savings* yields the results of column (2) and column (3), which adds a squared term to the specification. The otherwise unaltered specifications still do not allow for time constant heterogeneity and still do not instrument the wealth quintile indicators.[52] These two models rather serve as OLS-benchmarks.

[50] The literature that estimates the share of inherited wealth in total household wealth (see above, section 4.2) bases on deriving the *stock of inherited wealth*, i.e. inheritances may also conceptually be interpreted as stocks.

[51] This statement bases on marginal effects: E.g. even though the dummies for the poorest heirs indicates positive savings, the total effect for the poorest is negative for the sample's average transfer. And vice versa for the richest heirs. The differences between effects are however not statistically significant for the sample's average transfer.

[52] The endogeneity issue here is apparent: The dependent variable is defined as $S_t = W_t - W_{t-1}$ while the interactions on the right hand side include quintile indicators of W_{t-1}.

The expected saving pattern from column (1) has already vanished in the results of columns (2) and (3). In particular the results from the model which only includes dummy and linear term appear irritating as the richest heirs, on average and c.p., would not necessarily gain by inheriting. The average marginal effect for both, the average transfer of the total sample and the average transfer for the richest heirs, do not indicate wealth gains that are significantly different from zero. All other heirs deviate and are estimated to gain slightly more from inheriting, as is also indicated by the significant differences in the linear effects. The model underlying column (3) then adds the squared inheritance amount. The estimated pattern appears similarly implausible: For most inheritances accruing in the top wealth quintile, the savings effect is negative. After all, these benchmarks are likely to be biased, the estimated patterns are hardly illustrative.

Columns (4) and (5) eventually present presumably consistent estimates of the savings behavior of households after transfer receipt and its variation over the lagged wealth distribution:[53] The models underlying columns (4) and (5) of table 4.6 correspond to those of columns (4) and (5) of table 4.5 except for that they add the interaction terms as formulated in equation 4.12.

The results from the model with dummies and linear terms suggest the following saving pattern over the wealth distribution: The negative dummy for the top quintile indicates that only transfers beyond 92 000 Euro on average entail an increase in the savings of the richest 20 % of heirs. This value is well above the median (≈ 34 000 Euro) and well below the mean transfer in this quintile (≈ 148 000 Euro). The marginal effects imply that, conditional on being a heir in this quintile, fairly half of an inherited Euro is saved. Considering the mean transfer in this quintile, only $1/5^{th}$ of it would be saved, on average. The interaction effects estimating the savings behavior of the heirs from the lower quintiles indicate how their behavior deviates from the one in the top quintile. Considering the mean transfers in their quintiles, the first (saving $1/10^{th}$) and the third (saving half) show high propensities to consume. The second and fourth quintile save almost their entire transfers, judging from their quantile-specific mean transfer. Hence, this estimation does not allow to identify a somewhat consistent savings pattern over the lagged wealth distribution. Instead, neither do heirs in the bottom 4 quintiles deviate significantly in their behavior (insignificance of interaction terms) from the savings behavior of the richest heirs (main effect), nor do the estimated wealth gains based on respective average transfer sizes differ significantly between heirs from quintiles, nor bear the estimates for the richest heirs significance on conventional

[53] The first stage estimation results are not reported here as they encompass 25 estimations (5 instrumented variables in 5 imputed data sets). The results are however available on request.

Table 4.6: Heterogeneity in the savings effect across the wealth distribution:

	(1)	(2)	(3)	(4)	(5)
	OLS[1,2]	OLS[1,2]	OLS[1,2]	FD with IV[1]	FD with IV[1]
Dependent variable	Wealth	Savings	Savings	Savings	Savings
Transfer Dummy	-22570.17	41238.46	-25010.13	-48144.90	56497.38
	(31162.20)	(36861.78)	(30425.40)	(38270.29)	(108247.19)
Transfer × $W_{t-1}^{D=1}$	19747.47	-40850.10	13395.80	57910.75	-30453.94
	(33179.19)	(38731.44)	(32504.36)	(46477.22)	(109084.39)
Transfer × $W_{t-1}^{D=2}$	15025.61	-47064.41	15992.04	54543.62	-54392.89
	(32196.80)	(37988.95)	(32121.89)	(38196.77)	(113852.24)
Transfer × $W_{t-1}^{D=3}$	18365.55	-47241.97	-2651.93	43068.56	-72608.87
	(32660.05)	(38518.45)	(35715.11)	(41002.12)	(110833.15)
Transfer × $W_{t-1}^{D=4}$	-905.10	-63584.25	22617.85	50767.62	-63890.78
	(35150.30)	(39938.61)	(34612.52)	(44077.53)	(123757.94)
Amount	8224.48***	-5010.79	4863.45	5203.38	-21202.03
	(1655.41)	(3656.40)	(3712.52)	(3381.01)	(30418.45)
Amount × $W_{t-1}^{D=1}$	-3209.60*	10787.41***	5438.58	-4773.42	16464.38
	(1946.35)	(4070.28)	(5272.45)	(4910.57)	(31502.95)
Amount × $W_{t-1}^{D=2}$	99.72	13354.13***	4722.31	-1851.04	26425.88
	(2460.27)	(4095.77)	(8371.72)	(3979.23)	(33020.64)
Amount × $W_{t-1}^{D=3}$	-2515.75	10961.51**	9145.04	-4241.99	26210.57
	(3044.58)	(4380.45)	(7156.12)	(3754.47)	(31546.29)
Amount × $W_{t-1}^{D=4}$	2346.93	15463.16***	-1544.06	-166.63	28348.90
	(3137.53)	(4416.35)	(4274.37)	(4155.97)	(35587.92)
Amount^2			-59.30***		0.00
			(14.75)		(0.00)
Amount^2 × $W_{t-1}^{D=1}$			24.40		-555.58
			(28.19)		(785.72)
Amount^2 × $W_{t-1}^{D=2}$			43.89		-617.12
			(76.64)		(803.41)
Amount^2 × $W_{t-1}^{D=3}$			-75.86		-655.92
			(72.96)		(796.34)
Amount^2 × $W_{t-1}^{D=4}$			163.10***		-644.25
			(23.33)		(930.43)
W_{t-1}				-1.06***	-1.04***
				(0.16)	(0.16)
Controls	✓	✓	✓	✓	✓
Number of observations	10400	10400	10400	5200	5200

Note that each column includes the estimates from a single estimation, the middle rule just separates estimates to increase readability.

[1] Control variables: All parameters are conditional on controlling for a third order polynomial of age, a second order polynomial of household income and their interactions. Standard errors are clustered on the household level. Complete estimation results are reported in table C.7 the appendix. Intergenerational transfers are expressed in 10 000 Euros.

[2] Main effects of wealth quintile indicators reported in the table C.7 in the appendix.

Estimations based on SOEP v30.

levels (jointly significant only on the 29 % level). In accordance with the findings in section 4.7.1, there is again no sufficient evidence for dynamic effects, short and long term effects do not differ significantly.[54] Neither does the observed quintile-specific savings pattern allow to infer that the wealth endowment of heirs (conditional on the further controls) determines the households' treatment of transfers unambiguously in one direction (as assumed e.g. in the simulation in Wolff and Gittleman (2014)).[55] Nor does the accuracy of the estimation allows to derive insights about the consumption behavior of groups of heirs. The estimated results are insignificant throughout. A single take-away might be, that adding the squared terms in fact affects the suggested savings pattern over quintiles.

4.7.3 Discussion of results

The results presented in the previous section are surprising: The wealth endowment of a household does not seem to significantly impact how households adjust their savings behavior to the receipt of intergenerational transfers. The absence of a significant dynamic effect also implies that there is no gradual consumption (resp. saving) from intergenerational transfers. Households are thus expected to consume as much from a very recent transfer receipt as from one received long ago.[56]

Economically, it is conceivable that behavioral reactions across the wealth distribution do not differ significantly.[57] Households' consumption will primarily depend on permanent income, negative transitory shocks are generally mitigated by welfare state institutions. Hence, there is not necessarily a need for higher consumption out of transfers in lower wealth quantiles.

Nonetheless, methodological issues and data limitations might contribute to the results: It is for instance conceivable that the households' dynamic adjustment of their consumption path is not accurately identified. As noted above, the data structure entails that people are on average observed 2 years after receipt. Households might already have fully adjusted consumption within this time. It then appears as if households "immediately" consume the estimated and substantial share of roughly 1/3 of

[54]Again, the linear control for lagged wealth W_{t-1} yields an estimate of $\rho \approx -1$, leaving the γ parameter as defined in eq. 4.7 insignificantly different from 0. As the interaction approach however requires to take lagged wealth into account in anyway, the parameter remains in the presented models.
Column (5) again adds a squared term for the inheritance amount to the model and otherwise equals the estimation underlying column (4). The results, however, also do not provide further insights:

[55]The authors here assume that the savings rate rises proportionally with wealth with a specified slope parameter. Compare Simulation on p. 462ff.

[56]Also Westerheide (2005) does not find much variation in the saved share of transfers depending on whether they were received recently or already 5 or even 10 years ago.

[57]Looking at the relationship between savings behavior and income levels, Brenke and Pfannkuche (2018) provide descriptive evidence suggesting that the savings rate varies with income. Income and savings rate are however obviously endogenously chosen.

the transfer and might save the rest for e.g. own bequest considerations. Partly, the adjustment of the consumption path is also concealed by the returns accruing to the transfer receipts and that in itself might vary over the wealth distribution, as e.g. noted by Piketty (2014). Also, as mentioned above, the pace of the dynamic adjustment of consumption is likely to be related to the wealth type of the transfer. Inherited real estate is less liquid than e.g. financial transfers (Westerheide, 2005). My results might thus also reflect rather the immediate consumption from liquid assets and while not covering the longer term adjustments towards business capital and real estate. This shortcoming is however not only related to the lack of surveying the wealth type of the transfer but also the rather limited period of time covered by the data at hand.

The lack of significance may also be attributable to the costly estimation approach: After accounting for fixed effects and instrumenting lagged wealth, the analysis rests on a single time period only. The multiple imputation approach adds further uncertainty, the interaction approach virtually reduces the number of incidents per estimate and draws some degrees of freedom, even though we are still observing comparably low standard errors. Improved data and methods might also reveal that the absence of dynamics results from the fact that some households invest their transfers and generate returns while others dissave. These effects could balance each other to some degree. I will take up the role of expectations for these results in the robustness part, section 4.8.

4.7.4 Simulation

The purpose of this paper is to track down the distributional effects that intergenerational transfers have on the household net wealth distribution. One can describe this effect using the following two distributions:

- W^{obs}: This is the net wealth distribution as observed in the SOEP (pooled over the periods of 2002, 2007 and 2012).
- W^{net}: This counterfactual distribution is the actual wealth distribution net of transfers. Note that this distribution is *not* derived by $W^{net} = W^{obs}_{H,t} - B_{H,t}$ but by $W^{net} = W^{obs}_{H,t} - \beta_\tau \times B_{H,t}$ in order to take into account the savings behavior of households after transfer receipt.

Calculating the difference between the inequality between W^{net} and W^{obs} then yields the overall effect of transfers on the wealth distribution: $G(W^{net}) - G(W^{obs})$, where G is some function describing an inequality index.

As described in section 4.3, I would like to decompose this overall effect in order to identify in how far a heterogeneous savings behavior and the transfer incidence contribute to the overall inequality effect of intergenerational transfers.[58] I will use some of the estimation results so far derived in this paper in order to quantify the impact of these effects and to derive the overall effect of transfers on wealth. To do so, I will estimate inequality indices for two further counterfactual distributions of wealth *after* transfer receipt:

- W^{equ}: Describes a counterfactual distribution required to identify in how far the incidence effect is driving the distributional implications in the overall effect. Using estimates of a tobit model[59] of the form described in appendix section C.4.2.3, one can simulate a distribution of transfers that divides the aggregated bequest flow equally among the wealth quintiles in the sense that the expected unconditional transfer sizes over quintiles are equal in this counterfactual distribution. The difficulty here is that the incidence effect, as explained above, implies that both $P(B > 0)_\tau$ and $E(B|B > 0)_\tau$ differ across quintiles. In order to balance expected transfer sizes across quintiles only along the intensive margin, the tobit estimates are helpful for taking into account the differing shares of heirs over quintiles, i.e. the variation in $P(B > 0|\tau)$.[60] The expected (unconditional) transfer in wealth quintile τ is estimated to equal:

$$\hat{E}(B|\tau)_\tau = \hat{P}(B > 0|\tau)_\tau \times \hat{E}(B|\tau, B > 0)_\tau \tag{4.13}$$

  In order to get the counterfactual while keeping the total sum of transfers constant, one requires a hypothetical reallocation of the transfers between quintiles that balances the respective differences between quantile-specific expected transfers and the globally expected (unconditional) transfer. This is equivalent to solve for x_τ in

$$P(B > 0|\tau) \times (E(B|\tau, B > 0) + x_\tau) \stackrel{!}{=} \bar{E}(B)$$

[58]The overall effect furthermore is a function of the ratio of the initial net worth of households and its relative size to transfers. I do not alter the wealth distribution and do not alter the aggregate transfer volume. Identifying the incidence effect however reveals in how far the distribution of transfers across the wealth distribution is driving the distributional effect of transfers.

[59]The model is similar to the one underlying the descriptive results in table 4.4 (but leaving the age and income controls aside).

[60]Note that the equal distribution of transfers *among wealth quintiles* does neither imply that all households receive the same hypothetical transfer nor that transfers would have no distributional impact on wealth. It rather means that the expected (unconditional) transfer size for each quintile of the lagged wealth distribution is roughly the same. This does not translate into equally sized transfers for all households as the share of heirs (i.e. $P(B > 0)$) varies over quintiles. In order to keep $E(B|\tau) = P(B > 0|\tau) \times E(B|B > 0, \tau)$ constant over quintiles, $E(B|B > 0, \tau)$ has to adjust according to the given $P(B > 0|\tau)$ (as one would otherwise need to somehow choose counterfactual heirs or would need to adjust household weights).

and to add x_τ to each households' transfer in the respective quantile τ. The counterfactual distribution of transfers then is

$$\hat{B}^{equ}_{H,t,\tau} = B_{H,t} + \frac{\bar{E}(B) - \hat{E}(B|\tau)_\tau}{\hat{P}(B > 0)_\tau}. \tag{4.14}$$

Where $\hat{E}(B|\tau)_\tau$ is the expected (unconditional) transfer size in wealth quintile τ and $\bar{E}(B)$ the overall expected (unconditional) transfer size. The tobit estimation parcels out the total effect, as displayed in eq. 4.13, in extensive and intensive margin and thus provides with estimates for $\hat{P}(B > 0)_\tau$ (extensive margin) and $\hat{E}(B|\tau, B > 0)_\tau$ (intensive margin) the elements for the calculation of the counterfactual distribution as described in eq. 4.14. $B^{equ}_{H,t,\tau}$ is derived by adding the quintile specific difference between the overall expected value of transfers and the quintile specific expected transfer to each transfer of this quintile.[61] The resulting transfer distribution is net of the incidence effect as it implies the same expected transfers per wealth quintile.[62]

The distribution $W^{equ} = W^{net} + B^{equ}$ then allows to identify the inequality effect of the transfer incidence as $G(W^{net}) - G(W^{equ})$.[63]

- W^{mech}: This distribution is defined as $W^{mech} = W^{net} + B$ and allows to identify the actual *mechanical* effect of transfers on the wealth distribution as $G(W^{net}) - G(W^{post})$. The mechanical effect ignores the impact of transfers on the savings behavior of households (i.e. neglects β_τ). Hence, if the mechanical effect would differ substantially from the overall effect, this difference would be attributable to the heterogeneous savings behavior of households after the receipt of transfers.

The proposed decomposition aims at equalizing the unconditional expected transfer size *over* quantiles in order to measure the impact of potentially systematic variations

[61] While the distributional analysis in this section uses pooled wealth data over the three time periods, W^{equ} is calculated separately for 2002, 2007 and 2012.

[62] The aggregate transfer amount is kept constant by this procedure as the deductions for households above the mean balance the surplus of households below the overall mean transfer. Note as well that the given procedure balances the expected transfer per quintile by the absolute transfer amount only. Hence, given the incidence effect, as there are fewer recipients of transfers in the bottom quintiles, these households' receipts will be above the average expected transfer in order to balance the higher number of recipients in upper wealth quintiles. This way, there is no need to turn observed non-heirs into heirs in the bottom quintiles in order to equalize the transfer volume accruing in the bottom quintiles. Figure C.1 in the appendix displays the distributional effect of the counterfactual accrual of transfers in a Lorenz diagram for 2012.

[63] It would be furthermore possible to generate the distribution $W^{spar} = W^{net} + \beta_\tau \times B^{equ}$. This distribution would permit to identify the effect of heterogeneous savings behavior by $G(W^{net}) - G(W^{spar})$. Differences of this effect to the overall effect would then be attributable to the incidence effect. In order spare the reader of yet another counterfactual distribution, the effect of heterogeneous savings is identified as described above.

over the wealth distribution with direct distributional implications. The variation in transfer sizes within quantiles is however typically higher than between quantiles. The decomposition here is thus a coarse tool assessing only a single dimension of the variation in transfers. Also, the decomposition manipulates transfer distributions in order to reach evenly distributed expected transfer sizes in all quantiles of the wealth distribution. Another promising approach to reach such distributions could use the variations in transfers within quantiles and simply manipulate the households' survey weights. Such an approach is considered equivalent to the approach implemented here.

The overall effect of intergenerational transfers contains both the incidence effect and the effect on the savings behavior of households. The decomposition seeks to point these underlying dynamics out. Tables 4.7 and 4.8 provide a number of inequality indices for the mentioned four distributions. Note that the distributions in panels a, c and d rest on β_τ estimates. The distributions in the panels b to d include transfers, whereas different concepts of transfers. Panel a shows the only net-of-transfer distribution. While the results in table 4.7 base on the preferred β_τ estimates as presented in column (4) of table 4.6, table 4.8 rather serves as a robustness check using the endogenous estimates of column (1) in table 4.6, which bear a savings pattern closer to the initial expectations. Note here again, that the estimates from column (4) of table 4.6 are throughout statistically insignificant. I resort to these estimates primarily in order to demonstrate the mechanics of the decomposition, the point estimates may at best convey very rough tendencies about the quintile-specific savings behavior. I do not resort to the statistically significant estimates of the average effect estimation instead: Since the average effect estimation suggests increasing saving shares for higher transfers, these estimates would probably also lead indirectly to varying average saving shares over wealth quintiles. This effect however, would only result from systematic differences in accruing transfer receipt probabilities and varying transfer sizes over the wealth distribution and would thus reflect the transfer incidence instead of the savings behavior.

Table 4.7 presents the main results of the simulation by listing the estimated inequality in the four relevant wealth distributions. Inequality is measured by four relative inequality indices: the Gini index,[64] the Coefficient of Variation[65] and the 90/50 and 75/25 percentile ratios. Additionally, the last column provides with the difference

[64]Note that the Gini index loses his characteristic of being bound between 0 and 1 as wealth data contains negative values. In this case, the Gini could reach values above 1. Also, subtracting the saved share of transfers from observed wealth to reach the distribution W^{net} affects the share of households with negative wealth rendering the Gini indexes not necessarily comparable to each other.

[65]The CV is defined as the ratio between the standard deviation and the mean, i.e. $CV = \frac{\sigma}{\mu}$. Due to the mentioned flaws of the Gini index in the context of wealth data, the CV is commonly used as reference in measuring wealth inequality.

Table 4.7: Inequality in actual and counterfactual wealth distributions:

	Gini	Gini0	CV	p90/p50	p75/p25	p75-p25
a.W^{net}: *Counterfactual wealth net of transfers.*						
Index	.755	.69	2.38	8.63	331	184,829
Std. error	.0138	.01	.129	.561	119	6,049
Distributions including transfers.						
b.W^{obs}: *Wealth distribution as observed:*						
Index	.734	.682	2.25	7.97	99.5	196,153
Std. error	.0118	.0099	.128	.479	57.7	6,028
c.W^{mech}: *Transfers added w/o heterogeneous savings behavior.*						
Index	.752	.691	2.35	8.5	234	186,900
Std. error	.0134	.01	.129	.498	91.5	5,870
d.W^{equ}: *Transfers added w/o incidence and savings effect.*						
Index	.743	.682	2.2	7.84	165	181,999
Std. error	.0158	.0105	.163	.524	75.5	5,929

Note: SOEP v30, own calculations. Results are weighted. Data pooled across 2002-2012 periods.

between the 75^{th} and 25^{th} wealth percentile an absolute inequality measure. The Gini index is reported twice: The column labeled *Gini* includes results for the usual Gini index. The *Gini0* instead only considers households with non-negative wealth in order to reflect a comparable Gini measure bound between 0 and 1.[66] While the unrestricted Gini index overestimates inequality, the restricted one will underestimate inequality due to the systematic omission of the lower end of the wealth distribution. The most reliable inequality measure here is thus the CV.

First, panel a gives the wealth inequality in household wealth net of transfers, W^{net}. Panel b reports the inequality in the observed wealth distribution. Comparing the inequality between panel a and panel b indicates the overall inequality effect of transfers on the household wealth distribution, i.e. reflects the net effect of transfer incidence, savings behavior out of transfers and the aggregated transfer volume. According to all relative inequality measures, inequality is slightly higher in the distribution net of wealth transfers. Absolute wealth inequality has risen, though. Both of these results are well in line with the literature (Wolff and Gittleman, 2014; Elinder et al., 2018; Karagiannaki, 2015; Boserup et al., 2016a). This pattern was to be expected after having seen above that there is no savings pattern identified according to which richer households would save more out of transfers than poorer households. The observed

[66]It is common to report this reference as the Gini index in the context of wealth and without restrictions to non-negative values might be misleading. In order to get Gini values not exceeding 1 *and* Ginis that are comparable in that they evaluate the same underlying sample of households, *Gini0* restricts the sample to those households for which $W^{net} >= 0$. The net-of-transfer wealth distribution W^{net} is the distribution with the lowest households' wealth stocks, households with negative wealth in W^{net} are thus consistently excluded for all *Gini0* values reported here.

wealth distribution W^{obs} however is already the result of the adjustment of the savings behavior of households after bequest receipt. The literature widely neglects the potential variations in the savings reactions, conceptually table 4.7 panel *c* therefore helps to pin down the actual nature of the savings effect alone:[67] Panel *c* displays the inequality in wealth if only adding transfers mechanically to the net-of-transfer distribution, i.e. without considering the behavioral response in savings to transfer receipt. All relative inequality measures suggest that the inequality in W^{mech} is higher than in W^{obs}, implying that the savings behavior as estimated *adds* strongly to the equalizing effect of transfers on wealth inequality. This finding opposes the hypothesis of Wolff and Gittleman (2014) who assumed that the savings behavior over the wealth distribution would rather tend to disequalize wealth. Comparing the panels *b* and *c* furthermore leads to the conclusion that taking out the savings effect reduces the equalizing effect of transfers substantially. Studies not controlling for the savings behavior of households might thus heavily overestimate the genuine effects of transfers as they attribute the equalizing effect of the savings behavior falsely to transfers in general. The genuine inequality effect of only adding transfers mechanically, i.e. comparing panels *a* and *c*, however is small, according to the difference in *Gini0* even ambiguous.

Panel *d* then provides the counterfactual inequality in wealth after transfers, if the aggregated bequest flow would have been equally split among all wealth quintiles. W^{equ} indicates the maximum equalizing potential of the aggregated transfer volume as it basically takes out the transfer incidence. The underlying, virtually random distribution of transfers thus provides a reasonable upper limit to the relation relative transfer sizes can take in equalizing the wealth distribution. The relative transfer size is usually bigger for poorer households which explains why transfers tend to equalize wealth. According to the difference in the Coefficients of Variation, this upper limit of the equalizing effect of equally distributed transfers is then also slightly stronger than the equalizing effect of the savings behavior (comparing panels *b* and *d*). The difference in relative inequality between W^{equ} and W^{mech} is fully attributable to the transfer incidence (as the savings behavior is kept out of this comparison and the aggregate transfer volume is kept constant across these distributions). It shows that the transfer incidence, i.e. the relationship between parental wealth, as represented by the transfer size, and children's wealth, is contributing to wealth inequality. This relationship roughly describes the intergenerational persistence of wealth that exists

[67] That is, the effect of the savings behavior out of transfers on the inequality effect of transfers.

beyond the intergenerational transfers observed here.[68] [69] The transfer incidence thus disequalizes wealth. It is of course included when comparing W^{net} and W^{obs}, so that the equalizing forces behind transfer accrual are in total stronger than the disequalizing effect of the transfer incidence. The transfer incidence, however, almost offsets the equalizing effect of the aggregated transfer volume.[70] In this exemplary application of the decomposition, the savings behavior of heirs is a substantial factor that adds to the equalizing effect of transfers on wealth.

Hence, after the behavioral adjustment the transfer incidence of the aggregated transfer volume still leaves relative transfers higher for poorer people. Intergenerational transfers are thus, after all, equalizing wealth inequality also according to this decomposition method. As explained above, the decomposition analysis however hinges on the validity of the underlying estimated savings behavior. In this particular example, the estimates are statistically insignificant, so that the real savings behavior may have no actual impact at all. The decomposition thus rather demonstrates the mechanics of the decomposition along the somewhat arbitrary point estimates of the underlying estimation.

The decomposition approach presented here adds to the understanding of how transfer accrual affects wealth inequality. Nonetheless, the differences between most of the inequality measures in table 4.7 are not significant and thus only hint to potential relationships that I cannot back with sufficient evidence. Taking the effect directions as given, figure 4.2 gives a stylized illustration of how the subeffects add up to the observed overall effect.

Table 4.8 presents decomposition results as in the previous table, albeit based on the OLS estimates of β_τ (presented in table 4.6 column (1)), which suggested a strong heterogeneity in the savings behavior over the wealth distribution and in this context serve as a kind of upper bound for the degree to which the empirically derived savings patterns are regressive. The pattern suggested that the richest 20 % of the population save a much higher share of wealth than the bottom 20 % and, looking at quantile-specific estimated wealth gains through an average transfer, even the bottom 80 % of heirs. The underlying β estimates are clearly endogenous, but applying the

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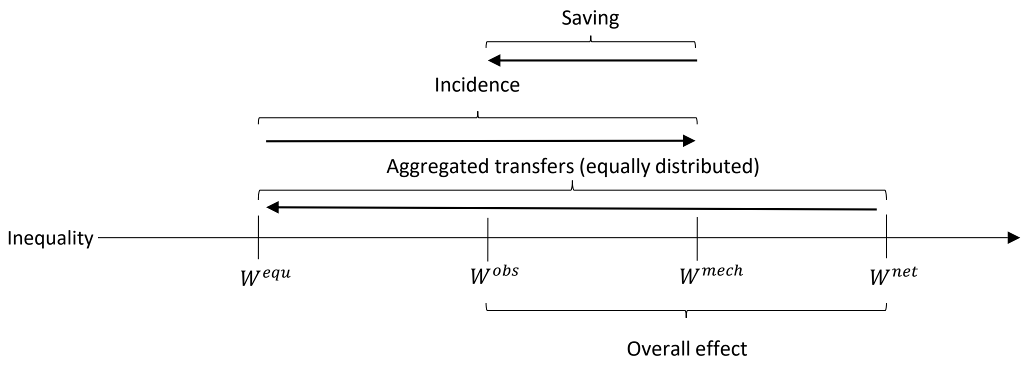
[68] In the sense that those households that are comparably rich *and* receive a comparably high transfer have become rich already without this very transfer. Hence, there is a strong correlation in wealth across generations not resulting from the transfers observed here. The impact of the other factors forming this intergenerational wealth persistence is however not well identified as parents and children are obviously in different phases of their life cycle so that their stocks of wealth are not comparable.

[69] Note here that $W^{equ} = W^{net} + B^{equ}_{H,t}$ *must* be more equal than W^{net} and W^{mech}, but is not necessarily more equal than W^{obs} as W^{obs} additionally takes the savings effect into account. Taking also the savings effect into account in W^{equ} would however need to result in a more equal distribution than W^{obs} and is in fact estimated to be slightly more equal with $CV = 2.17$.

[70] In the sense that W^{mech} is almost as unequal as if transfers would not have accrued, i.e. as W^{net}.

Figure 4.2: Stylized illustration of decomposition:



decomposition to the resulting distributions serves an interesting illustrative purpose: Interestingly, the decomposition results under this savings behavior do not differ substantially from those presented above. The difference in inequality between panel *b* and *c* is attributable to the savings effect and is, in fact, slightly smaller here than in table 4.7. Hence, while the savings pattern from the OLS estimation actually comes along with a more regressive impact, it only entails an almost negligible difference in the savings effects. The savings behavior of heirs has thus a smaller, albeit still clearly progressive effect on the inequality in household wealth. None of the empirically derived savings patterns in the present study thus qualifies to revert the equalizing forces of transfers.

The progressive nature of the savings effect maintains even over seemingly regressive estimated savings patterns. This is probably due to two reasons: First, the estimated savings patterns depict *absolute* gains. While the top 20 % might well gain most in absolute terms, relating these gains to the net-of-transfer wealth looks differently, as section 4.6 shows. The strong equalizing effect of the savings behavior might well be attributable to the fact that the β_τ estimates compress actual wealth gains over the wealth distribution and thus rather contribute to a more progressive relation of relative transfers (compare eq. 4.1). Secondly, also the OLS estimates do not indicate a monotonically increasing β over the wealth distribution and thus systematically deviate from the conceivable but empirically not backed savings patterns Wolff and Gittleman (2014) discuss.

This exemplary analysis suggests that the savings behavior can be a predominant force behind the equalizing power of transfer accrual. The here used estimations however lack the statistical significance that would allow more reliable conclusions. A more refined estimation approach might well identify more systematic variations in the behavioral responses over the wealth distribution. A savings pattern that would revert

Table 4.8: Inequality in actual and counterfactual wealth distributions (robustness):

	Gini	Gini0	CV	p90/p50	p75/p25	p75-p25
a.W^{net}: *Counterfactual wealth net of transfers.*						
Index	.747	.689	2.34	8.42	189	187,524
Std. error	.0118	.01	.128	.51	60.9	5,944
Distributions including transfers:						
b.W^{obs}: *Wealth distribution as observed.*						
Index	.734	.683	2.25	7.97	99.5	196,153
Std. error	.0118	.0099	.128	.479	57.7	6,028
c.W^{mech}: *Transfers added w/o heterogeneous savings behavior.*						
Index	.742	.689	2.31	8.38	146	189,995
Std. error	.0116	.01	.127	.501	61.2	6,064
d.W^{equ}: *Transfers added w/o incidence and savings effect.*						
Index	.731	.678	2.15	7.31	93.6	187,016
Std. error	.013	.0104	.157	.524	57.8	6,111

Note: SOEP v30, own calculations. Results are weighted. Data pooled across 2002-2012 periods.

the equalizing effect of the behavioral adjustment could also revert the overall effect and could thus confirm the hypothesis of Wolff and Gittleman (2014). Based on the given data, the used method and the corresponding results, identifying such a regressive savings pattern seems nonetheless unlikely. The predominant effect of the savings behavior and aggregated transfer effect more than offset the regressive impact of the transfer incidence, relative transfers thus remain higher for poorer households.

Keeping the limited reliability of the simulation in mind, the given results would meet concerns by Wolff and Gittleman (2014) that heterogeneous savings patterns could lead to a disequalizing effect of transfers on the wealth distribution: Even the here estimated pure savings effect net of the transfer incidence does not warrant such concerns. The estimations presented in this paper suggest in line with the literature, that transfers tend to equalize inequality in wealth even after taking dynamic adjustments of household behavior into account. The effects, while being only partly statistically significant, however seem rather small and do not necessarily bear economic significance.

4.8 Robustness

The robustness section presents some simple robustness checks for the estimation of the savings effect. Namely, exclusion of gifts, expectations concerning future transfer receipts, the time between transfer receipt and observation of the household and, lastly, excluding extreme observations.

4.8.1 Excluding gifts

So far, intergenerational transfers encompass *inheritances* and *inter vivo transfers*. While a single person can bequeath only once (i.e. at death), it may well pass on gifts several times during the life course. A concern may thus be that the transfer variable in the preceding estimations is endogenous: Households may have received gifts as financial support in moments of need. These households would then be likely to show a particularly high propensity to consume out of transfers. Additionally, preceding gifts may establish a biasing link between observed household wealth and observed *inheritances*: The more gifts a household received (before being observed here), the higher the household's wealth and the lower the actually observed inheritance. The estimate of interest would then be downward biased. The latter problem of unobserved preceding gifts is sufficiently addressed by taking first differences. The former issue, however, requires to exclude gifts and to only use inheritances as intergenerational transfers.[71] Excluding gifts will of course come at the cost of statistical power: As table 4.1 shows, almost half of the observed transfers are transfers between living persons. Table 4.9 presents some estimation results based entirely on inheritances. Columns (1) and (2) present OLS estimations with and without control variables, column (3) reports the FD model (results *with* inter vivos: table 4.5, column (2)), column (4) the FD-IV model (reference results in table 4.5, column (4)). Compared to the results basing on all observed transfers, the point estimates in table 4.9 tend to be somewhat smaller, albeit not significantly different from those in table 4.5.[72] Hence, there is no evidence that there is a more pronounced consumption out of gifts, the results rather indicate the opposite. After all, it does not seem likely that using inheritances and gifts introduces a bias.

4.8.2 Expectations about future transfer receipts

Economic theory predicts that expectations about future transfers will affect the consumption and savings behavior of individuals over the life cycle. In brief, individuals who are certain to receive a transfer will already take the expected future transfer amount into account when trading off current utility from consumption and saving. Everything else equal, one would expect a higher consumption rate out of unexpected transfers. Considering the approach in this paper, *expectations* will enter the estima-

[71] Note that households still can receive more than a single transfer, as they obviously can inherit from different persons. See footnote 1 for a brief overview of the source of transfers.

[72] Using STATAS 'suest' command adjusted for multiple imputation yields a p-value for the null hypothesis that the difference between the *amount* estimates in e.g. the FD estimation in table 4.9 and table 4.5 is 0.258. The respective p-value for the *transfer* estimate is 0.873. Hence, we cannot reject the null hypothesis, that the two coefficients have the same value.

Table 4.9: Excluding inter vivo transfers:

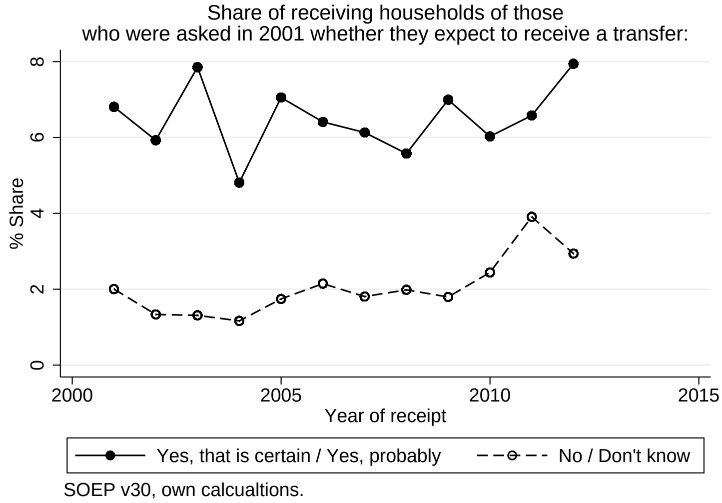
Dep.: Savings	OLS[1]	OLS[1]	FD[1]	FD with IV[1]
Amount	7288.77**	7449.48**	5018.64**	2694.47
	(3137.91)	(3065.32)	(2372.56)	(2026.20)
Amount squared	-60.39***	-59.14***		
	(18.07)	(17.24)		
Transfer Dummy	-25074.51*	-25990.57*	-11218.71	-4839.39
	(15082.74)	(14957.18)	(17656.98)	(13084.15)
W_{t-1}				-1.08***
				(0.17)
Controls		✓	✓	✓
Number of observations	9863	9863	4929	4929

[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Standard errors are clustered on the household level.
[+] Intergenerational transfers are expressed in 10 000 Euros.
[+] Estimations based on SOEP v30.

tion in the error term. If they are time-variant, they could also interfere with the estimation: If *expectations* correlate with e.g. *amount*, then they could bias the parameter of interest. As described in section 4.5, the SOEP enquired in 2001, whether individuals expected to receive an intergenerational transfer. Respondents could reply with "Yes, that is certain", "Yes, probably", "No" and "I don't know". Figure C.2 in the appendix seeks to validate these statements by plotting the share of households that eventually received a transfer by statement category over time. While respondents stating that a receipt is certain or likely show a higher relative probability to actually receive a transfer in the following periods, differences between answers appear small and rather noisy. I thus summarize the groups into, first, the group of those who somehow expect to receive and, second, in those who either do not know or seem to be certain not to receive. Figure 4.3 displays the relative probability of respondents from these groups to actually receive a transfer between 2001 and 2012: In fact, people who have stated in 2001 that they are confident to receive a transfer in the unspecified future seem to be slightly more likely to actually receive a transfer. Roughly 6 % of the households in this group receive a transfer over the observed following decade. The group of non-expectators is a bit less likely to receive, showing only about 2 % of the households inheriting.

In order to test whether these differences in expectations translate into different savings behaviors after bequest receipt, I interact the variables *amount* and *transfer* as in equation 4.7 with the indicator variable differentiating between expecting and non-expecting households. The results of this test are displayed in table 4.10, in the

Figure 4.3: Expectations about transfers and actual receipt:



columns headed with *Expectations*: Note first, that the interaction with only once observed[73] *expected* further complicates the interpretation.[74] The main effects describe the behavior of recipients who did not anticipate their receipt. Both of which are insignificant, individually and jointly, which suggests a rather inaccurate estimation and which is also facilitated by a particularly high propensity to consume out of unexpected transfers. The interaction terms with *expected* describe the behavior of individuals that anticipated their receipt. In fact, the point estimates in column (1) suggest that, conditional on receipt, households tend to save slightly more out of expected transfers ($\approx 1/2$ of an inherited Euro). Taking into account the intercepts, however, renders the total effect of e.g. the average transfer amount insignificant. The savings effect of anticipating heirs is thus also not significantly different from the savings effect of non-expecting heirs.[75] The second column of results displays the corresponding results for the model that additionally controls for lagged wealth. The results are similar in that they equally suggest a higher savings propensity out of transfers for anticipating heirs conditional on receipt. Tests of whether dummy and linear term differ between the groups however do not allow to reject the null hypothesis that there are no differences in the behavior between anticipating and non-expecting heirs. Also in this specification, the estimate for w_{t-1} does not allow to infer significant dynamic effects or the necessity to control for households' lagged wealth.

[73]Note that *expectations* are time-constant, as they are observed only once. Hence, they drop out of the FD specification, the behavior of non-receiving expectators is thus not identified.

[74]As always with interaction terms, the interaction effect only represents the deviation from the main effect. In this case, however, one still has to take into account that the *transfer dummy* and *amount* are implicit interactions, too.

[75]This holds despite the fact that the expecting households save significantly out of transfers (joint significance on 1 % level). Nevertheless, the groups do not differ significantly from another.

After all, while there is weak evidence that heirs who expect to receive a transfer tend to save more and consume less out of eventually received transfers, these deviations are estimated comparably imprecisely and do not allow to infer systematic differences in the savings behavior based on expectations. Similar evidence is for instance found by Brown et al. (2010) or Doorley and Pestel (2016): Brown and colleagues analyze the extensive margin of labor supply based on the early retirement behavior of heirs and controlling for expectations. While they find that heirs of unexpected transfers react more strongly (which is coherent with the implicit consumption patterns estimated here), the differences between the groups of expecting and non-expecting recipients is statistically not significant. Doorley and Pestel (2016) use the same data set as the present study and do not succeed in establishing deviating behaviors based on expectations.

Interacting the transfer-related variables with the expectations indicator in the model for heterogeneous savings effects (see equation 4.12) does also not reveal systematic differences in the savings behavior over the wealth distribution or between expecting and non-expecting heirs. The results of the estimation are thus not presented here.

Table 4.10: Robustness of the average saving effect:

	Expectations		Timing of receipt		Outlier sensitivity	
Dep.: Savings	FD[1]	FD with IV[1]	FD[1]	FD with IV[1]	FD[1]	FD with IV[1,2]
Amount	3033.51	-333.24	5607.29***	2848.33**	6425.91***	3514.17***
	(2778.75)	(1883.85)	(1874.62)	(1437.17)	(1688.27)	(1065.30)
Amount × Expected	4654.32	5681.04**				
	(3429.64)	(2531.57)				
Transfer Dummy	-885.58	2691.47			231.04	-1956.86
	(13403.62)	(9260.21)			(10518.51)	(6794.62)
Transfer × Expected	-16228.05	-14495.77				
	(34142.37)	(18134.85)				
W_{t-1}		-1.04***		-1.06***		-0.86***
		(0.14)		(0.16)		(0.08)
Transfer in t			-14265.83	15847.17		
			(29429.11)	(17218.45)		
Transfer in $t-1$			-44742.58	-1113.94		
			(39779.56)	(19365.61)		
Transfer in $t-2$			-12157.24	-748.33		
			(22669.85)	(16833.69)		
Transfer in $t-3$			22320.65	14530.60		
			(37081.43)	(17566.74)		
Transfer in $t-4$			5297.63	-15539.07		
			(36674.41)	(16342.07)		
Controls	✓	✓	✓	✓	✓	✓
Number of observations	5158	5158	5200	5200	5200	5200

[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Standard errors are clustered on the household level.

[2] Topcoding: Inheritances above p99 (99^{th} percentile) are replaced by the value of p99. Similarly, wealth below p1 and above p99 is replaced by the respective values.

+ Intergenerational transfers are expressed in 10 000 Euros.

+ Estimations based on SOEP v30.

4.8.3 Timing of receipt

As described in section 4.5, intergenerational transfers are aggregated over the four years prior to and the year of the wealth observation itself. The temporal difference between year of receipt and year of wealth observation are however known, which permits to explicitly control or specify the timing of receipt.[76] Generally, assuming a steady consumption from received transfers, one would expect that transfers received already 4 years ago (i.e. in $t-4$) contribute less to observed savings than more recent receipts. Consistently with the negligible dynamic effects documented in table 4.5 and table 4.6, I do not manage to gather sufficient evidence that these patterns systematically occur. The columns labeled *timing of receipt* in table 4.10 allow to draw this conclusion. While there are naturally multiple ways to test the impact of the timing of receipt,[77] I decided to split up the *transfer dummy* in 5 timing-of-receipt determined dummies. That is, I estimate separate intercepts for the 5 different timings of receipt, keeping the linear term constant.

As expected, the *amount* estimates are very similar to the main results presented in table 4.5. The separately estimated intercepts vary unsystematically and are estimated with substantial uncertainty. Hence, there is no clear pattern of a steady consumption stream from transfers over time.[78]

4.8.4 Outlier

In order to check whether results are significantly driven by few but extreme observations,[79] I resort to a top and bottom coding approach:[80] I calculate the 99^{th} and 1^{st} percentile for wealth taking the multiple imputation approach into account and replace values below the first (labeled $p1$ in the tables) and above the 99^{th} percentile

[76]Specifying the timing is not needed to prevent an omitted variable bias in the estimation as it is not clear why the timing of receipt should correlate with e.g. the amount of a transfer. Allowing the model for variations in the timing of receipt rather can reveal an interesting behavioral effect in itself.

[77]I also tested estimating separate linear *amount* parameters depending on the timing of receipt or interacted the *amount* variable with a further variable indicating the timing of receipt. While none of these procedures revealed a systematic variation in the savings contributions of a transfer, the latter procedure is additionally cumbersome as it introduces a further implicit interaction term with *amount*.

[78]Westerheide (2005), as noted above, tries to consider all reported transfers in his analysis. Interestingly, he does also not find a clear pattern of consumption over time.

[79]Karagiannaki (2015) provides quantile regression-based estimates for the median of the distribution in order to preclude the impact of such observations.

[80]While it is generally reasonable to check the sensitivity of the analysis to extreme observations, the main concern with wealth and inheritance based studies rather results from an insufficient coverage of rich households and households with high transfer receipts (Vermeulen, 2018). This is also why studies resort to cumbersome methods seeking to display the top of the distribution correctly. See for instance Saez and Zucman (2016). Top coding thus further withdraws information from a sensitive part of the distribution. Nonetheless, this approach allows to illustrate the impact of those few extreme observations of which a truly complete data set might have more.

($p99$ in the tables) with the value of the first and 99^{th} percentile respectively. I proceed accordingly for intergenerational transfers.

The results are displayed in columns (6) and (7) of table 4.10. In fact, the point estimates for *amount* do not differ significantly from the baseline estimation. Slight changes are however visible with respect to ρ: The parameter that indicates dynamic effects has fallen to roughly .86, which implies that $\gamma = \rho + 1 = 0.14$ is close to being statistically different from zero ($p \approx 0.064$). The long term β would then indicate a slowly increasing savings share after bequest receipt, a pattern probably attributable to returns to savings. The evidence in this regard is however weak, excluding further wealth observations also difficult to justify. I tested, whether these dynamics translate into differences in the savings behavior over the wealth distribution by re-running model 4.12 on the outlier-corrected sample but did not find patterns challenging previous conclusions.

4.9 Conclusions

This paper utilizes German panel data from the SOEP in order to evaluate the effect of intergenerational transfers on the inequality in the households' net worth distribution. In particular, the paper seeks to decompose the effect: First, households receiving a transfer do not necessarily save the entire transfer. They rather adjust their economic behavior to the new financial conditions, which might entail that transfer savings displace regular savings so that the net wealth gain of households through transfers amounts to less than the actual transfer amount. In a first step, I estimate the causal effect of transfer receipt on the savings behavior of households allowing for dynamic adjustment in this paper.

The results suggest that households on average save only about 2/3 of their transfer within a 2 years period after receipt and do not show a consistent dissaving (or reinvestment) behavior thereafter. The results convey considerable differences to estimations in the publications by Wolff (2015) and karagiannaki15 which suggested higher savings rates out of intergenerational transfers. All three studies may well describe the statistical relationships in the respective countries appropriately, in particular as the other studies might rather seek to provide descriptive evidence.

Wolff and Gittleman (2014) and Karagiannaki (2015) moreover hypothesize that the capacity to transform transfer wealth into household wealth might vary over the wealth distribution. Generally, the literature finds that intergenerational wealth transfers as such tend to equalize the net wealth distribution. If richer households however save much more out of their transfers than poorer households, this could crucially re-shape the inequality effect of transfers.

In order to test this hypothesis, I allow in my estimation for heterogeneities in the savings parameter over the wealth distribution. Additionally, using tobit regression techniques, I estimate how intergenerational transfers scatter over the distribution of household net wealth. I use the causal estimates from the first and the descriptive evidence from the second step in order to decompose the overall effect of transfers on wealth inequality in three sub-effects: First, in the equalizing potential of the *aggregate transfer volume*, secondly the *transfer incidence* effect and thirdly the distributional effect from the households' adjustment of their *savings behavior* after transfer receipt.

The results of the paper are well in line with the literature and suggest that intergenerational transfers have a widely equalizing effect on the wealth distribution. This equalizing effect is attributable to the aggregate transfer volume and the behavioral adjustment in savings, which cause that bequests tend to be relatively bigger for poorer households. The incidence effect, which results from richer households receiving higher transfers and inheriting more often, counteracts but does not offset these equalizing forces. After all, there is no evidence that existing heterogeneities in the savings behavior of households after bequest receipt could turn over the often documented equalizing effect of transfers on wealth inequality. The here estimated variations in savings over the wealth distribution rather tend to add to the equalizing nature of transfers. While it is well conceivable that savings patterns exist that could turn over present results, none of the estimations in this paper justifies concerns that transfer accrual was recently disequalizing wealth inequality in Germany.

All results are subject to the common limitations of empirical studies with wealth and intergenerational transfers, though: Despite multiple imputations and weighting schemes, there are retaining concerns that survey data does not fully depict the wealth distribution (Vermeulen, 2018). Similar concerns may be justified for the transfer distribution in general and the underlying understanding of intergenerational transfers as primarily monetary advantages. The equalizing effect of transfers also only holds for relative inequality indices. Absolute inequality measures, while being of less importance in economics, consistently indicate increasing inequality through transfers, which might actually add to the prevalent notion that wealth inequality increases. Finally, the given study focuses on the important topic of intergenerational transfers between households but thereby also neglects that resources might well have been shared within families across households before formal transfers. The study of the inequality between dynasties and its dependence on intergenerational transfers is thus of equal importance.

C.4 Appendix

C.4.1 Descriptives

Table C.1 describes the quintile cut-off points as used for the construction of the quintile dummy set in the main estimation.

Table C.1: Quantile cut-offs as used in estimation

	2002	2007	2012	Total
(distinction as used in estimation)				
Q20	0	0	0	0
Q40	17006	22899	18636	19298
Q60	100564	101157	93996	97253
Q80	255711	250023	227471	242371

SOEPv30, own calculations. Data is weighted.

Table C.2: Dispersal of wealth types: % of HH own wealth of respective type.

	2002	2007	2012	Total
Estate (residence owned)	0.42	0.46	0.45	0.45
Estate (other real estate)	0.13	0.14	0.14	0.14
Insurance	0.56	0.61	0.59	0.59
Financial	0.54	0.59	0.56	0.56
Business	0.07	0.07	0.06	0.07
Tangible	0.13	0.09	0.11	0.11
Consumer	0.17	0.22	0.22	0.20

SOEPv30, own calculations. Data is weighted.

Table C.3: Age of recipients of gifts and inheritances.

	2002	2007	2012	Total
Mean age heirs	51	56	54	54
std.	14	13	13	13
Mean gift recipients	43	44	43	44
std.	12	11	10	10

SOEPv30, own calculations. Data is weighted.

C.4.2 Results

C.4.2.1 Average Effects

Table C.4: Complete results average effects estimation

Dependent variable Savings	OLS (no controls) (1)	OLS (2)	OLS (no interest) (3)	FD (4)	FD (5)	FD with IV (6)	FD with IV (7)
Amount	8864.42***	8712.12***	9248.78***	5997.70***	655.97	3074.80**	1760.27
	(2465.71)	(2313.22)	(2362.88)	(1814.32)	(3793.31)	(1532.32)	(1792.13)
Amount squared	-65.00***	-63.14***	-69.82***		70.61*		17.42
	(17.89)	(16.06)	(15.61)		(36.36)		(27.18)
Transfer Dummy	-14217.97	-25568.60***	-25722.25***	-10080.74	8968.42	-7315.82	-2619.10
	(9542.74)	(9436.01)	(9289.01)	(14106.40)	(14028.51)	(9564.40)	(9173.46)
W_{t-1}						-1.06***	-1.06***
						(0.16)	(0.16)
Age		-40409.84*	-40358.45*	-65153.24	-62264.77	-14407.91	-13743.02
		(22935.03)	(22947.67)	(42089.03)	(42336.52)	(34115.18)	(34227.75)
Age^2		600.55	600.08	1071.17	1007.13	195.21	180.24
		(381.94)	(382.14)	(741.21)	(744.05)	(554.74)	(556.61)
Age^3		-2.92	-2.92	-5.13	-4.67	-0.84	-0.73
		(2.06)	(2.06)	(4.10)	(4.11)	(2.90)	(2.92)
Agg HH income		-18.23***	-18.21***	-21.85**	-20.93**	-14.38	-14.16
		(6.83)	(6.83)	(10.16)	(10.34)	(11.40)	(11.47)
Age × Agg HH income		0.88***	0.88***	1.11**	1.05*	0.62	0.60
		(0.34)	(0.34)	(0.54)	(0.54)	(0.55)	(0.56)
Age^2 × Agg HH income		-0.01**	-0.01**	-0.02**	-0.02*	-0.01	-0.01
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Age^3 × Agg HH income		0.00**	0.00**	0.00*	0.00	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Agg HH $income^2$		0.00***	0.00***	0.00***	0.00**	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age × Agg HH $income^2$		-0.00***	-0.00***	-0.00**	-0.00**	-0.00	-0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age^2 × Agg HH $income^2$		0.00***	0.00***	0.00**	0.00**	0.00	0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age^3 × Agg HH $income^2$		-0.00***	-0.00***	-0.00**	-0.00**	-0.00	-0.00
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Year Dummy 2007		0.00	0.00				
		(.)	(.)				
Year Dummy 2012		3793.36	3845.40				
		(7083.44)	(7084.30)				
constant	-1737.86	882024.39*	880842.29*	-16591.63	-17306.00	-6071.20	-6260.80
	(3182.37)	(444189.92)	(444455.90)	(14354.74)	(14334.20)	(7769.94)	(7789.71)
Number of observations	10400	10400	10400	5200	5200	5200	5200

[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Estimated with cluster robust standard errors on the HH level. Complete estimation results are reported in the appendix. Intergenerational transfers are expressed in 10.000 Euros.
[2] First stage results reported in the appendix.
Estimations based on SOEP v30.

Table C.5: First stages of average effect

Dependent var: D.W_{t-1}	(1)	(2)	(3)	(4)	(5)
W_{t-2}	-0.44***	-0.47***	-0.27***	-0.39***	-0.37***
	(0.06)	(0.09)	(0.04)	(0.06)	(0.06)
D.Amount	-2778.93**	-2473.76**	-2852.75**	-2869.98**	-2942.47**
	(1229.07)	(1182.84)	(1210.98)	(1204.69)	(1206.14)
D.Transfer Dummy	-3690.84	-2668.53	-1196.05	-5359.88	-1403.02
	(9068.55)	(8505.00)	(7890.00)	(7505.92)	(8863.53)
D.Age	-9017.28	-13115.91	5096.85	201.11	-1870.57
	(30621.82)	(27641.73)	(24254.44)	(24584.75)	(25026.83)
D.Age^2	70.33	117.46	-154.06	-82.10	-33.19
	(532.19)	(480.56)	(424.35)	(429.88)	(439.77)
D.Age^3	-0.77	-1.02	0.44	0.02	-0.19
	(2.94)	(2.66)	(2.35)	(2.39)	(2.44)
D.Agg HH income	3.06	3.79	3.52	5.68	3.95
	(7.35)	(6.57)	(5.87)	(6.51)	(5.98)
D.Agg HH income^2	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D.Age × Agg HH income	-0.23	-0.27	-0.24	-0.37	-0.28
	(0.39)	(0.35)	(0.31)	(0.34)	(0.32)
D.Age^2 × Agg HH income	0.00	0.00	0.00	0.01	0.01
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
D.Age^2 × Agg HH income^2	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D.Age^3 × Agg HH income	-0.00	-0.00	-0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
D.Age^3 × Agg HH income^2	0.00	0.00	0.00	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
constant	92098.05***	99816.04***	65368.40***	87899.34***	77904.43***
	(14230.04)	(20559.01)	(9505.11)	(14741.27)	(14799.95)
Number of observations	5200	5200	5200	5200	5200

[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Estimated with cluster robust standard errors on the HH level. Complete estimation results are reported in the appendix. Intergenerational transfers are expressed in 10.000 Euros.
[2] First stage results reported in the appendix.
Estimations based on SOEP v30.

Table C.6: Alternative level specification (without controlling for dynamic effects)

Dependent var: Wealth	(1) OLS	(2) FD
Amount	11435.31***	4688.03**
	(1746.04)	(2008.28)
Amount squared	-25.38***	-29.71
	(7.03)	(25.23)
Transfer Dummy	-8642.25	-12884.51
	(9451.19)	(8752.09)
Age	4897.48	-2056.34
	(18637.99)	(11777.79)
Age^2	-120.11	170.96
	(367.47)	(233.67)
Age^3	0.67	-1.21
	(2.27)	(1.43)
Agg HH income	-8.49	-10.29***
	(6.64)	(3.70)
Agg HH $income^2$	0.00*	0.00**
	(0.00)	(0.00)
Agg HH income	0.00	
	(.)	
Age $\times$ Agg HH income	0.32	0.51***
	(0.38)	(0.19)
Age^2 $\times$ Agg HH income	-0.00	-0.01**
	(0.01)	(0.00)
Age^3 $\times$ Agg HH income	0.00	0.00**
	(0.00)	(0.00)
Age $\times$ Agg HH $income^2$	-0.00	-0.00**
	(0.00)	(0.00)
Age^2 $\times$ Agg HH $income^2$	0.00	0.00**
	(0.00)	(0.00)
Age^3 $\times$ Agg HH $income^2$	-0.00	-0.00**
	(0.00)	(0.00)
Year Dummy 2007	-36117.38***	-5446.31
	(4604.85)	(3299.36)
Year Dummy 2012	-29741.95***	
	(6160.39)	
constant	41056.86	-23833.44***
	(298485.84)	(5394.38)
Number of observations	15598	10398

[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Estimated with cluster robust standard errors on the HH level. Intergenerational transfers are expressed in 10.000 Euros. Estimations based on SOEP v30.

C.4.2.2 Heterogeneous Effects

Note: Table C.7 only reports the missing estimates for the control variables from the models reported in table 4.6. Specifically, column (1) here in table C.7 corresponds to column (1), column (2) here corresponds to column (4) in table 4.6 and column (3) here corresponds to the column (5). This is done as the table would otherwise not capture all estimates.

Table C.7: Control variable estimates of heterogeneous effects estimation:

Specification Dependent variable	OLS (1) Dummy + linear term Wealth	FD with IV (2) Dummy + linear term Savings	FD with IV (3) Dummy+linear+ squared term Savings
[Omitted estimates of table 4.6]	.	.	.
$W_{t-1}^{D=1}$	-398599.37***		
	(16244.21)		
$W_{t-1}^{D=2}$	-389579.78***		
	(16404.56)		
$W_{t-1}^{D=3}$	-355732.31***		
	(17461.63)		
$W_{t-1}^{D=4}$	-266369.87***		
	(15961.31)		
$W_{t-1}^{D=5}$	0.00		
	(.)		
Age	-538.86	-13053.76	8186.35
	(23033.08)	(34261.43)	(45307.88)
Age^2	-143.07	169.10	-322.03
	(396.94)	(557.25)	(864.50)
Age^3	1.35	-0.66	2.98
	(2.21)	(2.91)	(5.65)
Agg HH income	-9.54	-14.02	-4.93
	(6.86)	(11.33)	(17.36)
Agg HH $income^2$	0.00**	0.00	0.00
	(0.00)	(0.00)	(0.00)
Age × Agg HH income	0.33	0.60	-0.00
	(0.35)	(0.55)	(1.01)
Age^2 × Agg HH income	-0.00	-0.01	0.00
	(0.01)	(0.01)	(0.02)
Age^3 × Agg HH income	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)
Age × Agg HH $income^2$	-0.00*	-0.00	0.00
	(0.00)	(0.00)	(0.00)
Age^2 × Agg HH $income^2$	0.00	0.00	-0.00
	(0.00)	(0.00)	(0.00)
Age^3 × Agg HH $income^2$	-0.00	-0.00	0.00
	(0.00)	(0.00)	(0.00)
Year Dummy 2007	0.00		
	(.)		
Year Dummy 2012	5359.36		
	(5749.95)		
constant	622541.72	-6655.89	-6363.00
	(437229.43)	(7749.79)	(8292.79)
Number of observations	10400	5200	5200

[1] Control variables: All parameters are conditional on controlling for polynomials of age and household income. Estimated with cluster robust standard errors on the HH level. Complete estimation results are reported in the appendix. Intergenerational transfers are expressed in 10.000 Euros.
Estimations based on SOEP v30.

C.4.2.3 Simulation

The results of table C.8 are derived from a tobit estimation of the form:

$$B^*_{H,t} = \delta + \sum_{q=1}^{5} \gamma_q I[\tau(W_{H,t-1}) = q] + u_{H,t} \tag{4.15}$$

Where $u_{H,t}$ is the error term, $u_{H,t} \overset{iid}{\sim} N(0, \sigma^2)$. With:

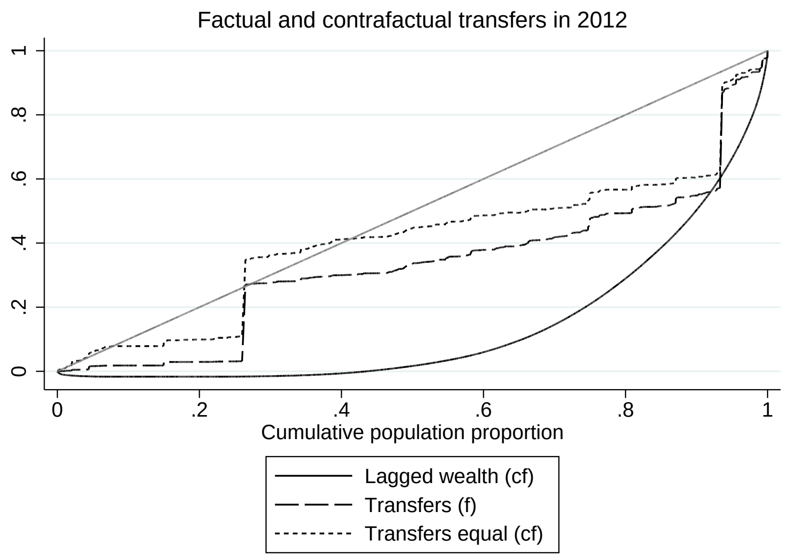
$$B_{H,t} = \begin{cases} B^*_{H,t}, & \text{if } B^*_{H,t} > 0 \\ 0, & \text{if } B^*_{H,t} \leq 0 \end{cases}$$

Table C.8: Simulation: Auxiliary tobit estimates

Dependent variable: Amount	(1) Tobit 2007	(2) Tobit 2012
Quintile indicator of respective lagged wealth distribution:		
Quintile 1	0.00	0.00
	(.)	(.)
Quintile 2	42109.04***	32430.06**
	(15479.07)	(14563.20)
Quintile 3	90013.02***	58744.67***
	(13158.78)	(13825.25)
Quintile 4	84496.35***	70525.02***
	(13774.01)	(13812.40)
Quintile 5	115913.89***	76988.03***
	(13303.77)	(13736.15)
constant	-318531.46***	-276439.05***
	(14649.34)	(13939.52)
sigma	182818.65***	176328.44***
	(5223.87)	(5391.14)
Number of observations	8185	5731

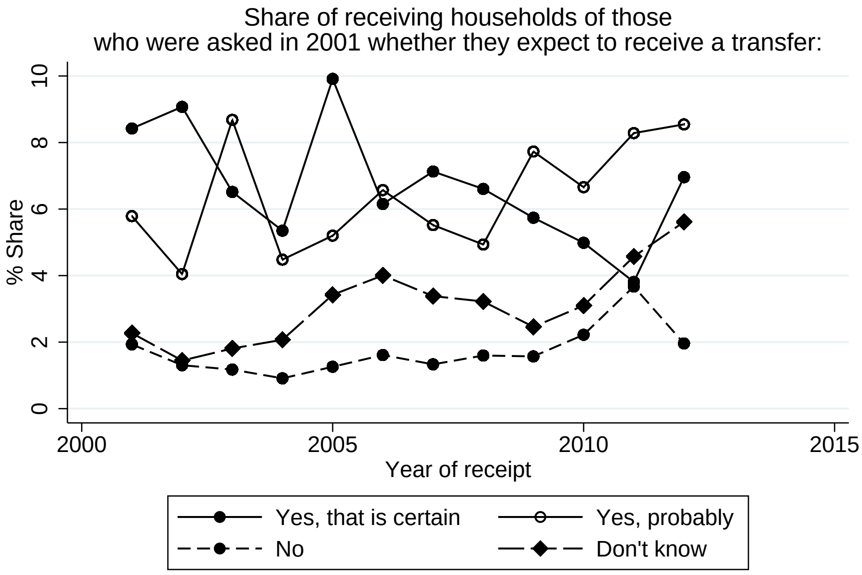
Estimations based on SOEP v30.

Figure C.1: Distributional impact of actual transfer accrual (f) and counterfactual one (cf):



C.4.3 Robustness

Figure C.2: Expectations about transfers and actual receipt:



SOEP v30, own calcualtions.

Chapter 5

Parental altruism and inheritance taxation

5.1 Research Question

In the wake of an increasing interest in questions about economic inequality and social mobility, the taxation of intergenerational transfers has recently received much attention in the economic literature as inequality in inheritances[1] is an important driver of life-time income inequality. Inheritance or bequest taxation is a widely contentious topic, as it relates to personal notions of the societal role of the family[2] on the one hand and the meritocratic principles of western societies on the other.[3] The design of the inheritance tax depends on the trade-off between parental incentives to provide bequests and equity concerns in the children's generation. This paper contributes to the debate on the properties of an optimal inheritance tax. In particular, it demonstrates how heterogeneity in parental altruism affects the optimal tax schedule. As will be seen, this depends crucially on how the social planner valuates the welfare of heirs.

Most analysis in the context of the optimal taxation of intergenerational transfers departs from the zero tax results provided by Atkinson and Stiglitz (1976), Chamley

[1]The national distributions of intergenerational transfers are typically very uneven, as e.g. Piketty and Saez (2013) point out. Empirical evidence does nevertheless not indicate that wealth inequality among children increases through transfers. Adermon et al. (2018) even show that inheritance taxation may in itself increase the inequality in wealth among heirs. See also Wolff and Gittleman (2014) for a concise discussion of the topic.

[2]A prominent argument against the taxation of inheritances is the "double taxation" argument. Its proponents argue that taxing inheritances would mean to tax wealth that already has been taxed once it was accumulated (see for example Boadway et al., 2010). This argument bases on the notion of a dynasty as economic unit. Compare also the results of the quantitative vignette study by Gross et al. (2017).

[3]This discussion is particularly addressed in the literature on the equality of opportunity. The totality of transfers that parents pass on to their children throughout their lives differs strongly and may in itself give reason for bequest taxation.

(1986), and Judd (1985) and the literature currently agrees that taxing or subsidizing transfers to some degree is optimal. In a prominent paper Farhi and Werning (2010) make a strong case for progressive, but negative marginal tax rates. A key characteristic of the paper is that the utility of children enters the maximization problem of the social planner twice, directly by the consideration of the children's utility in the social welfare function and indirectly through the altruism of parents. This feature has recently found multiple applications and has proven to drive inheritance tax models towards negative tax rates in a variety of settings.[4] At the same time, many scholars oppose this "double counting" of utility (Boadway and Cuff, 2015; Kaplow, 2009; Kopczuk, 2009). In the present paper, we trace the sensitivity of optimal inheritance tax models with respect to this characteristic and we are particularly interested in interactions with another key characteristic of optimal inheritance tax models, namely the varying degree of preferences for bequests in the generation of parents.

Models widely vary by the sources of inequality, i.e. the characteristics over which individuals, particularly the parents and thus the bequest levels, differ. While most papers allow for differences in productivity[5] some introduce further dimensions: Brunner and Pech (2012a) endow individuals with different levels of initial wealth. Piketty and Saez (2013), Boadway and Cuff (2015), and Farhi and Werning (2013) let parents differ by their taste for bequests. Similar to variations in productivity, preferences for inheritances are private information and require the social planner to take the incentive compatibility of the tax scheme into account. Both productivity and preferences can be inherited to some degree. Nevertheless, while being similar in nature, they might entail different reactions to inheritance taxation: In our simplest model specification, parents are equally productive but vary by their taste for bequeathing. The tax system here concerns only the parents' trade-off between own consumption and their children's consumption and thereby abstracts from the scenario in which more productive parents not only bequeath but also (potentially) consume more than less productive parents.[6] This scenario adds to the discussion in Farhi and Werning (2013) on the question to what extend differences in preferences in the parents' generation justify bequest taxation on normative grounds.

In order to assess the interaction of variations in parental preferences for transfers and the public valuation of the descendants' utility, we resort to a simple two gener-

[4] Double counting occurs in some sense for instance in the recent contributions by Piketty and Saez (2013), Brunner and Pech (2012a), Brunner and Pech (2012b), and Kopczuk (2013b) but was already discussed in detail before. See Boadway and Cuff (2015) for an overview.

[5] E.g. the contributions by Farhi and Werning (2010), Piketty and Saez (2013), Brunner and Pech (2012a), Saez and Stantcheva (2018), and Kopczuk (2013b).

[6] Differences in productivity are mainly addressed by income taxation, whereas differences in preferences for bequeathing require an inheritance taxation.

ations model: All parents have an altruistic bequest motive,[7] but vary by how much they value their children's future utility. The social planner furthermore discounts the utility of the second generation to some degree. For the sake of clarity, we restrict our main model to parents that are equally productive but relax this assumption later. Our model thus balances the equity of the second generation against the incentives of the parental generation. We derive first order conditions of the social planner's problem. Instead of solving the system of equations analytically, obtaining very complex expressions for the optimal tax system, we present a number of illustrative simulations: We consider the effects of the entire range from "no double counting" to full "double counting" and cover numerous variations in parental altruism. We extend our main model and also take the effect of alternative—exogenous—instruments for redistribution towards children and variations in the productivity of parents on the optimal inheritance tax system into account.

Several papers focus on rigorous derivations of optimal inheritance tax rates in complex settings and while they are able to provide relatively intuitive and illustrative analytical solutions for marginal tax rates, they often do not characterize the entire tax system (Farhi and Werning, 2010, 2013). Other papers identify the tax system completely by e.g. providing linear tax rates but often at the cost of assuming linear utility from consumption and thereby eliminating income effects from their models (Piketty and Saez, 2013; Saez and Stantcheva, 2018; Boadway and Cuff, 2015). Simplifying the model facilitates outlining the specific effects at play, but also limits the applicability of these models. Our model relaxes the assumption of no income effects and allows to characterize the entire tax system. This effort comes at the cost of presenting only numerical solutions to our model.

Our approach to assess the interaction of the positive externalities of giving and variations in the altruism of parents is closely related to the contributions by Farhi and Werning (2013) and Boadway and Cuff (2015). In contrast to Farhi and Werning (2013) we characterize the entire tax system and provide a more detailed simulation of results. In contrast to Boadway and Cuff (2015), we allow for decreasing marginal utility in consumption. Our results are mostly in line with the literature: The taxation of inheritances is, for most parts, progressive and, in line with Farhi and Werning (2013), our model suggests negative tax rates for inheriting. In contrast to the literature, our model however also shows that under certain, and not uncommon parameterizations of the model, even a regressive taxation of transfers can be optimal. The reason is

[7] We apply the altruistic bequest motive to preclude a somewhat odd implication of the also commonly used warm-glow motive: If parents draw utility from their net-bequest (and not their children's utility), they might prefer bequest subsidies over other transfers even if this led to a decrease in the lifetime income of their children.

that there is a trade-off between different redistributive aims: On the one hand, the social planner wants to redistribute to children, who receive a relatively small amount of inheritances. On the other hand she wants to redistribute to children whose parents obtain high utility from their children's consumption. As is always the case when a social planner trades off consumption for one person against consumption for another, these results hinge on the social planner's approach of how to value the individuals' utilities. We show how an equally conceivable valuation strategy of the social planer affects our results. Different valuations of individual utility can lead to regressive or progressive inheritance schedules.

The paper is structured as follows: Section 5.2 gives a more detailed overview of the recent contributions in this field. Section 5.3 presents our model. In section 5.4 we provide our main results in a detailed simulation study and test the robustness of our model with some extensions. We introduce an alternative way of valuating individual utility in section 5.5. Section 5.6 summarizes and discusses our results, section 5.7 concludes.

5.2 Literature

The recent literature on the optimal taxation of intergenerational transfers departs from the famous zero tax results. Atkinson and Stiglitz (1976) show that given weak separability of leisure and consumption choices, a non-linear labor income taxation is optimal and no further taxation of capital or wealth (transfers) is necessary.[8] The contributions by Chamley (1986) and Judd (1985) come to similar results: Based on an infinite horizon model, the authors show that capital taxes result in huge efficiency losses in the longer term, which make a zero tax rate on capital desirable.

Most of the recent contributions however find that some kind of tax or subsidy can be justified. A famous example is the paper by Piketty and Saez (2013): This contribution bases on sufficient statistics formulas for optimal inheritance and labor income taxation in a steady state framework. Conceptually, this setting permits concrete applications of the tax formulas to the data of specific countries and thereby draws the literature in a more policy oriented direction. It uses inheritances to model bi-dimensional inequality in life-time resources. The Atkinson-Stiglitz result collapses in this context as inheritances occur not only as a kind of consumption good in the utility of the testators due to the warm-glow motive, but also in the form of income also as a component in the utility of the recipients. Inequality results from both heterogeneity

[8] Taxation of capital and wealth transfers can be shown to be equivalent. Compare Cremer and Pestieau (2006) for further explanations.

in labor income and heterogeneity in received transfers. The equity-efficiency trade-off is thus not sufficiently addressed by only levying an income tax.[9] The Chamley-Judd result is however nested when the supply side elasticity of capital with respect to the net-of-tax return is infinite. The paper also derives the optimal long term tax rates for n generations and, in an earlier version (Piketty and Saez, 2012), even endogenizes the wealth distribution that will ceteris paribus emerge under the given characteristics. The paper derives the above mentioned result of a progressive and negative tax rate by Farhi and Werning (2010) as a nested solution. The results as parameterized with data for France and the US suggest comparably high linear tax rates when the social planner primarily cares for the utility of the least privileged households.

The sufficient statistics approach has also been deployed by Saez and Stantcheva (2018) who derive, in distinction to Piketty and Saez (2013), non-linear tax rates for capital and income taxation. The model builds on Saez (2001) and relies on the applicability of the pareto distribution for income and capital. The Atkinson-Stiglitz result does not apply as capital income,[10] in addition to productivity, is a source of inequality, Chamley-Judd again is nested depending on the infinity of elasticities. While these two contributions point to a more policy oriented research in optimal taxation by deriving their formulas from estimable parameters (elasticities and distributional parameters), both models hinge on the absence of income effects: Both models assume linear utility from consumption, which facilitates modeling considerably but limits the applicability of the models severely. Moreover, the desirability of redistribution under linear utility is doubtful.

Generally, employing multiple sources of inequality is not a prerequisite for the derivation of non-zero optimal inheritance tax rates: The presence of externalities in the context of intergenerational transfers warrants the implementation of tax instruments that seek to manipulate individual behavior in order to correct for otherwise inefficient allocations (Pigouvian taxes). As mentioned in the introduction, the results in some recent papers are driven by a positive externality that results from giving: Both donor and recipient usually draw utility from the same act of transferring. A social planner who takes the utility of both parents and children from inheriting into account will rather tend to subsidize intergenerational transfers. In their simplest model specification Farhi and Werning (2010) consider a two generations model in which parents work, consume and bequeath and children only consume the bequest. Parental productivity is the only source of inequality as preferences for bequests are uniform and thus

[9] The sole effect on income of an intergenerational transfer which occurs just once would not warrant an inheritance tax.

[10] Interestingly, Saez and Stantcheva (2018) implement both consumption and wealth in the utility function of the individual.

earnings and transfers correlate perfectly. Parents are altruistic, i.e. value the utility from consumption of their children, and the social planner considers both the utility of parents and children. In this setting, the optimal inheritance tax is progressive and negative, driven by the "double counting" of the children's utility. If the social planner did not take the children's utility into account, the Atkinson-Stiglitz result would apply. Farhi and Werning (2010) extend their model in some ways, their main result however maintains.

The somewhat counter-intuitive result of subsidizing intergenerational transfers[11] has provoked opposition: Some scholars argue that this "double counting" of transfers is misleading as transfers are rather a zero-sum redistribution of resources between generations and do not leverage a pareto improvement (Brunner, 2014). In a sense, the externality from giving, opponents say, does not really qualify as an externality that requires correction. A number of prominent papers have however adopted the double counting logic to different settings: Brunner and Pech (2012a) test the effect of double counting in a two generations model in which parents differ by their productivity and their initial wealth endowment. Correlations between productivity and wealth endowment counteract the tendency to subsidize bequests so that total effects are ambiguous. In a related paper, Brunner and Pech (2012b) use a joy-of-giving bequest motive, differences between individuals in productivity and initial wealth and introduce, similar to us, a parameter between 0 and 1 that allows to flexibly vary the impact of "double counting" on the optimal tax scheme. The results resemble those already mentioned. Kopczuk (2013b) also resorts to a two generations model by considering the so called *carnegie effect* as an example for a negative externality: The income effect of inheriting limits the work incentives of heirs. While this is not a problem in itself, it reduces the income tax revenues of the state, Kopczuk (2013b) infers a *negative fiscal externality*. This adds to the tendency to tax transfers, the sign of the total effect is thus again ambiguous. Piketty and Saez (2013) use a model in which consumption of children also occurs twice. The model bases on a warm-glow bequest motive, solves the long-run optimum and nests the Farhi-Werning result.

The purpose of our paper is closely related to the contributions by Boadway and Cuff (2015) and Farhi and Werning (2013), which both assess double counting in the context of parents with differing bequest motives. The former paper explicitly criticizes the practice of double counting, provides some arguments against and tests its effect in a two generations model with two types of parents: A share of the parents has a

[11] Farhi and Werning (2010) actually argue that some very common institutions in western societies subtly reflect the tendency of subsidizing transfers: Particularly free public schooling and the possibility for heirs to reject negative bequests which implicitly creates progressive and marginal negative tax rates.

warm-glow bequest motive and bequeaths, the remaining share does not. The authors find that when not putting weight on children's utility, taxing bequests is both equity and efficiency enhancing. With weight on children, a trade-off emerges. Our paper is conceptually similar but deviates in some respects: In contrast to Boadway and Cuff (2015), we allow for income effects. Moreover, parents in our model do not have a warm-glow motive but are altruistic. We also present numerical simulations and characterize the entire tax system.

Farhi and Werning (2013) also allow for income effects and provide simulations. In their two generations model, parents have altruistic bequest motives but vary on a continuous scale in their degree of altruism. In contrast to Farhi and Werning (2013), we characterize the entire tax system. We also provide more detailed simulations over the full range of double counting children's utility not at all or fully. In addition we show how results vary depending on how utilities are aggregated by the social planner. In sum, we believe that the interaction between double counting and bequest motives has not yet sufficiently been studied, particularly, regarding the interaction of collective and individual valuation.

5.3 The Model

We present a model with two generations, in which altruistic parents receive uniformly exogenous labor income. We assume two types of parents that differ in δ_i which describes their taste for bequeathing to their children or more precisely their degree of altruism towards their children. While parents decide on how much to consume now and how much to bequeath, children just consume. We explicitly model heterogeneity in the strength of the bequest motive by varying the rate at which parents discount their children's utility. We abstract from interest payments. Parents' direct utility function is given by

$$u_{i=l,h} = \alpha_i v(c_{i,t}) + \beta_i \tilde{v}(c_{i,t+1}) \tag{5.1}$$

and the individual budget constraint is

$$\begin{aligned} I_i - T_{i,L}(I) - b_i &= c_{i,t} \\ b_i - T_{i,b}(b_i) &= c_{i,t+1}. \end{aligned} \tag{5.2}$$

In practice, we focus on solutions, where consumption levels are positive. In our simulations these solutions are optimal from both parents' and the social planner's perspective. The subscripts l and h denote parents with low and high preference for bequeathing and α and β are parameters that specify the respective parental degree of altruism. In our basic simulation we set $\alpha = 1$ and $\beta_i = \delta_{i=l,h}$ with $\delta_h \geq \delta_l$. Ordinal utility and thus the choice of parents is only determined by the ratio of α and β, but the absolute magnitudes of these parameters impact cardinal utility, which matters for the optimization problem of the utilitarian social planner.[12] The utility of parents with respect to consumption is determined by $v(c_{i,t})$, where v is increasing and concave in $c_{i,t}$. Children consume $c_{i,t+1}$, from which they derive utility $\tilde{v}(c_{i,t+1})$ which is increasing and concave as well. Moreover, the two functions are continuously differentiable. I_i is exogenous labor income (which in the simplest calibration of the model we assume to be the same for all parents, such that the only heterogeneity is in the degree of altruism of parents) and $T_{i,L}$ and $T_{i,b}$ denote income and inheritance tax liabilities respectively. Below we will use $\tau_{1,b}$, $\tau_{2,b}$, and τ_L, which denote two marginal tax rates for the nonlinear inheritance tax and the constant marginal income tax rate.

We consider a tax system that is characterized by a linear income tax and an inheritance tax with two brackets. That is, the income tax is given by

$$T_{i,L} = \tau_L \times I_i. \tag{5.3}$$

The inheritance tax schedule is defined by:

$$T_{i,b} = \begin{cases} \tau_{1,b} \times b_i & \text{if } b_i \leq k \\ \tau_{1,b} \times k + \tau_{2,b} \times (b_i - k) & \text{if } b_i > k, \end{cases} \tag{5.4}$$

where k is the inheritance amount above which the tax rate $\tau_{2,b}$ applies. Figure 5.1 gives an example for the marginal tax rate on inheritances as function of the gross inheritance b_i.

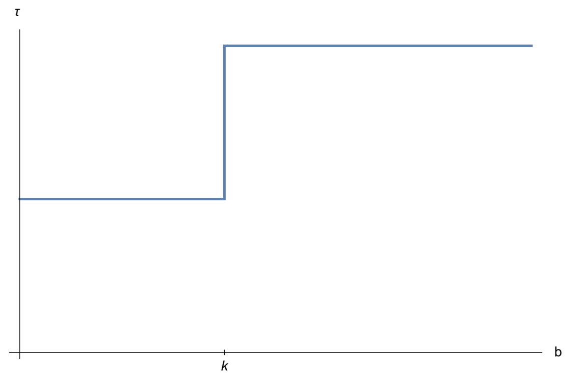
Parents' maximization problem and corresponding indirect utility function $\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k)$ are given by

$$\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) = \max_{b_{i,t}} \quad u_{i=l,h} \tag{5.5}$$

$$\text{s.t.} \quad \begin{aligned} c_{i,t} &= I_i(1-\tau_L) - b_i \\ c_{i,t+1} &= \begin{cases} b_i - \tau_{1,b} \times b_i & \text{if } b_i \leq k \\ b_i - \tau_{1,b} \times k + \tau_{2,b} \times (b_i - k) & \text{if } b_i > k. \end{cases} \end{aligned}$$

[12]Farhi and Werning (2013) similarly introduce this kind of altruism heterogeneity, but assume that without redistribution marginal utility of consumption is the same for different values of δ. In some specifications they additionally introduce social weights that decline with the strength of altruism.

Figure 5.1: Example of marginal tax rates.



Importantly, the social planner sets the marginal inheritance tax rates such that $b_l^* \leq k$ and $b_h^* \geq k$, where b_l^* and b_h^* indicate the optimal inheritance amounts of the two types. These constraints replace the classical incentive compatability constraint. In section 5.4 we provide the indirect utility functions for the log-utility case.

For $b_i \neq k$ the Euler equation

$$\frac{\frac{\partial \tilde{v}_i}{\partial c_{i,t+1}}}{\frac{\partial v_i}{\partial c_{i,t}}} = \frac{\alpha_i}{\beta_i(1 - T_b'(b_i))} \tag{5.6}$$

holds (see the derivation in appendix section D.5.1).[13] Allowing for potentially negative inheritances, this first order condition characterizes the individual optimum for $b_i \neq k$. In practice, parents can die with debts.[14] Interpreting b_i more generally as a transfer from parents to children, including *inter vivo* transfers, a negative value of b_i for instance occurs when children have to pay for their parents' care as may be the case in Germany.[15] For the log utility case, which we use in our simulations, negative consumption levels are never optimal, ruling out negative inheritances as long as children have no exogenous income.

Denote by $\phi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k)$ the utility of children given the optimal choice of

[13] Note that the Euler equation as it is given here implies that the tax is paid by the children, i.e. it is specified as inheritance tax. Specifying a bequest tax instead, would yield a slightly changed formula which would however be equivalent in expressing the same trade-off.

[14] In many countries children can refuse negative inheritances, which can be interpreted as a negative inheritance tax, see Farhi and Werning (2010).

[15] Children may have to step in when parents cannot afford the costs of their care, i.e. pension and insurance payments do not suffice and children can afford to pay. The so called *Elternunterhalt* results from BGB §1601 - 1603.

parents. The social planner sets tax rates $\tau_{1,b}, \tau_{2,b},$ and τ_L to maximize

$$\max_{\tau_{1,b},\tau_{2,b},\tau_L} \sum_{i=l,h} \left(\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) + \gamma\phi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k)\right) \tag{5.7}$$

$$\text{s.t.} \quad \sum_{i=l,h}(T_{i,L} + T_{i,b}) = G, \tag{5.8}$$

$$b_l^* \leq k, \tag{5.9}$$

$$b_h^* \geq k, \tag{5.10}$$

where γ denotes the social discount factor. Note that $T_{i,L}$ and $T_{i,b}$ are defined by equations (5.3) and (5.4). If $\gamma = 0$, the social planner does not directly take the utility of the children into account. Their utility then only enters the optimization indirectly through the (varying degrees of) altruism in the parents' utility function. $\gamma = 1$ in contrast denotes the case of full "double counting". G is a public good that needs to be financed through taxes. In the following section we discuss under what conditions the constraints (5.9) and (5.10) hold. The simulations are calibrated such that corner solutions for the individuals are never optimal, i.e., inequality (5.9) and inequality (5.10) hold with inequality and equation (5.6) always holds. We provide the corresponding first order conditions with non-binding constraints in appendix section D.5.2.

5.4 Simulation

The simulations base on the log-utility specification, i.e. $v(c_{i,t}) = \log(c_{i,t})$ and $\tilde{v}(c_{i,t+1})$ alike. In practice we run the simulations assuming that inequality (5.9) and inequality (5.10) are non-binding and then verify that the conditions are not violated. In contrast, the government budget constraint is binding. Before presenting the results, we discuss under what conditions the constraints (5.9) and (5.10) hold.

Denote by b_1' the inheritance amount an individual would choose if tax bracket 1 expanded beyond k and there was only one marginal tax rate, $\tau_{1,b}$. Denote by b_2' the inheritance amount an individual would choose if tax bracket 2 expanded beyond k and there was only one marginal inheritance tax rate, $\tau_{1,b}$. In the case of a progressive inheritance tax the latter case would imply a "virtual income" that is higher than actual net earnings. The terms are given by

$$
\begin{aligned}
b_1' &= \frac{\beta_i/\alpha_i(1-\tau_L)I_i}{1+\beta_i/\alpha_i} \\
b_2' &= \frac{\beta_i/\alpha_i(1-\tau_L)(1-\tau_{2,b})I_i - k(\tau_{2,b}-\tau_{1,b})}{(1+\beta_i/\alpha_i)(1-\tau_{2,b})}
\end{aligned}
\tag{5.11}
$$

Denote by $U(b_1')$ and $U(b_2')$ utility that parents would derive if the respective hypothetical inheritance amount was chosen. Three cases can be distinguished for the optimal inheritance b_i^* under the actual inheritance tax schedule:

$$
\begin{aligned}
I &: \; b_i^* = b_1' \quad \text{if} \quad (b_1' \le k \wedge b_2' < k) \vee (b_1' \le k \wedge b_2' \ge k \wedge (U(b_1') > U(b_2')) \\
II &: \; b_i^* = k \quad \text{if} \quad b_1' \ge k \quad \wedge \quad b_2' \le k \\
III &: \; b_i^* = b_2' \quad \text{if} \quad (b_1' \ge k \wedge b_2' > k) \vee (b_1' \le k \wedge b_2' \ge k \wedge (U(b_1') < U(b_2'))
\end{aligned}
\tag{5.12}
$$

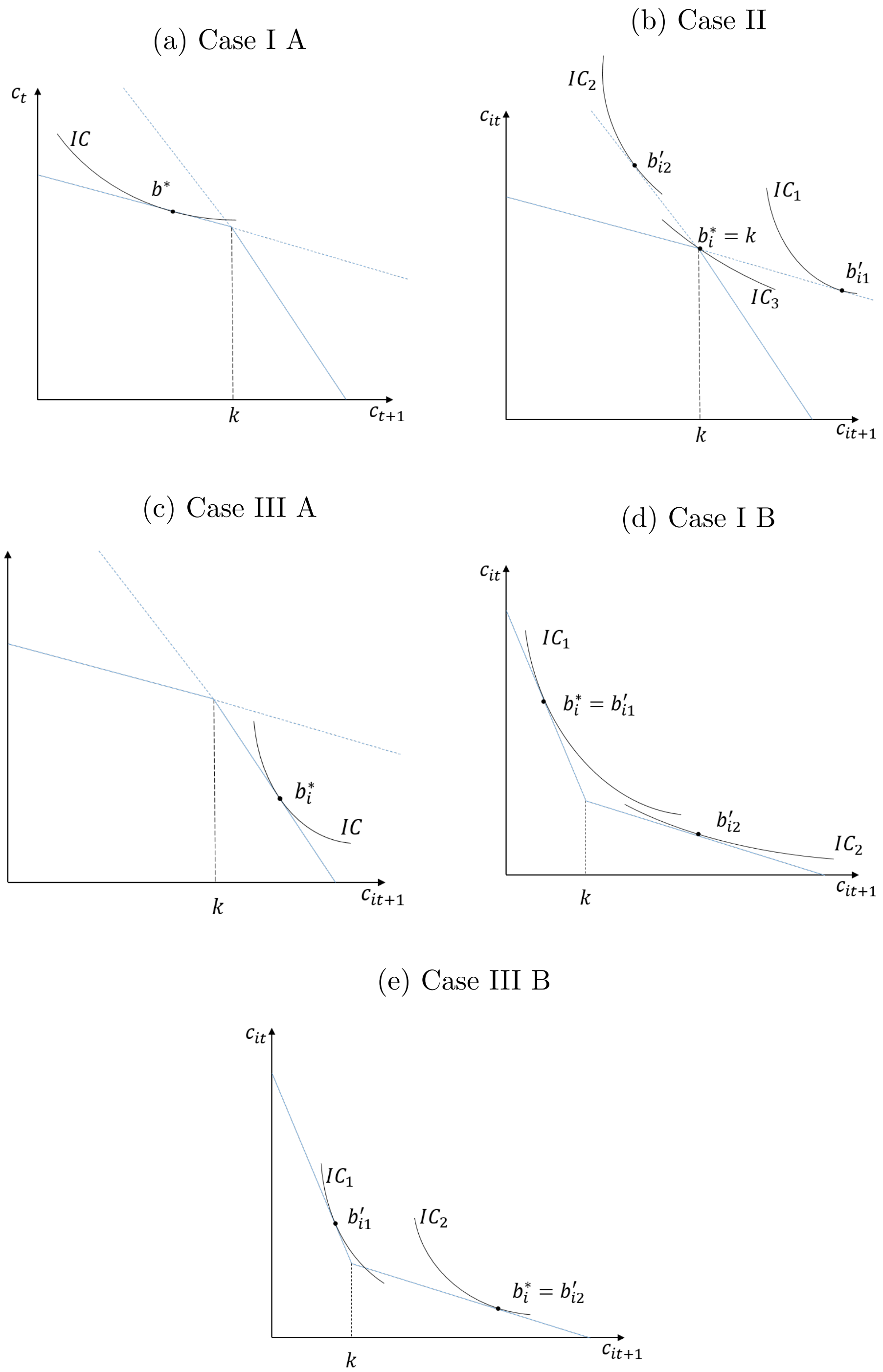
Note that in the case of equality of the respective first condition of the first and the third cases, the respective terms for b_i^* equal k. Moreover, the first terms in parentheses for cases I and III are relevant in a progressive tax system, while the second terms in parentheses are relevant in a regressive tax system.[16]

Figure 5.2 illustrates the three cases for the case of a progressive inheritance tax schedule and the two cases for a regressive inheritance tax scheme. In subfigure 5.2a the point of the optimal inheritance, where the indifference curve is tangent to the budget line, lies inside the first tax bracket. Note that negative optimal inheritances fall under this case. Subfigure 5.2b shows the case of a corner solution, case II. There is no solution, where the indifference curve is tangent to the budget line and thus the corner solution k is chosen. Point b_1' illustrates the first condition for Case II and b_2' illustrates the second condition. Subfigure 5.2c illustrates the case where the optimum lies inside the second tax bracket in a progressive tax system. Subfigures 5.2d and 5.2e illustrate cases I and III in a regressive tax system. In such a system, the optimal inheritance never equals k.

The indirect utility functions, $\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k)$ and $\phi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k)$, are given by

[16] A theoretically possible case is that $U(b_1') = U(b_2')$, in which the individual chooses b_1' or b_2' with equal probability.

Figure 5.2: Optimal individual solutions



Note: Optimal solutions of individual under a progressive or regressive inheritance tax system. b* denote the optimal inheritance, straight lines indicate budget constraints.

$$
\begin{aligned}
\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) &= \alpha_i \log\left(\frac{(1-\tau_L)I_i}{1+\beta_i/\alpha_i}\right) + \beta_i \log\left(\frac{(1-\tau_{1,b})\beta_i/\alpha_i(1-\tau_L)I_i}{1+\beta_i/\alpha_i}\right), \\
\phi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) &= \log\left(\frac{(1-\tau_{1,b})\beta_i/\alpha_i(1-\tau_L)I_i}{1+\beta_i/\alpha_i}\right) \quad (5.13)
\end{aligned}
$$

for Case I, i.e., when b_i^* is below the tax threshold. The first term in logs represents consumption of parents and the second term in logs the net inheritance, i.e. consumption of children. Clearly, the inheritance increases with β_i/α_i and consumption of parents and children decreases with τ_L. For Case II, i.e., if $b_i^* = k$, indirect utility functions are:

$$
\begin{aligned}
\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) &= \alpha_i \log\left((1-\tau_L)I_i - k\right) + \beta_i \log\left((1-\tau_{1,b})k\right), \quad (5.14) \\
\phi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) &= \log\left((1-\tau_{1,b})k\right)
\end{aligned}
$$

and Case III, b_i^* above the tax threshold, is characterized by the following indirect utility functions:

$$
\begin{aligned}
\psi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) &= \alpha_i \log\left(\frac{(1-\tau_{2,b})I_i(1-\tau_L) + k(\tau_{2,b}-\tau_{1,b})}{(\beta_i/\alpha_i+1)(1-\tau_{2,b})}\right) \quad (5.15) \\
&+ \beta_i \log\left(\frac{\beta_i/\alpha_i\left((1-\tau_L)I(1-\tau_{2,b}) - (\tau_{2,b}-\tau_{1,b})k)\right)}{1+\beta_i/\alpha_i}\right), \\
\phi_i(\tau_L, \tau_{1,b}, \tau_{2,b}, I_i, k) &= \log\left(\frac{\beta_i/\alpha_i\left((1-\tau_L)I(1-\tau_{2,b}) - (\tau_{2,b}-\tau_{1,b})k)\right)}{1+\beta_i/\alpha_i}\right).
\end{aligned}
$$

To understand the mechanics of the model, consider how the net inheritance is impacted by changes in the marginal tax rates. For inheritances up to k, the chosen gross inheritance does not depend on the lower inheritance tax bracket as in the case of log utility substitution and income effects cancel out. Thus the net inheritance clearly decreases with an increase in $\tau_{1,b}$. For inheritances in the upper tax bracket, the derivative of the net inheritance with respect to $\tau_{2,b}$ is $-\frac{\beta_i/\alpha_i(I_i(1-\tau_L)+k)}{1+\beta_i/\alpha_i}$. This is negative as long as $I_i(1-\tau_L) > k$, which holds if individuals do not bequeath more than their net earnings. The derivative of net inheritance with respect to $\tau_{1,b}$ is $-(k/(1+\beta_i/\alpha_i))$, which is negative.

For the simulations we set $k = b_l + 0.02$, i.e. the tax bracket that applies to higher inheritances starts slightly above the optimal inheritance of the low type. We set the public good $G = 0$.

5.4.1 Benchmark case

For the benchmark case we set

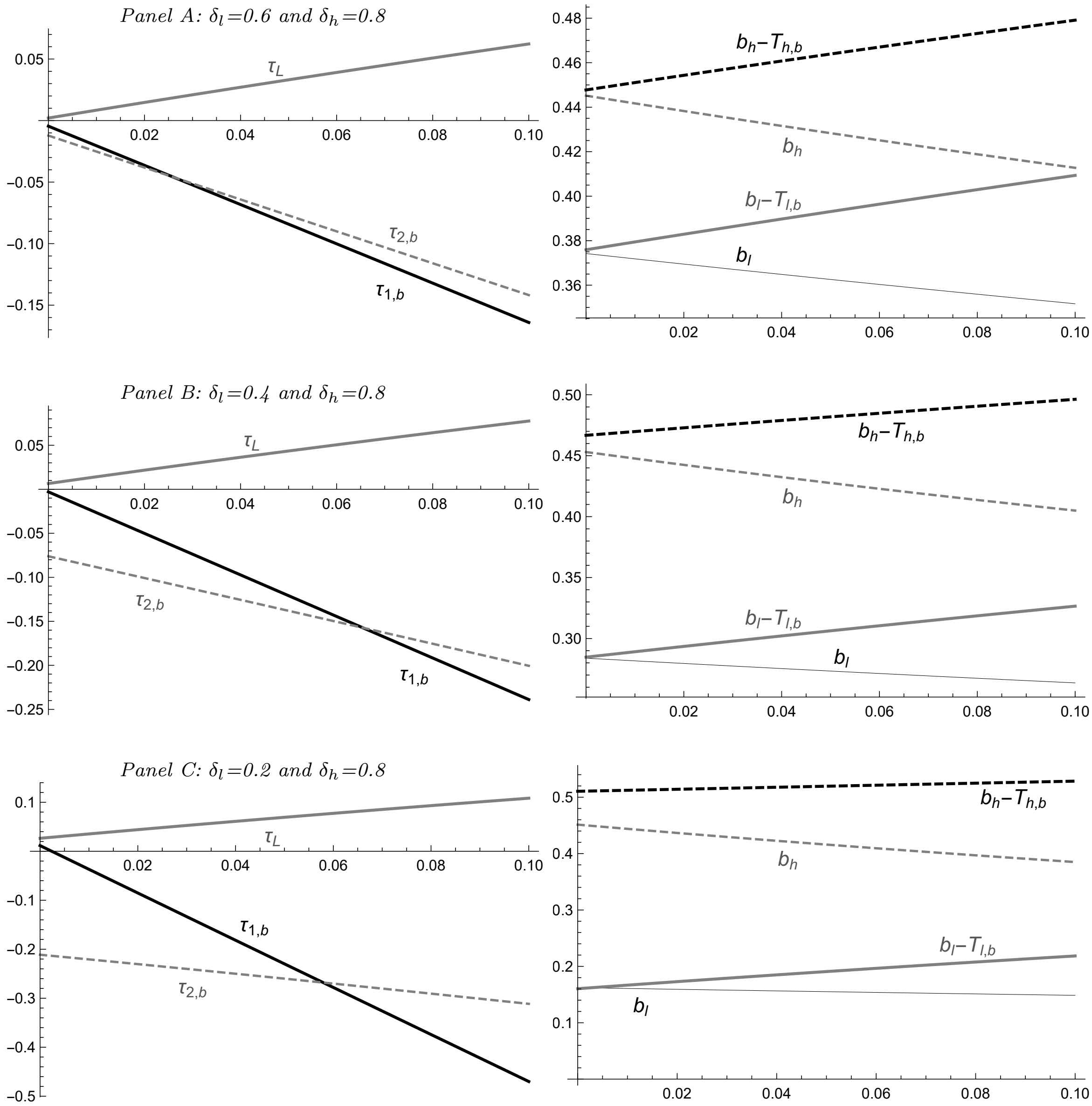
$$\alpha_i = 1, \tag{5.16}$$
$$\beta_i = \delta_i.$$

Figure 5.3 displays different combinations of altruism for parents with low and high preference for bequeathing and the resulting optimal tax rates on the left hand side and the corresponding gross and net inheritances on the right hand side. The abscissa always displays different values of γ, the degree of social discounting. Note that the figures in the main part of the paper show results for the range $0 \leq \gamma \leq 0.1$. We provide the same graphs with the full range of double counting, i.e. $0 \leq \gamma \leq 1$, in appendix section D.5.3. We normalize exogenous labor income $I = 1$ for both types.

The upper panel shows the results of the simulation when assuming moderate and comparably close values for parental altruism with $\delta_l = 0.6$ and $\delta_h = 0.8$. Both types receive bequest subsidies for the entire range of γ. The state finances these inheritance subsidies with positive tax rates on labor income. Note that the low type receives subsidies that are at least as big as those of the high type for most values of γ (compare figure D.1 in the appendix). As more altruistic parents always bequeath more, this range displays the well known result of a progressive and negative inheritance tax rate as e.g. derived by Farhi and Werning (2010). Nonetheless, for values of roughly $\gamma < 0.025$ we observe the more altruistic type to receive higher subsidies. For this range of comparably high social discounting, the optimal tax system thus is regressive. The reason is that marginal utility of consumption for the high type is higher than for the low type, implying an intragenerational redistributive motive for the parent generation. As γ increases, the intragenerational redistribution between children becomes more important, leading to a progressive tax schedule. The differences in negative tax rates are very small in the beginning, behave generally smoothly and remain relatively small. The figure however shows the strong sensitivity of the model to the chosen degree of social discounting: Only for small values of γ tax rates remain realistic in size. Full "double counting" with $\gamma = 1$ would even result in inheritance subsidies of around 150 % as shown in the appendix. Such values appear drastic and question whether the implications of "double counting" have been sufficiently taken into consideration in the recent literature. The stark dependency of results on the value of γ is illustrative. Farhi and Werning (2013) limit their simulation to values of up to $\gamma = 0.02$, i.e., the social planner puts a very low weight on heirs. Numerous papers, however, implement full

Figure 5.3: Tax rates and inheritance of children as a function of γ (double counting).

(a) Marginal tax rates: (b) Inheritance amounts:



Note: $\alpha_i = 1, \beta_i = \delta_i$, Labor income is normalized to 1.

double counting in their models, which, in this setting would yield tremendous optimal subsidies.

The upper right panel shows the corresponding gross and net inheritances for the offspring of low and high type as function of values of γ. Note that the gross labor income is normalized to 1. The child of the more altruistic type always receives a higher gross inheritance and a higher net inheritance than the child of the type with less pronounced preferences for bequeathing. Looking again at the range of γ that implies a regressive tax system, the regressiveness means that even though the gross inheritance of the offspring of the more altruistic type exceeds the inheritance of its less altruistic peer, the optimal subsidy further redistributes from the less altruistic parents to the children of the more altruistic type by using the revenues of the income tax levied in the parents' generation. This form of redistribution is optimal as the marginal utility of consumption of the parents with high preference for bequeathing exceeds, given the chosen parameters, the marginal utility of parents with a low degree of altruism. After all, while the given choice of parameter values yields that redistribution from the high type to the low type is optimal for low values of social discounting, this result is not unambiguously true for the entire range of values for social discounting.

The middle panel displays the same simulation exercise with $\delta_l = 0.4$ and $\delta_h = 0.8$. The results differ slightly and particularly reveal that the model may yield optimal *regressive* inheritance tax rates for a far bigger range of values for γ. Namely, for values up to $\gamma = 0.07$ the bequest subsidies of the more altruistic type exceed those of the less altruistic type. Hence, while the regressive tendencies in panel A may seem almost negligible, panel B suggests that a surprisingly regressive tax scheme may be optimal for values of γ that well exceed those used in the simulation by Farhi and Werning (2013).

Panel C completes the picture by providing results for rather distant values of δ_i. The range of regressive tax rates does not increase further. Both tax rates however increase and reach very high rates already for small values of γ. Moreover, the low type actually pays a small but positive tax for $\gamma = 0$ and thus contributes to the regressive redistribution by earnings *and* inheritance tax.[17] Summing up, while progressive taxation is optimal for the most part of values for γ, the result of clearly regressive inheritance tax schemes for low levels of "double counting" remains. This result is interesting, given that the literature primarily discusses progressive or linear optimal inheritance tax schemes. It results from the assumption that more altruistic parents have higher *cardinal* utility of bequeathing than less altruistic parents. Also, the results suggest that, given this model specification, all differences in δ_i will translate in some sort of ambiguity in the direction of the redistribution. That is, differences in the taste for bequeathing will in this specification always entail a regressive tax scheme for respectively low values of γ and specifically for $\gamma = 0$. Hence, even in the absence of the positive externality from giving and the corresponding pigouvian correction, a redistributive purpose exists that justifies some sort of bequest taxation.

5.4.2 Lump-sum transfers

So far, the inheritance tax is the only means by which the social planner can support children. In practice, intergenerational transfers *by the social planner* are common, e.g.

[17] The further apart the δ_i, the stronger are the motives for a positive inheritance tax.

in the form of the educational system. In order to evaluate how this would impact the optimal tax rates, we adjust the model slightly by introducing a lump sum transfer, TR, to the children, such that the consumption level of children is given by

$$c_{i,t+1} = b_i - T_{i,b} + TR \tag{5.17}$$

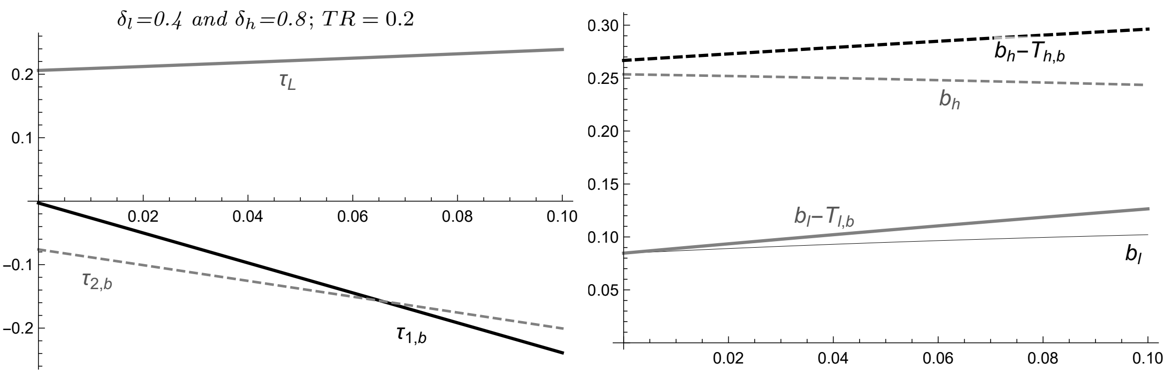
and the budget constraint of the social planner is

$$\sum_{i=l,h} (T_L + T_{i,b} - TR) = G. \tag{5.18}$$

The transfer is uniform and exogenously set.

Figure 5.4: Tax rates and inheritance of children as a function of γ with lump sum transfer.

(a) Marginal tax rates: (b) Inheritance amounts:



Note: $\alpha_i = 1, \beta_i = \delta_i$, Labor income is normalized to 1.

Figure 5.4 shows the results for the scenario of $\delta_l = 0.4$ and $\delta_h = 0.8$ and is thus comparable to the middle panel of figure 5.3. The lump sum transfer is set to $TR = 0.2$. The left panel again plots the inheritance tax rate for the two types as a function of the social discount factor γ. The introduction of the transfer does not alter the inheritance tax rates (note that scales differ slightly). However, the labor income tax, τ_L, is shifted upwards in order to levy the revenue required to finance the transfers to children. The fact that the inheritance tax rates are unaffected by the lump sum transfer meets the concern that a lump sum transfer could, to some degree, render the inheritance tax obsolete. The right panel plots gross and net inheritances of the children. Compared to figure 5.3, the gross bequests of both types have decreased while the disposable income of children remains unaffected. The lump sum transfer here represents a second income for the children, thus a second source to finance consumption, and thereby reduces the incentives for parents to bequeath. Higher transfer values can even drive the gross bequests negative, so that parents in practice fault against their children.[18]

5.4.3 Variations in productivity

So far, the earnings of the two types were equal and fixed. In order to introduce a second source of inequality, we assign different degrees of productivity to the parental generation. Hence, incomes are still fixed so that no further incentive compatibility constraint is introduced, but vary between types.

Figure 5.5 summarizes the results following from this model variation in the same way as before: The upper panel is a benchmark case in which we set $\delta_l = \delta_h = 0.8$. There is thus no need for redistribution along the altruism of parents but, instead, with respect to the differing productivity levels that translate into differing gross bequests.[19] The upper left panel shows that in this setting a progressive tax scheme is unambiguously optimal. The high type pays a positive tax for values of $\gamma < 0.08$ and receives a bequest subsidy for higher values of γ that is nonetheless always lower than the subsidy for the less altruistic type.

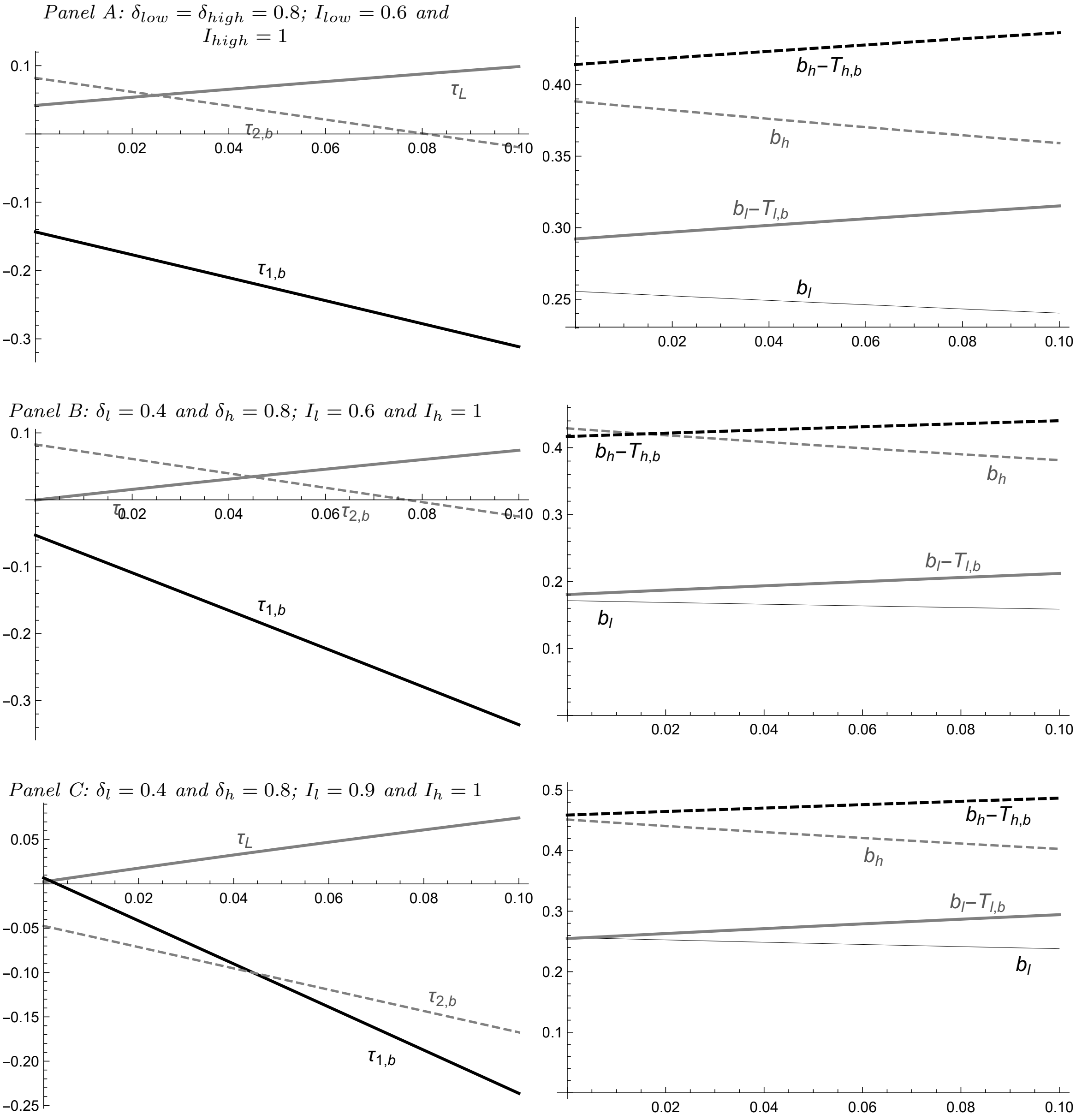
In panel B we reintroduce different degrees of altruism. We assign the higher income to the type with higher preference for bequeathing. Such a positive correlation between altruism and labor income could result as the degree of altruism can be interpreted as a discount factor and the more altruistic type could also have been more patient when investing in his human capital. The other parameters remain as set, panel B of figure 5.5 shows the corresponding results: The labor income tax is slightly shifted downwards, the inheritance tax rate for the low type is slightly shifted upwards, the function in general somewhat steeper. The tax rate for the high type is shifted slightly downwards. Compared to panel A, the differences due to the variations in δ_i are limited and do not alter the nature of the tax system. The low type receives bequest subsidies for the full range γ takes here, the more altruistic type pays a positive bequest tax up to $\gamma = 0.08$. The significant impact of earnings differences is then stressed by panel C: The δ parameters are maintained, the difference in earnings between low and high type is however decreased to $I_h = 1$ and $I_l = 0.9$. The difference to the previous panels is stark, the direction of redistribution overturned. The resulting tax system is regressive up to values of $\gamma \approx 0.04$ and progressive thereafter. The type with lower preference for bequeathing even pays a positive bequest tax for very small values of γ. The pattern of the result is similar to the one in panel B in figure 5.3. The

[18] The figures here do not display this case. Figure 5.6 panel A however is an example for such a scenario. Farhi and Werning (2010) describe that most countries allow children to decline negative inheritances and read this as example for a negative, progressive inheritance tax.

[19] Typically, different levels of productivity would require non-linear labor taxes in order to permit redistribution within the generation.

Figure 5.5: Tax rates and inheritance of children as a function of γ with differences in parental earnings.

(a) Marginal tax rates: (b) Inheritance amounts:



Note: $\alpha_i = 1, \beta_i = \delta_i$.

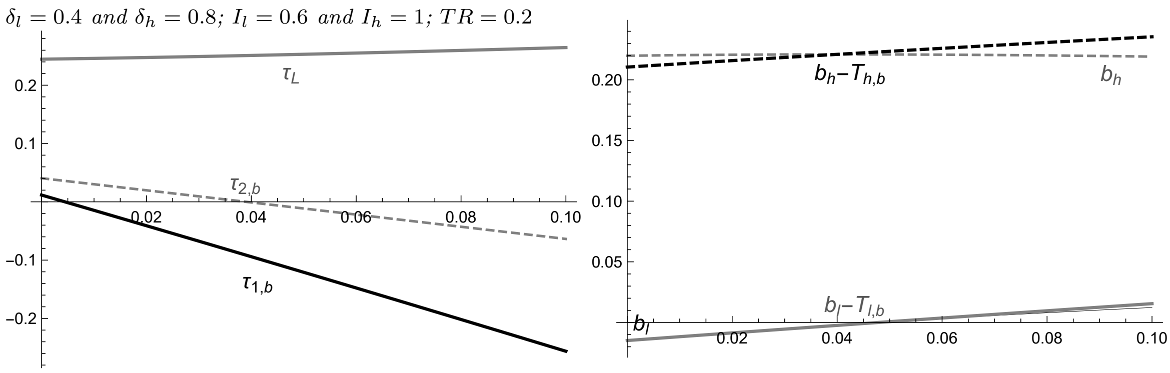
difference in earnings however reduces the range of the social discounting parameter γ for which a regressive scheme would be optimal. Given that equal productivity renders a regressive inheritance tax scheme optimal for low values of γ (as shown in figure 5.3, panel B) and given that the absence of differences in parental altruism leads to an unambiguously progressive scheme (Figure 5.5, panel A), panel C shows an exemplary parameterization in which the effect of the parental differences in altruism dominate.

Figure 5.6 resumes the discussion from above and introduces a lump sum transfer that is paid to the children. The figure reproduces the parameterization from figure

5.5 panel B and adds a transfer of $TR = 0.2$ to the setting.

Figure 5.6: Tax rates and inheritance of children as a function of γ with differences in parental earnings and lump sum transfer.

(a) Marginal tax rates: (b) Inheritance amounts:



Note: $\alpha_i = 1, \beta_i = \delta_i$.

The transfers again renders the parents to leave lower intergenerational gross transfers as children already receive an income. In contrast to the discussion in section 5.4.2, the introduction of transfers here however also affects the inheritance tax rates: As income is unequally distributed, the income tax already reduces the absolute difference in parental disposable income and redistributes to the lower type. Less redistribution via the inheritance tax is needed, so that inheritance tax rates are closer to one another. However, the results here are fully in line with those from section 5.4.2 as the transfer still does not affect the disposable income of children (and thus parents), i.e. the sum of transfer and inheritance maintains over the introduction of the lump sum transfer.[20]

5.5 Inverting the valuation of the social planner

Our model allows for a further variation: From the individuals' point of view, the social planner could take their utility in different ways into account. We here want to consider an approach of how the social planner can take the individuals' utility into account, which we denote the *inverse valuation* (IV) case. Here, eq. 5.3 is transformed linearly by setting

$$\alpha_i = \frac{1}{\delta_i} \text{ and } \beta_i = 1. \tag{5.19}$$

This approach to take individual utility into account does not alter the valuation of behavioral opportunities from the perspective of the individual but solely from the

[20]Note as well, that the case here differs from the one in figure 5.4 as the less altruistic type receives a lower income than before so that the aggregate income in this economy here is also lower.

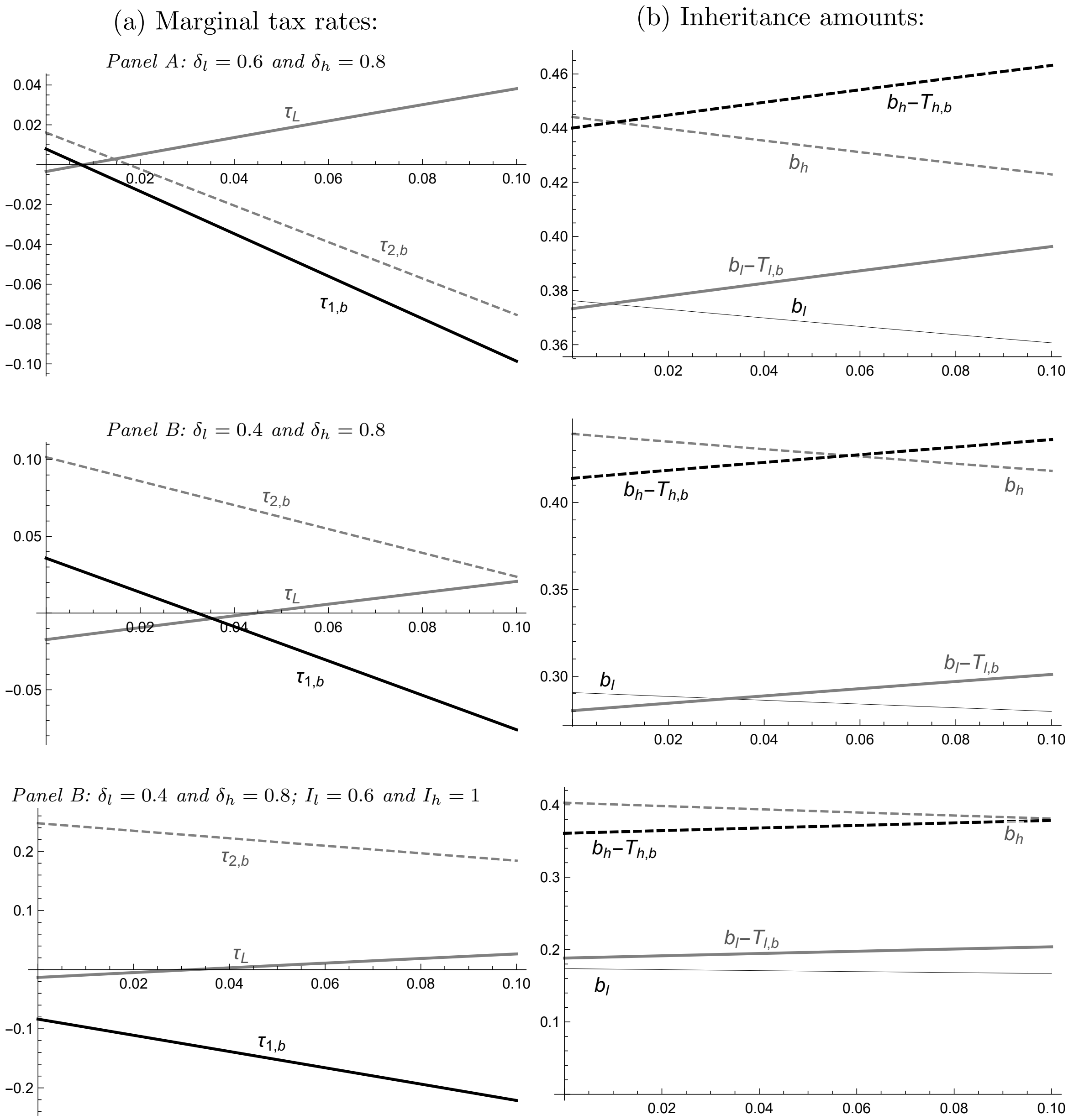
perspective of the social planner. This variation however affects our previous results and therefore requires some further discussion.

Figure 5.7 presents the results for the simulation with the IV-type of valuation of individual utility. The parameterization otherwise corresponds to previous simulations: Panel A and B correspond to those very panels of figure 5.3. The results in figure 5.7 deviate slightly from our previous results as presented in panel A and B of figure 5.3. Particularly, the IV type of weighting does not yield regressive tax schemes for low values of γ. While the differences are small between the A-panels, the location of the $\tau_{2,b}$ line has clearly shifted that much in figure 5.7 that instead of regressive inheritance tax schemes a progressive scheme occurs. The shift in $\tau_{2,b}$ is even more pronounced when comparing the B-panels: While our initial specification yields a regressive scheme for values of $\gamma \leq 0.07$, the inverse valuation of altruism yields progressive schemes for the entire range of γ. Hence, by shifting $\tau_{2,b}$ upwards, the IV-valuation reverses our initial finding: Even when the social planner does not explicitly take into account the utility of the second generation, a progressive inheritance tax scheme is optimal here because the social planner believes that marginal utility of more selfish parents is higher than that of more altruistic parents. Looking at panel A, for $\gamma < 0.01$ also the less altruistic type pays a positive inheritance tax, albeit much smaller than that of the high type. For values of $\gamma > 0.017$ both types receive inheritance tax subsidies, the tax system is progressive throughout. Panel B shows a similar, but much more pronounced pattern. The range of values, for which positive tax rates occur, grows, the difference in the taxation of the two types increases substantially.

Our initial specification just as the inverse valuation case appear to be extreme cases that supplement the approach Farhi and Werning (2010) have used: Compared to our initial specification, the IV-case deflates the cardinal utility of the more altruistic and inflates the utility of the less altruistic type. The initial scenario of a higher marginal utility of consumption of the more altruistic type is thus reversed.

After all, these two approaches of taking parental utility into account seem equally plausible. While both progressive and regressive tax schemes can be optimal for very low "double counting", the two approaches yield stark progressive inheritance taxes for most of the social discounting range. The simulation exercise nonetheless reveals that the interaction of social discounting and preferences for bequeathing are sensitive to the model specification which may yield contrasting results. In particular, the potentially considerable impact of "double counting" has to be documented by providing the full range of possible parameterizations. The pattern of effects of the variations in the valuation also apply to the variations of our initial model that we presented in section 5.4 and are not reported here with inverse and normalized valuation.

Figure 5.7: Tax rates and inheritance of children as function of γ with inverse valuation of individual utility.



Note: $\alpha_i = \frac{1}{\delta_i}$ *and* $\beta_i = 1$*, Labor income is normalized to 1.*

5.6 Discussion of results

Our results stress the dependency of the optimal inheritance tax system on degrees of altruism and social discounting. The first set of results, as presented in figure 5.3 shows that also in a restrictive setting, variations in altruism and social discounting can lead to a regressive tax system and very large negative optimal tax rates. Overall, most parameterizations yield progressive tax schemes, though. The results in figure 5.5 describe mostly also progressive tax schemes, while proving that modest levels of inequality in earnings do not prevent regressive tax rates from occurring. However, few models disclose the impact of social discounting on their results, in particular as many scholars do not derive results for a variety of values of γ: Proponents of the direct and indirect consideration of children's utility will probably implement full "double counting", $\gamma = 1$. Our complete characterization of the tax systems suggests however that this practice can lead to implausibly high tax rates. Opponents of "double counting", in contrast, will probably only indirectly consider the children's utility (i.e. set $\gamma = 0$). Doing so draws the tax scheme, c.p., more or less pronounced towards regressive taxation but leaves the character of the tax system ambiguous when different dimensions of inequality overlap and depend on the valuation type. Depending on the inequality between individuals, even regressive tax rates can turn out to be optimal. We also present a variation in the way the social planner values individual utility and show that an equally plausible valuation approach does not yield regressive tax schemes. It is not clear, why any of the presented valuation strategies should be preferred over the other. Our results thus complement the recent findings in the literature that primarily suggest progressive tax schemes to be optimal by deriving the conditions for a regressive exception.

The different valuation strategies also reveal the character of the forces driving the tax rates: The valuation as implemented by Farhi and Werning (2013) stresses that the positive externatlities from giving evoke a pigouvian correction. The stark differences between benchmark and inverse valuation underline the redistributive purposes of positive tax rates that emerge from the specific valuation approach. Given heterogeneities in the parental preferences for bequeathing, bequest taxation may be optimal irrespective of externalities from giving, but crucially depend on the redistributive motive inherent in the beliefs of the social planner about cardinal utility of relatively selfish and altruistic parents.

After all, our model is still restrictive. We only implement a linear labor income tax, so that no redistribution within the parents' generation is possible via the income tax. In particular the scenario in which productivities differ between parents would call for such a tool. The key trade-off in our model however concerns the inequality in the children's generation and the incentives to bequeath in the parental generation. In the center of our interest is thus the redistribution between low and high types across generations. Endogenous labor supply would not necessarily alter this mechanism. Also, while our model is restrictive in the regard of labor supply and taxation, it takes income effects in the parental generation into account, a feature that is lacking in several recent publications and particularly in those, that fully characterize the tax system (Piketty and Saez, 2013; Saez and Stantcheva, 2018).

5.7 Conclusions

We present a simple two generations model in which parents have an altruistic bequest motive but vary in the degree of altruism. We test in how far this setting interacts with the common procedure to count the utility of children in the optimization problem directly and indirectly. Our results only partly confirm the results presented in Farhi and Werning (2013) and Boadway and Cuff (2015): While our model predicts negative and progressive inheritance taxation in most cases, it also shows that a regressive inheritance taxation can be optimal in several common settings that have so far not found sufficient attention in the optimal taxation literature. This is the case when the social planner beliefs that marginal utility of more selfish parents is higher than that of more altruistic parents. Our paper thereby adds to the discussion about the interaction of different specifications of bequest motives and the so called “double counting”.

D.5 Appendix

D.5.1 Derivation of Euler equation (eq. 5.6)

Inserting the budget constraint into Equation (5.3) and taking the first derivative with respect to b_i, applying the chain rule, and rearranging yields the Euler equation.

$$\frac{\partial u_i}{\partial b_{i,t}} = -\alpha_i \frac{\partial v}{\partial c_{i,t}} + \beta_i \frac{\partial \tilde{v}}{\partial c_{i,t+1}} \times \left(1 - \frac{\partial T_{i,b}}{\partial b_{i,t}}\right) \overset{!}{=} 0 \tag{5.20}$$

D.5.2 First order conditions

The first order conditions of the optimization problem of the social planner are the budget constraint and the following:

$$\begin{aligned}\frac{\partial L}{\partial \tau_1} =& \alpha_l \frac{\partial \psi_l}{\partial \tau_1} + \alpha_h \frac{\partial \psi_h}{\partial \tau_1} + (\gamma + \beta_l)\frac{\partial \phi_l}{\partial \tau_1} + (\gamma + \beta_h)\frac{\partial \phi_h}{\partial \tau_1} \\ &+ \lambda\left(\tau_1 \frac{\partial b_l}{\partial \tau_1} + \tau_2 \frac{\partial b_h}{\partial \tau_1} + k + \tau_1 \frac{\partial k}{\partial \tau_1} + b_l(\tau_1) - \tau_2 \frac{\partial k}{\partial \tau_1}\right) = 0,\end{aligned} \tag{5.21}$$

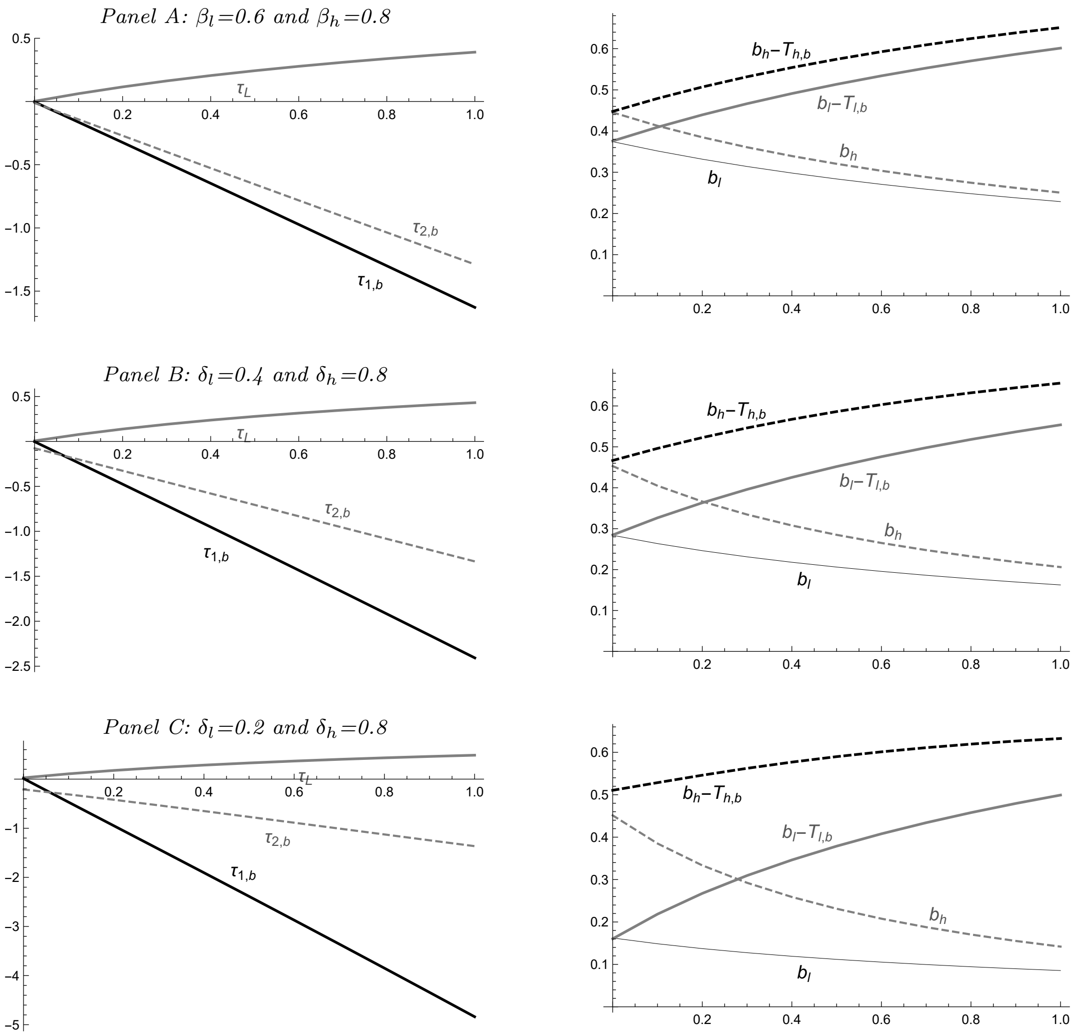
$$\frac{\partial L}{\partial \tau_2} = \alpha_h \frac{\partial \psi_h}{\partial \tau_2} + (\gamma + \beta_h)\frac{\partial \phi_h}{\partial \tau_2} + \lambda\left(\tau_2 \frac{\partial b_h}{\partial \tau_2} + b_h(\tau_2) - k - \tau_2 \frac{\partial k}{\partial \tau_2}\right) = 0,$$

$$\begin{aligned}\frac{\partial L}{\partial \tau_L} =& \alpha_l \frac{\partial \psi_l}{\partial \tau_L} + \alpha_h \frac{\partial \psi_h}{\partial \tau_L} + (\gamma + \beta_l)\frac{\partial \phi_l}{\partial \tau_L} + (\gamma + \beta_h)\frac{\partial \phi_h}{\partial \tau_L} \\ &+ \lambda\left(I_1 + I_2 + \tau_1 \frac{\partial b_l}{\partial \tau_L} + \tau_1 \frac{\partial k}{\partial \tau_L} + \tau_2\left(\frac{\partial b_h}{\partial \tau_L} - \frac{\partial k}{\partial \tau_L}\right)\right) = 0,\end{aligned}$$

D.5.3 Simulation

Figure D.1: Tax rates and inheritance of children as a function of γ (double counting).

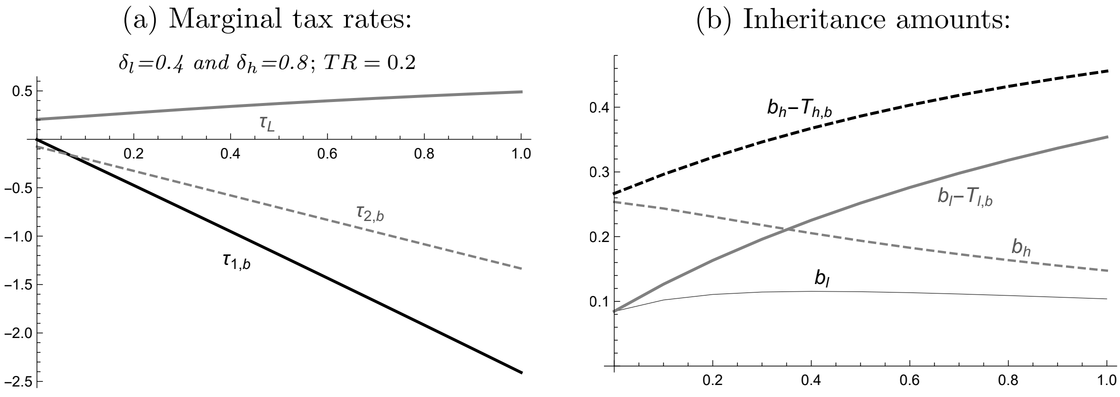
(a) Marginal tax rates: (b) Inheritance amounts:



Note: $\alpha_i = 1, \beta_i = \delta_i$, *Labor income is normalized to 1.*

Figure 5.3 extended in the range of γ.

Figure D.2: Tax rates and inheritance of children as a function of γ with lump sum transfer.

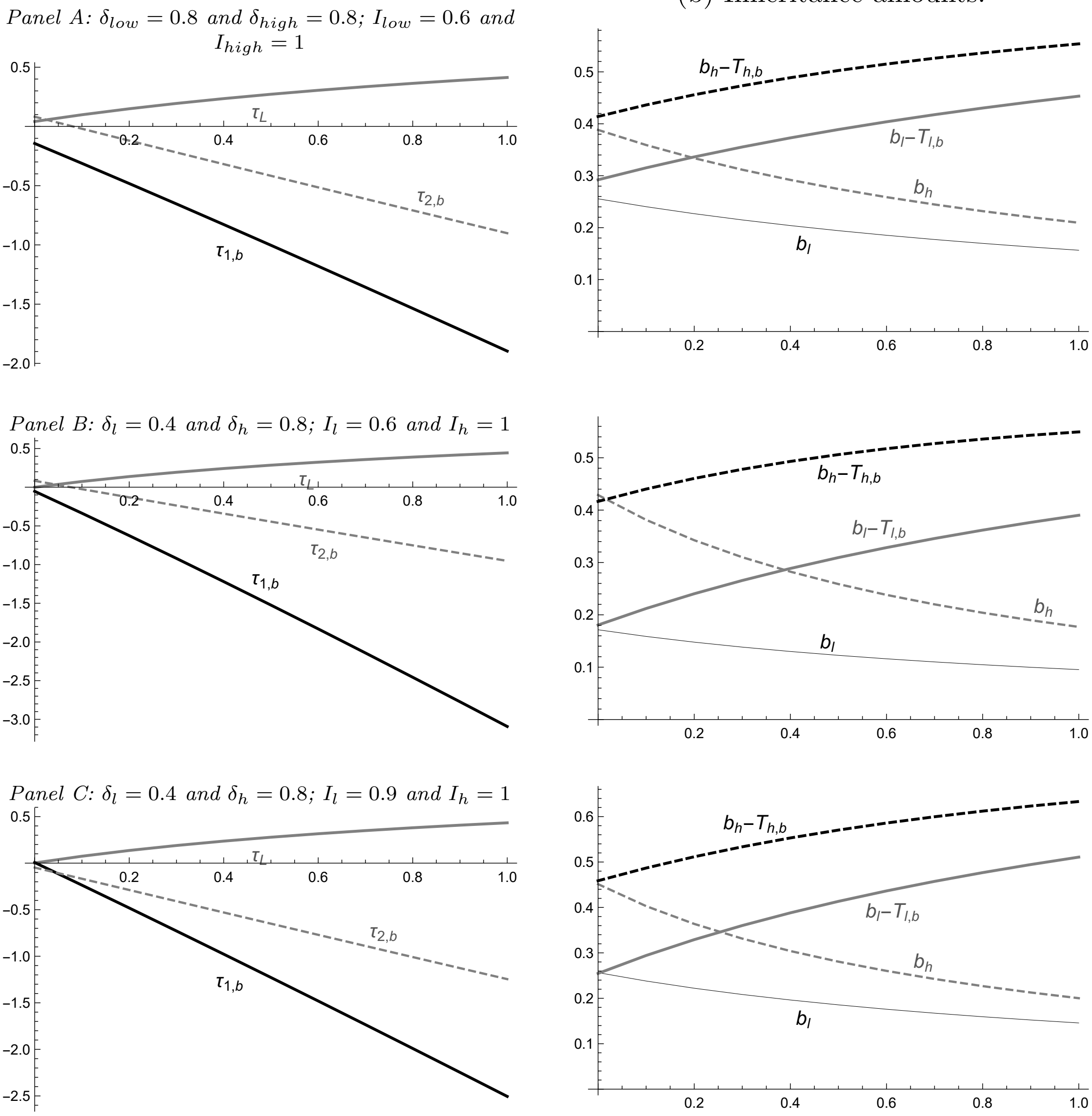


Note: $\alpha_i = 1, \beta_i = \delta_i$, *Labor income is normalized to 1.*

Figure 5.4 extended in the range of γ.

Figure D.3: Tax rates and inheritance of children as a function of γ with differences in parental earnings.

(a) Marginal tax rates: (b) Inheritance amounts:

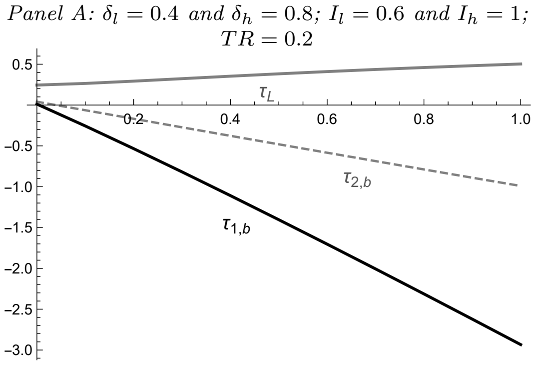


Note: $\alpha_i = 1, \beta_i = \delta_i$, Labor income is normalized to 1.

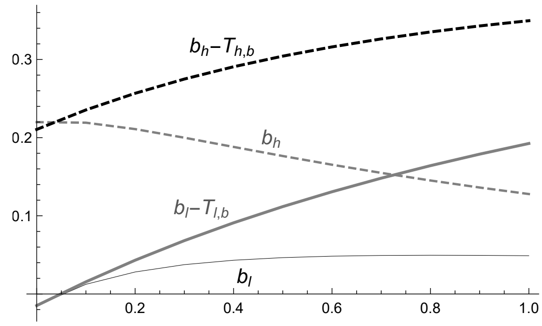
Figure 5.5 extended in the range of γ.

Figure D.4: Marginal tax rates and inheritance of children as a function of γ with differences in parental earnings and lump sum transfer.

(a) Marginal tax rates:



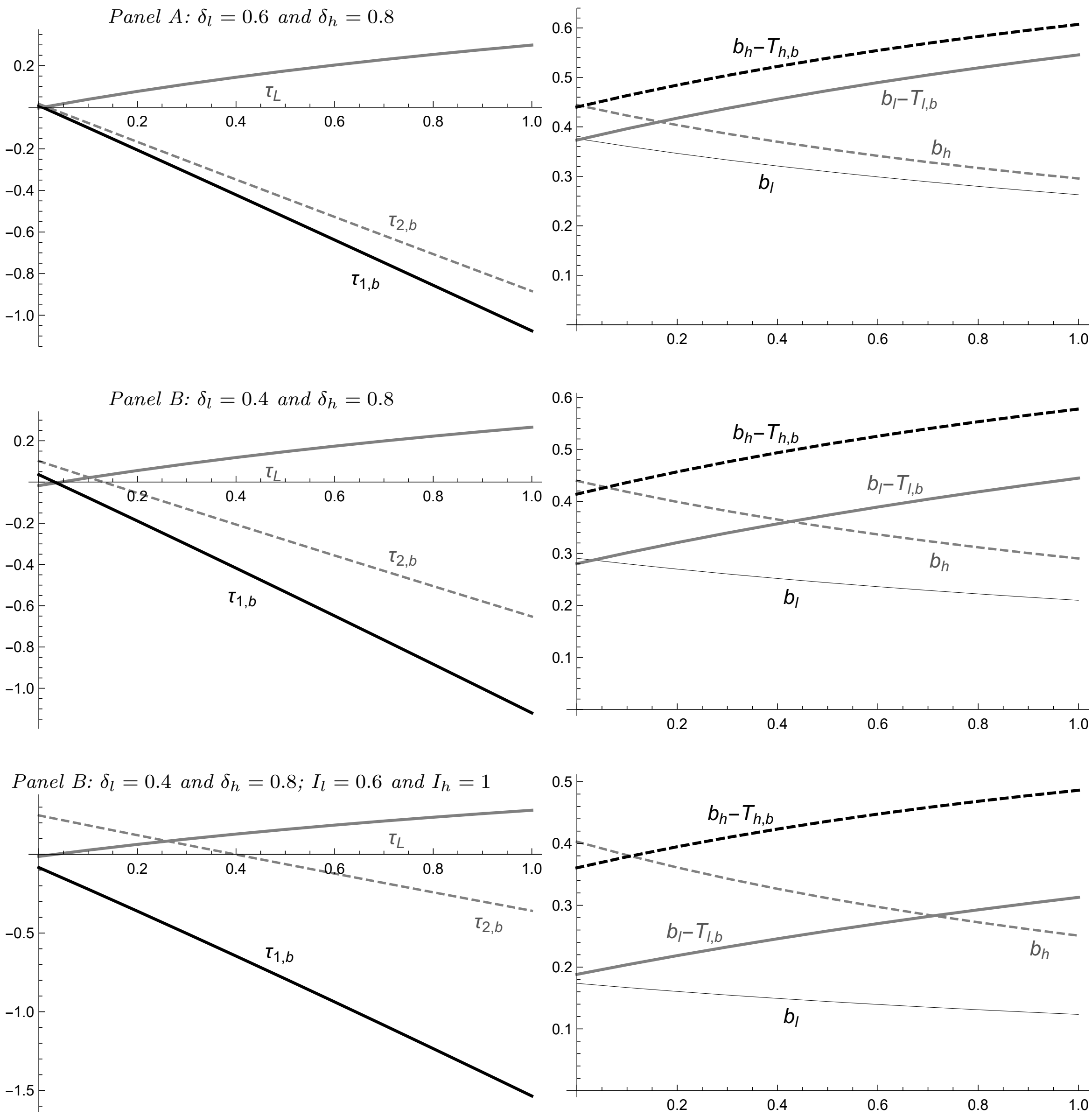
(b) Inheritance amounts:



Note: $\alpha_i = 1, \beta_i = \delta_i$, *Labor income is normalized to 1.*

Figure D.5: Tax rates and inheritance of children with inverse valuation of individual utility.

(a) Marginal tax rates: (b) Inheritance amounts:



Note: $\alpha_i = \frac{1}{\delta_i}$ *and* $\beta_i = 1$, *Labor income is normalized to 1.*

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English Summary (Abstracts)

Chapter 2: How Inheritances Shape Wealth Distributions: An International Comparison

We use data from the European Household Finance and Consumption Survey in order to examine the distributional effect of intergenerational wealth transfers on the net worth distribution in 8 European countries and compare it to recent findings for the US. To do so, we resort to the decomposition of the coefficient of variation as suggested and applied by Wolff (1987, 2002, 2015) and Wolff and Gittleman (2014). The results hint that inheritances and gifts have a vastly equalizing effect on inequality in household wealth in all 8 countries.

Chapter 3: The affluency to quit: How inheritances affect retirement plannings

This study uses the German SAVE panel study in order to estimate the effect of intergenerational transfers on the retirement behavior of individuals. The literature in this field typically estimates the transfer effect on the actual retirement probability. We suggest to base the analysis on the expected retirement age instead. This entails two methodological advantages: First, it is possible to exploit the within individual variation for the entire sample (even of those who do not yet retire) and thereby permits to analyze a key trade-off in the life-cycle plannings of individuals. Second, the effect size can easily be expressed in terms of time and thereby monetary opportunity costs. We find that heirs expect to retire earlier, even when receipts are expected to some degree. Specifically, heirs plan to retire four to five months earlier and thereby accept costs in the form of foregone income and pension entitlements corresponding to 20-30 % of the inheritance.

Chapter 4: Intergenerational transfers: How do they shape the German wealth distribution?

This paper uses SOEP data to study the distributional effect of intergenerational transfers on the wealth distribution of German households. Similar to most other central

European countries, Germany is likely to face a period of increasing aggregate bequest flows. At the same time, there is an ongoing debate on the distributional implications of such wealth shocks. This study adds to the discussion by providing causal estimates for the effect of transfer receipt on the savings behavior of households. The model allows for dynamic adjustment and variations in the savings behavior over the wealth distribution. I use the estimates to decompose the overall effect of transfers on wealth inequality in the effect of the aggregated transfer volume, the transfer incidence over the wealth distribution and the effect of the savings behavior. The results are very much in line with the literature, indicating that transfers tend to equalize wealth inequality, despite minor variations in the savings behavior over the wealth distribution and despite a strong relationship between initial household wealth and transfer accrual.

Chapter 5: Parental altruism and inheritance taxation

We derive optimal nonlinear inheritance and linear income tax rates in a two generations model of inheritance where parents differ by their preferences for bequeathing. We provide simulations that show that results depend crucially on the degree of the so called "double counting" of the heirs' utility in the social welfare function. We allow for income effects and characterize the entire tax schedule. Detailed simulations illustrate the implications of parental preferences interacting with social discounting. Optimal inheritance tax rates are negative and progressive unless double counting is minimal. The reasons are an intergenerational redistributive motive due to double counting and an intragenerational redistributive motive for the generation of heirs. For some parameterizations with limited double counting, an intragenerational redistributive motive for the generation of parents can lead to an optimal regressive inheritance tax.

Deutschsprachige Zusammenfassung

Die Dissertation untersucht den Zusammenhang zwischen der Vermögensverteilung und dem Erbschaftsgeschehen empirisch und mit einem Schwerpunkt auf den Zusammenhängen in Deutschland. Die Unterkapitel bedienen sich vornehmlich statistisch-ökonometrischer Methoden, um Zusammenhänge sichtbar zu machen, und, insbesondere im letzten Kapitel, einfacher Modellierungen, um theoretische Implikationen offenzulegen. Insgesamt ist es das Ziel der Arbeit, zu untersuchen, wie das Erbschaftsgeschehen die Vermögensverteilung beeinflusst. Die Schrift unterteilt sich in 5 Kapitel:

Kapitel 1 leitet in das Thema ein und fasst wichtige Ergebnisse der folgenden Hauptkapitel bereits zusammen. Der Kern dieses Kapitels ist es aber, die ökonomische Debatte um Erbschaften und Erbschaftsbesteuerung in einen größeren Kontext zu stellen und bedient sich dafür auch den Implikationen des Gabe-Theorems für das Themenfeld der Erbschaften.

Kapitel 2 nutzt die Vermögens- und Erbschaftsdaten des *European Household and Consumption Survey* um den Einfluss von Erbschaften auf die Vermögensungleichheit im Haushaltsvermögen über die Euro-Staaten hinweg zu untersuchen. Dies geschieht durch die von Edward N. Wolff vorgeschlagene und mehrfach von ihm angewendete Dekomposition der Ungleichheit im Haushaltsnettovermögen in die Ungleichheitsanteile, die die verschiedenen Komponenten des Vermögens mitbringen (Wolff, 1987, 2002; Wolff and Gittleman, 2014; Wolff, 2015). Die Dekomposition zeigt, dass Erbschaften die Vermögensungleichheit abschwächen, weil sie relativ betrachtet tendenziell in größerem Umfang für ärmere Haushalte anfallen. Die schon vor Erbschaftszugang bestehenden Vermögen korrelieren folglich negativ mit den relativen Erbschaften. Dieser Zusammenhang zeigt sich sehr robust über alle der untersuchten Länder hinweg. Die Wolff'sche Zerlegung nimmt allerdings an, dass Erbschaften vollständig angespart werden. Sie offenbart deshalb lediglich den mechanischen Effekt von Erbschaften auf die Vermögensverteilung und ignoriert, dass der Einkommenseffekt des Erbschaftszugangs

Verhaltensanpassungen wahrscheinlich macht. Sollte der Umfang der Verhaltensanpassung stark mit dem Haushaltsvermögen vor Erbschaftszugang korrelieren, ist denkbar, so zeigen Wolff and Gittleman (2014), dass der angleichende Effekt von Erbschaften auf die Vermögensverteilung umgekehrt wird. Die folgenden beiden Kapitel untersuchen diesen Zusammenhang genauer.

Kapitel 3 richtet den Fokus nun zunächst auf die durchschnittliche Verhaltensanpassung: Haushalte reagieren über verschiedene Kanäle auf den Erbschaftszugang, können ihr Spar- und Konsumverhalten so auch über das Arbeitsangebot anpassen. Dieses Kapitel untersucht die Anpassung im Hinblick auf das extensive Arbeitsangebot, das durch Effekte auf den Zeitpunkt des Renteneintritts gemessen wird. Im Gegensatz zu verschiedenen anderen Studien konzentrieren wir uns allerdings darauf, die Veränderung des *erwarteten* Renteneintrittsalters zu untersuchen. Dieser Ansatz ist vorteilhaft, weil er es uns erlaubt, geplante Verhaltensanpassungen von Individuen aller Altersgruppen zu untersuchen. Außerdem wird das erwartete Renteneintrittsalter mehrfach pro Individuum erfasst und ermöglicht es damit, für individuelle fixe Effekte zu kontrollieren. Da das erwartete Renteneintrittsalter zudem eine zeitliche Dimension öffnet (und nicht die Verrentungswahrscheinlichkeit Gegenstand der Untersuchung ist), lässt sich der Umfang der Verhaltensanpassung in Opportunitätskosten umrechnen: Plant ein Individuum aufgrund eines Erbschaftszugangs früher in Rente zu gehen, nimmt es damit einerseits geringere Ansprüche aus der gesetzlichen Rentenversicherung in Kauf, andererseits verzichtet es in diesem Zeitraum auch auf den Betrag, um den sein aktuelles Arbeitseinkommen seinen künftigen Rentenanspruch übersteigt. Unsere Ergebnisse legen nahe, dass Erben im Durchschnitt etwa vier bis fünf Monate früher in Rente zu gehen planen als Nichterben. Setzt man die sich individuell ergebenden Opportunitätskosten dieses früheren Renteneintritts ins Verhältnis zur Höhe der erhaltenen Erbschaft, ergibt sich, dass Erben implizit planen, etwa ein Drittel ihres Erbes für den Renteneintritt auszugeben. Dieses Ergebnis offenbart eine hohe Zahlungsbereitschaft für Freizeit und sollte bei der Konzeption des Rentensystems berücksichtigt werden.

Kapitel 4 untersucht den Effekt von Erbschaften auf die Vermögensverteilung und berücksichtigt dabei im Gegensatz zu Kapitel 2 den Effekt der Erbschaft auf das Spar- und Konsumverhalten von erbenden Haushalten. Im Gegensatz zu Kapitel 3 wird der Effekt nicht nur im Hinblick auf das extensive Arbeitsangebot, sondern im Hinblick auf das aggregierte Haushaltsvermögen untersucht. In dem Papier schätze ich zunächst, welchen Anteil Haushalte typischerweise von Erbschaften sparen (bzw. äquivalent, welchen Effekt der Erbschaftszugang auf das sonstige Sparverhalten hat) und prüfe ebenfalls, ob dieser Anteil über die Vermögensverteilung variiert. In einem weiteren Schritt zerlege ich den Effekt von Erbschaften auf die Vermögensverteilung in die Beiträge der Erbschaftsinzidenz und des Sparverhaltens auf die Ungleichheit in Vermögen. Die Ergebnisse weisen darauf hin, dass Haushalte im Schnitt nur etwa 60 % ihrer Erbschaften sparen. Entegegen der Vermutung von Wolff and Gittleman (2014) lässt sich allerdings keine systematische Variation im Effekt der Erbschaft auf das Spar- und Konsumverhalten über die Vermögensverteilung nachweisen. Die Zerlegung des Effektes zeigt, dass die Erbschaftsinzidenz zwar zu einer stärkeren Ungleichheit in Vermögen führt, ihr Effekt jedoch durch das Sparverhalten und den Effekt des aggregierten Transfervolumens mehr als aufgewogen werden. Auch die hier verwendete Methode legt also nahe, dass Erbschaften der relativen Ungleichheit in Vermögen entgegenwirken, die explizite Berücksichtigung des Sparverhaltens führt dabei nicht zu anderen Ergebnissen. Erbschaften sind weiterhin relativ betrachtet größer für weniger wohlhabende Haushalte, es finden sich somit keine empirischen Belege für die Vermutung von Wolff and Gittleman (2014). Die Ergebnisse aus Kapiel 2 haben folglich Bestand.

Kapitel 5 ist im Gegensatz zu den vorhergehenden Kapiteln eher theoretisch ausgerichtet und beinhaltet einen Beitrag zur Theorie der optimalen Erbschaftsbesteuerung: Wir untersuchen in einem Modell für zwei Generationen mit altruistischen Eltern und linearer Einkommensbesteuerung, wie sich Unterschiede in den elterlichen Präferenzen für Erbschaften auf die optimale, nichtlineare Erbschaftsbesteuerung auswirken. Wir untersuchen dies auch im Hinblick auf das sogenannte *Double-counting*, also die in der Literatur diskutierte doppelte Berücksichtigung des Nutzens der Nachkommengeneration in der sozialen Wohlfahrtsfunktion. Unser Modell optimiert damit den Zielkonflikt zwischen einer durch den sozialen Planer angestrebten Gleichheit im Nutzen aus Konsum unter den Nachkommen und der Effizienz des Vererbens in der Elterngeneration. Unsere Ergebnisse decken sich größtenteils mit den Ergebnissen aus der Literatur, die zuletzt darauf hingewiesen haben (Farhi and Werning, 2010), dass eine progressive und negative Einkommenssteuer optimal sein kann. Allerdings zeigt unser Modell, dass diese Ergebnisse wesentlich auf das *Double-counting* zurückzuführen sind und sich im Falle einer starken Diskontierung des Nutzens der Nachkommen sogar eine regressive Besteuerung von Erbschaften unter den Bedingungen variierender Präferenzen für Erbschaften als optimal erweisen kann.

Erklärung an Eides statt

Wie bereits zu Beginn der Dissertation dargestellt, sind drei der fünf Kapitel gemeinsam und zu gleichen Teilen mit Ko-Autoren verfasst worden.

Gemäß §4 Abs. 2 Promotionsordnung zum Dr. rer. pol. des Fachbereichs Wirtschaftswissenschaften der Freien Universität Berlin vom 13. Februar 2013 erkläre ich hiermit, dass ich mich noch keinem Promotionsverfahren unterzogen oder um Zulassung zu einem solchen beworben habe, und die Dissertation in der gleichen oder einer anderen Fassung bzw. Überarbeitung einer anderen Fakultät, einem Prüfungsausschuss oder einem Fachvertreter an einer anderen Hochschule nicht bereits zur Überprüfung vorgelegen hat.

(Ort, Datum, Unterschrift)

Gemäß §10 Abs. 3 der Promotionsordnung zum Dr. rer. pol. des Fachbereichs Wirtschaftswissenschaften der Freien Universität Berlin vom 13. Februar 2013 erkläre ich hiermit, dass ich für die Dissertation folgende Hilfsmittel und Hilfen verwendet habe:

- Statistiken und Regressionen: Stata
- Simulationen: Mathematica
- Schriftsatz und Formatierungen: LaTeX, Texmaker
- Darstellungen: PowerPoint

Auf dieser Grundlage habe ich die Arbeit selbstständig verfasst.

(Ort, Datum, Unterschrift)