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Michael Berlemann | Marc-André Luik

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Authors:

Michael Berlemann (Berlemann@hwwi.org)
Hamburgisches WeltWirtschaftsInstitut (HWWI),
Helmut-Schmidt-Universität Hamburg,
CESifo, ifo Institut für Wirtschaftsforschung

Marc André Luik
Zalando & GLO

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Hamburg Institute of International Economics (HWWI)
Scientific Director: Prof. Dr. Michael Berlemann
Managing Director: Dr. Dirck Süß
Mönkedamm 9 | 20457 Hamburg | Germany
Phone: +49 40 340576-0 | Fax: +49 40 340576-150
info@hwwi.org | www.hwwi.org

Institutional Reform and Depositors' Portfolio Choice
Evidence from Bank Account Data

Michael Berlemann[1,2] and Marc André Luik[3]

[1] *Hamburgisches WeltWirtschaftsInstitut (HWWI), Mönkedamm 9, 20457 Hamburg, Germany.*
[2] *Helmut-Schmidt-University Hamburg, Holstenhofweg 85, 22043 Hamburg, Germany.*
[3] *Zalando GLO, Germany.*

Abstract

In this paper we employ the natural experiment of German Division and Reunification in order to study the effect of institutional reform on the decision to hold risky assets. We present empirical evidence indicating that even 16 years after German Reunification risky portfolios of East and West German bank customers differed systematically, even after controlling for wealth and other socio-demographic factors. While these differences are especially pronounced for bank customers with experiences in the former communist system, even the younger generation of East Germans still differs remarkably from their West German counterparts in terms of risky asset choice. Thus, informal institutions tend to have long-lasting effects on portfolio behavior.

Keywords: Institutional reform, stockholding puzzle, portfolio choice, bank data, informal institutions

1 Introduction

A major finding of the field of household finance is that only a minority of individuals holds risky assets (Haliassos and Bertaut 1995, Fagereng, Gottlieb, and Guiso 2017). This so-called "stockholding puzzle" is the more surprising as the return on equity has averaged about 6% more than the return of (almost) riskless government bonds (see e.g. Mehra and Prescott 1985). Understanding the determinants of individual stockholding is not only important for brokers or firms which aim at allotting shares. Due to the comparatively high long-run return of stocks these assets provide attractive investment opportunities throughout working life which can significantly contribute to accumulating necessary wealth for the retirement phase (Lusardi and Mitchell 2017). Especially in countries without social insurance systems, asset market participation can thus be an important factor preventing poverty among the elderly. However, even in many highly developed countries with social security systems private wealth accumulation is important as ageing populations often challenge the ability of these systems to provide adequate pension levels (Christelis, Georgarakos, and Haliassos 2011). Moreover, financial sector development in general is often seen as a prerequisite for economic prosperity (Levine 1997). As liquid stock markets facilitate the possibilities to trade ownership and to diversify portfolios (Hasan, Wachtel, and Zhou 2009) the existence of effective stock markets increases social welfare and contributes to economic growth.[1]

The quickly growing literature has considered many socio-demographic factors such as income, wealth, age, gender, education, financial literacy or health status as determinants of individual stockholding.[2] Comparatively little is yet known on the effect of institutions and especially institutional change on stockholding behavior.[3] While the role of institutions has been neglected by

1. See Chinn and Ito 2006, Rousseau and Wachtel 2000 and Rousseau and Xiao 2007 for empirical support of this line of argument.
2. We briefly summarize this literature later in section 2. For a relatively new survey article see Zehra and Singh 2023.
3. Noteworthy exceptions are the two papers by Osili and Paulson 2008 and Fuchs-Schündeln and Haliassos 2015, which will be discussed in the literature section.

economists for long periods of time, nowadays most economists believe that institutions matter as they influence individual economic behavior and thus finally affect the economic performance of economies.[4] We thus might also expect institutions to have an influence on stockholding behavior.

Institutions, understood as political constraints which are persistent over time and show depth and durability (Glaeser *et al.* 2004), can be formal or informal. Formal institutions (such as e.g. constitutions or electoral rules) are typically laid down in the written legal framework and e.g. define (and constrain) the role of the state in a society. Informal institutions are the rules shaping human behavior in everyday interactions such as social norms, customs, attitudes and beliefs about right and wrong (North 1990). While informal rules evolve under and are influenced by formal institutions, they are not directly defined by politicians. In order to learn how institutions affect stockholding behavior it is important to understand how formal institutions shape informal institutions (such as e.g. individual preferences) and thereby influence the individual demand for risky assets. Moreover, whenever politicians are interested in affecting stockholding behavior via changing formal institutions it is important to know how quickly we might expect institutional change to affect risky asset demand.

In this paper we employ the natural experiment of German Division and Reunification to study the effect of institutions and institutional change on portfolio choice of individuals.[5] For almost 40 years the populations of East and West Germany experienced completely different political, social and economic systems and, thus, have lived under completely different formal and informal institutions. Using historical data, Alesina and Fuchs-Schündeln 2007 show that before 1945, the regions belonging to East and West Germany were similar regarding their income levels and other economic dimensions, e.g., the share of the population working in industry, agriculture, or commerce. Moreover, historical election results indicate no differences with respect to political views. Thus, differences in informal institutions which can be observed between the West and the East German population after German Reunification can clearly be attributed to the treatment, i.e. the differences in the formal institutions throughout the period of German Division. Moreover, using the natural experiment of German Division and Reunification allows us focusing exclusively on the effect of institutions as both parts of Germany share the same culture.[6]

The formal institutions in East and West Germany differed in many respects throughout the time of German Separation. The most striking difference was the socio-economic system. While West Germany adopted the system of a capitalistic market economy, the government of the German Democratic Republic (GDR) opted for a communist system with a centrally planned economy. In such a command economy most economic decisions are planned by the central government authority and organized along a top-down administration. Especially decisions regarding production output requirements and investments are decided by planners from the top of the chain of command. Such a system leaves almost no room for private entrepreneurship. As Fuchs-Schündeln and Masella 2015 discuss in detail, the GDR installed an educational system which aimed at creating socialist personalities. The school curricula contained a comparatively high share of courses on socialism and communism. Moreover, the GDR school system did not incentivize critical thinking but suppressed diverging opinions (Block and Fuchs 1993) and the curricula allowed only minimal scope for teacher or student initiative.

As it was the case in most centrally planned economies, the GDR did not permit any financial

4. The belief that ”good institutions” are important prerequisites for economic prosperity is guided by the theoretical reasoning of New Institutional Economics (for an overview on the most important theoretical arguments see Acemoglu, Johnson, and Robinson 2005) and is supported by a growing body of empirical research, see e.g. Knack and Keefer 1995, Barro 1996, Knack and Keefer 1997, Levine 1998, LaPorta *et al.* 1999, Acemoglu, Johnson, and Robinson 2001 and Rodrik, Subramanian, and Trebbi 2004.

5. Fuchs-Schündeln and Schündeln 2020 show that Communism in Eastern Europe left their long-run traces in population preferences.

6. As Alesina and Giuliano 2015 have argued, there is often a two-way interaction between culture and institutions as certain cultures often choose institutions which tend to preserve culture among future generations.

transactions between enterprises and households (Bofinger 1990, Wolf 1985). Instead of establishing a private capital market, private savings were collected by state savings banks, transferred to the GDR state bank and distributed to state firms according to the central economic plan (Siebert 1990). As a consequence of these formal institutions, the East Germans did not collect any experiences with private capital markets and products such as investment funds, bonds, stocks or derivatives. However, the formal institutions in GDR times not only disallowed East Germans to collect their experiences with capital markets. As outlined earlier, the GDR system and its policies also influenced informal institutions such as self-reliance, the belief to be able to influence one's own life (locus of control) and trust.[7] Capitalist behavior such as profit seeking or entrepreneurial activity as integral parts of capitalist systems were deemed as "asocial", "decadent" and "imperialistic" (see Malycha and Winters 2009). Against this background Bauernschuster, Falck, and Heblich 2010 suspect that "the values and norms, i.e., the implicit institutions of the GDR society, were deliberately manipulated"[8] and due to the fact that "implicit institutions develop rather slowly"[9] might affect individual behavior even after formal institutions have changed.

In our study we employ a unique set of individual customer data from a number of German savings banks, located in both parts of Germany to study whether East and West German bank customers differ systematically in their portfolio choice. When doing so we follow Miniaci and Weber 2002 and distinguish between the extensive and intensive portfolio decision, as the decision to hold risky assets at all might substantially differ from the one how much of these assets should be held. Broadly in line with the findings of Fuchs-Schündeln and Haliassos 2015 for survey data from the German Socio-Economic Panel (SOEP) we detect no significant differences in the decision to hold any sort of risky asset at the extensive margin. However, we find West Germans to take a more active role in portfolio decisions than their East German counterparts. Whereas East Germans tend to rely much more on externally managed funds, West Germans more often buy stocks and bonds on their own or at least opt for investment funds not managed by their own bank. The differences between East and West German bank customers turn out to be even larger at the intensive margin. Bank customers living in West Germany hold significantly more risky assets, even after controlling for differences in their individual customer characteristics such as income and wealth. This holds especially true for externally managed funds, stocks and bonds. Moreover, the difference to the East Germans increases in the conditional level of risky asset holdings. We argue that the reported differences in portfolio behavior between East and West Germans are likely due to the earlier mentioned differences in informal institutions such as self-reliance, trust and locus of control as a consequence of the communist treatment. We also detect differences between East and West Germans to be more pronounced for individuals which had longer experiences with the communist system. Interestingly enough, we also find differences between East and West Germans in the generation of bank customers which itself was too young at the time of German Reunification to have made its own financial experiences in the former system. Thus, informal institutions seem to have quite persistent effects on portfolio choice.

The remainder of the paper is organized as follows. Section 2 reviews the related literature. Section 3 introduces the employed dataset and delivers summary statistics. Section 4 is concerned with risky portfolio choice at the extensive margin whereas section 5 deals with the intensive dimension. Section 6 considers differences in portfolio choice for subgroups with different experiences in the former communist system due to their age at German Reunification. Section 7 summarizes the main results and concludes.

7. Williamson 2009 defines informal institutions as economic culture via the four determinants trust, respect, individual self-determinantion and obedience.

8. Bauernschuster, Falck, and Heblich 2010, p. 6.

9. Bauernschuster, Falck, and Heblich 2010, p. 6.

2 Related Literature

The question how corporations (should) decide on their financial portfolios is a major topic of corporate finance. However, since private households differ substantially from corporations, the results of corporate finance research can hardly be applied to financial decisions of private households (Guiso and Sodini 2013). Against this background a new strand of the literature, household finance, evolved since the early 1990s (Haliassos 2008). One of the most important empirical findings of this literature, the earlier mentioned stockholding puzzle, is mostly explained by households' participation costs and complementary effects (e.g. Christelis, Georgarakos, and Haliassos 2011). Triggered by the early paper by Haliassos and Bertaut 1995, a quickly growing empirical literature on the determinants of the decision to hold risky assets evolved.

Most of this literature is concerned with studying socio-demographic determinants of risky asset demand. Among the most often considered factors are income (risk) (e.g. Vissing-Jørgensen 2002 or Guiso, Jappelli, and Terlizzese 1996), financial wealth (e.g. Haliassos and Bertaut 1995, Brsch-Supan and Eymann 2002 or Calvet and Sodini 2014), education (e.g. Campbell 2006 or Cole, Paulson, and Shastry 2014), occupation (e.g. Campbell 2006 or Haliassos and Bertaut 1995), age[10] and gender (e.g.Barber and Odean 2001). Additional socio-demographic factors which have been considered are ethnicity (Haliassos and Bertaut 1995), marital status and parentship (Love 2010), health status (Rosen and Wu 2004), cognitive abilities (e.g. Christelis, Jappelli, and Padula 2010 or Grinblatt, Keloharju, and Linnainmaa 2011) and financial literacy (Van Rooij, Lusardi, and Alessie 2011).

Besides socio-demographic variables, institutional factors have also been considered as determinants of the decision to hold risky assets. Hong, Kubik, and Stein 2004 argue, based on a well-defined theoretical model, that sociability (as informal institution) might trigger stock market participation either via word-of-mouth and observational learning or the pleasure of being capable of taking part in conversations and discussions on market developments with other fellow participants of the stock market. Based on survey evidence from the Health and Retirement Study (HRS) Hong, Kubik, and Stein 2004 study this hypothesis empirically. After classifying the survey respondents into socials and non-socials, based on survey questions on interactions with their neighbors and church attendance, the authors in fact find a strong, robust and statistically significant effect of sociability on stock market participation. A reassessment for German data by Dierkes, Klos, and Langer 2011 leads to the result that the effect of sociability on the probability of holding risky assets is much stronger among people younger than 50 years. Guiso, Sapienza, and Zingales 2008 analyze the influence of general trust, another informal institution, on stock market participation. Using surveys from different countries, the authors show that less trustful individuals are also less likely to hold stocks. A joint analysis of trust and sociability on stock market participation can be found in Georgarakos and Pasini 2011. In their study of 13 industrialized countries, Christelis, Georgarakos, and Haliassos 2013 find considerable differences in stock market participation on the country level even after controlling for differences in population characteristics. The authors find that these differences to some extent are related to country differences in formal and informal institutional factors such as shareholder rights and the level of prevailing trust in the referring countries. Both, a higher level of shareholder rights and a higher level of trust tend to increase stock market participation.

Our subsequent analysis is most closely related to the very small literature on the effects of

10. While age is almost always included in analyses of household portfolios, the exact specification differs from study to study. Some papers include age in a linear fashion (e.g. Calvet, Campbell, and Sodini 2007) while others such as e.g. Campbell 2006 use a polynomial specification. The least restrictive way of modeling age effects is the inclusion of age (group) dummies (Guiso, Haliassos, and Jappelli 2003). Due to the fact that most studies use cross-section data, the existing empirical evidence might be subject to an identification problem as it cannot be ruled out that the results are driven by cohort effects (Ameriks and Zeldes 2004). The common practice of estimating age effects is thus only correct if we assume cohort equality.

institutional change on individual portfolio choice. This literature consists, to the best of our knowledge, of only two papers.

The first paper is the study by Osili and Paulson 2008, which employs individual survey data from the U.S., extracted from the Survey of Income and Program Participation. Osili and Paulson 2008 argue that immigration can be interpreted similarly as an institutional reform as the immigrants are suddenly confronted with completely different formal institutions while at least initially their attitudes are still shaped by the experiences they made in their countries of origin. The authors find that country-of-origin institutional quality has a strong effect on the likelihood of immigrants' stock market participation. Lower institutional quality in the country of origin turns out to depress the probability to hold stocks significantly. Moreover, the effect is amplified by living in a neighborhood with many other immigrants from the same country of origin. However, the effect tends to decrease slowly in the course of time and completely diminishes after roughly a quarter of a century living under the new formal institutional framework.[11] Osili and Paulson 2008 find no effect of country-of-origin institutions at all for immigrants which have been comparatively young when immigrating. Similarly, the authors find no empirical evidence indicating that informal institutions are transmitted to younger generations. However, it is less clear in how far Osili and Paulson's (2008) results can really answer the question how institutional reforms affect household finance in general. Two major problems render this generalization critical. First, it cannot be ruled out that the sample of emigrants differs considerably from the rest of the population of the country of origin (Borjas 1994). One might suspect that the emigrants are less risk averse and better educated than the average citizen. Second and even more important, one might suspect that it makes a huge difference whether an individual experiences a change in formal institutions in his country of origin or whether it experiences this change by moving to a foreign country. In the first case the individual is surrounded by other citizens with the same institutional experiences. As a consequence the whole population has to adapt to the new formal institutions. In the second case, where an individual moves into a different country with stable institutions, the emigrant interacts primarily with people who are already experienced with the prevailing formal institutions. One might therefore expect that in the latter (and for reforms less typical) case former informal rules become unimportant more quickly. Finally, it is not completely clear whether the differences between immigrants and U.S. citizens are due to differences in informal institutions or due to differences in culture. In line with the study of financial behavior of migrants to Sweden by Haliassos, Jansson, and Karabulut 2017 one might argue that these differences are largely a consequence of differing cultures rather than solely caused by differing institutions.

The second related paper, authored by Fuchs-Schündeln and Haliassos 2015, employs the earlier described natural experiment of German Division and Reunification to study whether product familiarity determines individual stock market participation. While the paper is thus not primarily concerned with institutional change, it nevertheless allows to draw some conclusions on this issue. The authors employ survey data from the German Socio-Economic Panel and compare (among other issues) stock market participation of East and West Germans after German Reunification. They find that, after controlling for individual characteristics, participation rates among both groups of the German population quickly converged. However, as Osili and Paulson 2008, Fuchs-Schündeln and Haliassos 2015 focus exclusively on the extensive dimension of the participation decision and do not distinguish between different types of risk.

11. This finding is consistent with the literature on experience-based learning in financial markets (see e.g. Malmendier and Nagel 2011 and Malmendier, Nagel, and Yan 2021).

3 Data and descriptive statistics

3.1 Data

Most of the empirical evidence in household finance is based on survey data. Surveys have the advantage of being capable of drawing a reasonably complete picture of household wealth as it is, in principle, possible to ask for each type of asset and liability separately and regardless of where the assets and liabilities are held. Moreover, surveys collect a wide range of socio-economic characteristics. However, this comes at the price of the well-known disadvantages of questionnaires such as problems of self-selection, non-response behavior, systematic misreporting, wishful thinking and lack of accuracy.[12] Survey participation itself might alter financial behavior, as the empirical evidence presented in Crossley *et al.* 2014 indicates. Two alternatives to survey data are register and account data. While the use of register data is appealing and has its obvious advantages, its access is mostly limited to the Scandinavian countries and Finland (Gaudecker 2015). In Germany, the only feasible alternative to survey data, whenever available, is bank account data.[13] While this sort of data typically exhibits high levels of validity, this comes at the price that account data often do not provide a complete picture of household wealth and socio-economic characteristics. The possibly most severe disadvantage of bank account data is that bank customers may have accounts or hold assets at more than one bank.

In our analysis we make use of a unique dataset consisting of individual customer data from 11 German savings banks. Eight banks operate in East Germany, three in West Germany. For both German regions (east and west) our sample includes small, mid-size and large banks from rural, mixed and urban areas. Table 1 provides a condensed overview of bank characteristics. The size of the banks is categorized as follows: banks with less than 100.000 customers are considered as ”small”, banks with more than 100.000 and less than 200.000 customers are labelled ”medium” and banks with more than 200.000 customers are denoted as ”large”. Altogether, our sample is reasonably representative for the German savings banks sector.[14]

As mentioned earlier, utilization of bank account data might be problematic as bank customers may have more than one bank connection. Most likely, this also holds true for numerous savings bank customers in our sample.[15] However, against the background of our empirical approach of comparing East and West German bank customers this would be problematic only if the average number of bank connections in our East and West German samples would differ systematically. Surveys on the number of bank connections per customer on a regional basis are conducted only rarely. However, at least for the year 2002 survey data from IfD Allensbach is available. Employing this data we calculated the average number of bank connections for those regions, our East and West German sample banks come from (see Table 2). The results indicate no systematic differences in the number of bank connections between the two samples. Thus, although our dataset most likely does not cover the whole wealth of savings bank customers, the existing bias is the same in both subsamples and is thus at least unproblematic for our subsequent analysis. Moreover, to keep the bias as small as possible, we restrict our analysis to customers holding a giro account with their savings bank as doing so is a good indicator of whether the referring bank is the customer’s major bank connection.[16]

For all 11 savings banks in our sample we have a complete record of all private customer accounts. All financial variables are recorded with their values as of 31th December 2006. We

12. For a discussion see Calvet, Campbell, and Sodini 2007.
13. For an application of German brokerage and bank account data, see Hackethal, Haliassos, and Jappelli 2012.
14. Due to confidentiality requirements and a nondisclosure-clause, we are not allowed to provide more detailed information about the savings banks in our sample. The data set only covers typical savings banks; Landesbanken are not included in the sample.
15. Note that the dataset itself contains no information on this issue.
16. Within a battery of robustness checks we also show that all qualitative results remain unchanged when further restricting our sample to bank customers receiving a regular income of more than 1000 per month on their giro account.

Table 1. Characteristics of banks

Bank	Size	Location	Characteristics of retail district
1	Medium	East	Rural
2	Large	East	Mixed
3	Medium	East	Urban
4	Medium	East	Urban
5	Large	East	Mixed
6	Small	East	Urban
7	Small	East	Urban
8	Medium	East	Rural
9	Small	West	Urban
10	Small	West	Rural
11	Large	West	Mixed

Table 2. Number of bank connections per sample region, 2002 (Source: IfD Allensbach 2002)

Number of bank connections	Sample regions East Germany	Sample regions West Germany	Germany total
1	67.02	67.19	67.18
2	22.00	22.41	22.12
3	7.98	7.10	7.81
4	1.00	2.82	1.37
5 or more	1.00	1.28	1.06

excluded corporate clients from the sample since corporations are, as mentioned earlier, well known to differ in their portfolio behavior. While the vast majority of accounts in our sample is belonging to individuals, there is a significant number of joint accounts, typically owned by (married) couples. Since our estimation model bases on individual data, we split up joint accounts by assigning assets and liabilities proportionally to (fictive) individual accounts.

Before conducting our empirical analysis we excluded various observations from the dataset. First, we are only interested in active customers which likely hold the major share of their financial wealth with their savings bank. We therefore excluded customers not owning a checking account or having zero asset wealth (621,683 observations). Second, we excluded all observations for which the age variable is either missing or likely misreported. We therefore deleted customers with unknown age or with a reported age of more than 100 years from the dataset (38,030 observations).[17] Third, we are only interested in individuals who can choose their bank portfolios freely. As there are legal restrictions for bank customers in the age of less than 18 years we dropped all observations of these young bank customers (71,386 observations). Fourth, as we are interested in comparing bank customers living in East and in West Germany we excluded observations who are either from Berlin (2,289 observations) or could not be attributed to a unique German district (NUTS-3) (2,652 observations). The resulting sample included 1,774,475 observations. In order to exclude influential outliers from our subsequent analysis we decided to use the 99.9999 quantile of the sample for the subsequent empirical analysis (which led to a an exclusion of 18 observations). Thus, our final sample consists of 1,774,457 bank customers. While 1,417,205 individuals live in East Germany, the remaining 357,252 customers live in West Germany.

Table 3 delivers an overview of the set of variables which is available for each bank customer. In addition to a detailed breakdown of customer wealth into the bank's financial products,[18] we also have information on socio-demographic and regional characteristics.[19]

The first block of variables consists of socio-demographic information. First, we have information on a customer's gender. $Male$ is a dummy for male bank customers. Second, we code the dummy variable $Transfer$ for customers receiving social transfers (such as unemployment benefits). We also know the exact age of each bank customer. As our dataset contains a huge number of observations we code a dummy variable for each age class $m = 18, \ldots 84$. Older customers are summarized in an additional dummy. We also have information on the living place of bank customers. The variables $Area_{urban}$, $Area_{mixed}$ and $Area_{rural}$ are dummy variables for customers living in predominantly urban, mixed and predominantly rural areas.[20] We also code a dummy variable $East$ for bank customers living in East Germany.

The second block of variables refers to income, liabilities and wealth. $Income$ measures customers' regular income, which was derived via automatically detected repeated income streams from individual bank account transaction data. Gross financial wealth, GFW, is the sum of sight deposits, time deposits, savings deposits and the sum of all risky assets a bank customer holds with his or her savings bank. We also have information on bank customers' loans. As the distribution of liabilities is highly right-skewed, we use dummy variables for different liability-classes in our subsequent estimations. In order to do so we create categorical variables, indicating liabilities of zero ($Liab_{zero}$), one to 10,000 ($Liab_{10,000}$), 10,001 to 100,000 ($Liab_{100,000}$) and more ($Liab_{high}$). We thereby account for the high number of zero liabilities and differences between comparatively small consumer and comparatively high housing loans.

17. While a small number of customers might in fact be older than 100 years, these observations most likely refer to deceased customers, which have not yet been deleted from the banks' databases.

18. All financial variables are expressed in Euro of year 2006.

19. The data was provided by each bank separately. For some banks, even more detailed data on customer accounts was available. However, we had to use the data on the aggregation level which was available for all sample banks. In particular, no consistent information on maturities was available.

20. We follow the classification of Eurostat (2007) when classifying areas of residence.

Table 3. Description of variables

Variable	Description
Socio-Demographics	
$Male$	Sex of customer is male, dummy
$Transfer$	Receives social transfer, dummy
Age	Age of customer at reference date, coded as dummies
$Area_{urban}$	Residence in predominantly urban living area, dummy
$Area_{mixed}$	Residence in intermediate living area, dummy
$Area_{rural}$	Residence in rural living area, dummy
$East$	Residence in East Germany (NUTS-3), dummy
Income, Liabilities and Wealth	
$Income$	Regular income (2006)
GFW	Gross financial wealth (2006)
$Liab_{zero}$	No liabilities, dummy
$Liab_{10,000}$	Less than 10,000 liabilities, dummy
$Liab_{100,000}$	in between 10,000 and 100,000 liabilities, dummy
$Liab_{high}$	More than 100,000 liabilities, dummy
Assets	
$Risky$	Sum of all risky assets (2006)
$Risky_{ext}$	Stocks, bonds and externally managed mutual funds (2006)
$Risky_{int}$	Mutual funds issued and managed by savings bank (2006)

Finally, the third block of variables delivers some information on risky assets, individuals hold in their portfolios. In general, investors which are willing to hold risky assets can either decide to follow a passive or an active investment strategy. A comparatively passive investment strategy consists of buying mutual funds. The strategy to buy mutual funds is often driven by the motive to profit from the (at least in the long-run) above-average stock- and bond returns by investing in a highly diversified portfolio. Instead of making own investment decisions, the detailed investment strategy is made by the mutual fund manager.[21] As a consequence, the option to buy mutual funds is attractive even for investors with low degrees of capital market experience, no specific informational advantages and investors with low degrees of confidence in their own abilities to judge on good investments. An active investment strategy consists of buying and selling securities based on own judgments of their expected yield. One might expect that following such a strategy requires a significant deal of financial literacy, experience, information and especially self-reliance.

To some extent, our data allows us distinguishing between the two described investment strategies. First, for every bank customer we have the amount of wealth held in mutual funds, issued and managed by DEKA Bank ($Risky_{int}$), an institution owned by German savings banks themselves. While bank customers holding this type of asset clearly make an active decision to invest in somewhat risky assets, they nevertheless remain comparatively passive in their investment decision by delegating the choice of their portfolio to the fund manager. As the fund manager is belonging to the savings bank company, one might expect that the level of trust in the fund exceeds the one in externally managed funds. Second, we have information on the amount of risky assets ($Risky_{ext}$) a bank customer holds in the form of stocks, bonds and derivatives. The amount held in the form of these ”risky external assets” is a proxy for customers’ willingness to adopt an active

21. Often mutual funds aim at reproducing stock market indices and thus deliver the average market yield.

investment strategy. The variable $Risky_{ext}$ also contains externally managed mutual funds.[22] For those banks where the information is available,[23] these account for roughly 20% of the external risky assets. Thus, $Risky_{ext}$ is still a valid proxy for bank customers' willingness to take an active role in portfolio investment decisions.

3.2 Descriptive statistics

Table 4 displays some descriptive statistics on the employed dataset.[24] Column 3 reports population-weighted values for Germany, columns 4 and 5 report values for West and East Germany.

The majority of savings bank customers is female (53%). While about 45% of the savings bank customers living in East Germany are male, the share of male customers is slightly higher in West Germany (48%). Only 2% of West German savings bank customers receive social transfers while this holds true for 11% in East Germany. This comparatively large difference is primarily (although not completely) due to the differences in unemployment rates in the two parts of Germany. On average, West German savings bank customers are roughly three years younger than their East German counterparts.[25] There are comparatively large differences in terms of urbanity of living areas of East and West German savings bank customers. While 71% of the West German customers live in predominantly urban districts, this holds true for only 17% of their East German counterparts. While the least of all East and West German customers live in predominantly rural areas, most East German customers reside in districts of intermediate urbanity (83%). In the subsequent empirical analysis we control explicitly for these differences.

Average income is roughly the same in East and West Germany (for those customers, earning a regular income). However, West Germans hold more often debt with their savings bank than their East German counterparts. This holds true especially for loans in between 10,000 and 100,000 . Gross financial wealth turns out to be higher in West Germany (17,583 as compared to 13,370 in East Germany).

For total risky assets we find little difference in participation rates between East (20%) and West German bank customers (19%). However, whenever West Germans hold risky assets at all, the amount they invest in this asset (30,659) is more than twice as large as East Germans' risky investments (13,560). When studying the composition of risky asset holdings we find additional differences between East and West German bank customers. East Germans have a much higher participation rate in internal risky assets than their West German counterparts (14% versus 11%). Conditional on holding risky internal assets at all, West Germans hold slightly higher amounts of this asset type. For risky external assets we find higher participation rates among West Germans (11% versus 8%). Moreover, conditional on holding risky external assets at all, West Germans hold much higher amounts of risky external assets (41,588 as compared to 14,764 among East Germans).

Figure 1 delivers plots of the empirical cumulative distribution functions of total, internal and external risky assets, conditional on participation in the respective asset class. We show all percentiles from 1 to 99. The gray (black) curve and vertical line represent the East (West) German cumulative distribution function and the sample mean, respectively. The vertical lines resemble the conditional means reported in Table 4. Up to the 40-percent-quantile we find little differences between East and West Germans for total risky assets. However, for higher quantiles West Germans hold systematically more risky assets. Moreover, the difference tends to increase in the quantiles

22. We should expect that bank customers buying externally managed mutual funds in general exhibit higher levels of trust in financial market participants (here: fund managers) as these managers do not belong to the savings bank company.

23. The exact share is available for only two banks in our sample. As a consequence there is no way of disentangling externally managed mutual funds from stocks, bonds and derivatives in a systematic way.

24. Additional descriptive statistics on the distribution of financial variables over East/West Germany, age and banks are provided in Appendix C.

25. Note that we excluded customers in the age of less than 18 from the sample, thereby increasing average customer age in the dataset.

Table 4. Descriptive statistics

		Germany	West	East
Socio-demographics				
$Male$	%	0.47	0.48	0.45
$Transfer$	%	0.04	0.02	0.11
Age	in years	49.95	49.39	52.16
$Area_{urban}$	%	0.60	0.71	0.17
$Area_{mixed}$	%	0.38	0.27	0.83
$Area_{rural}$	%	0.01	0.01	0.00
Income (> 0), wealth (> 0) and liabilities				
$Income$	in	1,163	1,167	1,145
$Liab_{10,000}$	%	0.06	0.06	0.04
$Liab_{100,000}$	%	0.07	0.09	0.03
$Liab_{high}$	%	0.02	0.02	0.00
GFW	in	16,731	17,583	13,370
Asset participation rate				
$Risky$(>0)	%	0.19	0.19	0.20
$Risky_{int}$(>0)	%	0.12	0.11	0.14
$Risky_{ext}$(>0)	%	0.10	0.11	0.08
Assets (cond. on participation)				
$Risky$	in	27,200	30,659	13,560
$Risky_{int}$	in	11,363	11,740	9,873
$Risky_{ext}$	in	36,163	41,588	14,764
Observations		1,774,457	357,252	1,417,205

Financial variables reported in of year 2006.

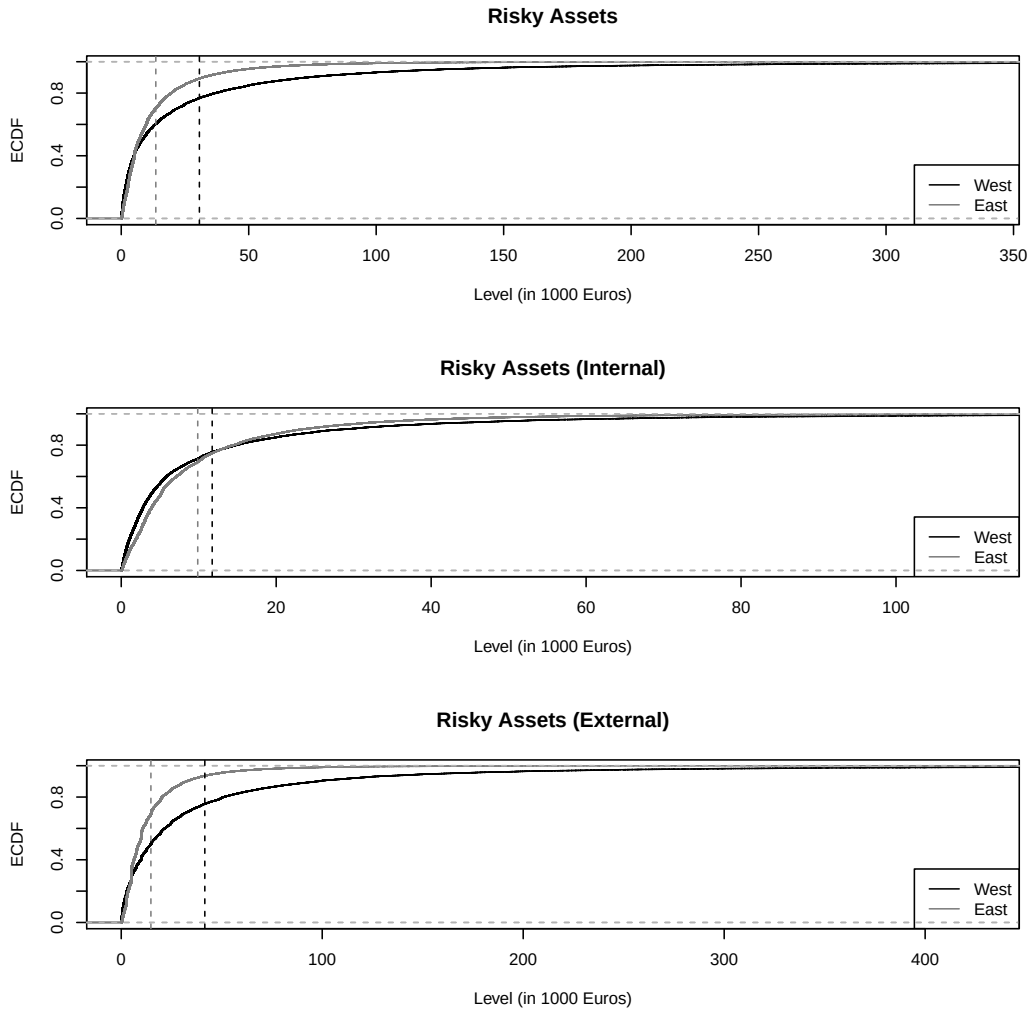

Figure 1. Empirical cumulative distribution (conditional on ownership)

of the distribution. As the figure also reveals, the effect for total risky assets is primarily due to differences in external risky asset holdings.

Our preliminary descriptive analysis allows us drawing several conclusions. First, the stockholding puzzle seems not to be an artifact of survey research. Even when using German real world bank customer data, only a comparatively small fraction of all bank customers holds risky assets. Second, while the percentage of bank customers holding some sort of risky asset in his or her portfolio is similar in East and West Germany, the composition of risky assets seems to differ. Savings bank customers living in West Germany more often hold external mutual funds, stocks and bonds. They also tend to hold much more wealth in these assets. However, the samples of bank customers living in East and West Germany strongly differ in some of their properties. Customers living in the western part of Germany exhibit higher gross wealth than their East German counterparts, and, on average, they are younger and less likely to receive social transfers or to live in rural districts. Thus, a purely descriptive analysis is incapable of answering the question whether the observed differences in investment behavior are driven by different sample characteristics or in fact by differing preferences. In order to answer this question we proceed with a more advanced empirical analysis in the following subsections.

4 The decision to hold risky assets at the extensive margin

4.1 Estimation approach

In our empirical analysis we start out with studying the decision to hold risky assets at the extensive margin. In order to do so we construct a dummy variable for the participation in the risky asset market:

$$P(Risky)_i = \left\{ \begin{array}{lcl} 1 & : & Risky > 0 \\ 0 & : & else \end{array} \right\} \tag{1}$$

Following the same procedure we construct participation dummies for risky internal and risky external assets.

We then regress the three constructed dummy variables on a number of control variables within a logit estimation approach and estimate the model with the maximum likelihood technique. The choice of our control variables follows the earlier summarized literature and data availability. First, we control for the socio-demographic characteristics gender ($Male$), employment/social status ($Transfer$), age (age dummies)[26] and the characteristics of the living area ($Area_{mixed}$, $Area_{rural}$, reference group: $Area_{urban}$). We also control for income ($Income$) and gross financial wealth (GFW).[27] As usual in the literature, both variables enter the regression equation in logarithms.[28] Finally we control for liabilities ($Liab_{10,000}$, $Liab_{100,000}$, $Liab_{high}$, reference group: $Liab_{zero}$).[29]

As discussed in the introduction, at least the elderly East Germans have lived under completely different institutions than the West Germans for almost 40 years. It is thus interesting to study whether the differences in institutions have left their traces in bank customers' portfolio behavior. In order to study this question we add a dummy variable for East Germans ($East$) to our regressions. Somewhat problematic, we have no information on the place of birth of bank customers and we also do not know in which of part of Germany the customers have been living throughout the period of German division. As comparable studies such as the one by Fuchs-Schündeln and Masella 2015 we thus cannot rule out that a significant share of bank customers living nowadays in East Germany is originally from West Germany and has moved to East Germany (and the other way round). Moreover, the younger bank customers have lived under the same institutional circumstances in reunified Germany. While it is well possible that their portfolio behavior is shaped or at least influenced by the experiences of their families and friends, which they collected in the earlier existing systems, one might nevertheless expect that the own experiences made under the institutions in reunified Germany nowadays play the predominant role. Thus, even when the formerly differing institutions in the two parts of Germany had an influence on portfolio behavior it might be hard to disentangle them in our data. However, when we in fact find differences in between bank customers living in East and West Germany this might be interpreted as a very strong indication for the existence, strength and persistence of these effects.

4.2 Estimation results

The estimation results are summarized in Table 5. The results for any sort of risky asset are reported in column (1), those for risky internal assets are shown in column (2) and the findings for risky

26. The large number of available observations allows us employing the earlier mentioned dummy approach. As discussed earlier, in order to disentangle age and cohort effects, we implicitly assume cohort equality, see Ameriks and Zeldes 2004 and Campbell 2006.

27. As the left hand variable refers to one asset class included in gross financial wealth, we correct gross financial wealth in each regression for the asset class the left hand variable belongs to. Thus, GFW differs in between estimations for different asset classes.

28. In particular, in order to account for zero income or wealth, we conduct a sinus hyperbolicus transformation. Following this procedure is common in the literature (see e.g. Christelis, Georgarakos and Haliassos 2013).

29. In order to control for unobserved bank heterogeneity one could consider to include bank fixed effects. However, as each bank is located either in East or West Germany, the resulting identification of the East coefficient would rely on "moving" customers whose bank and residence are in West (East) and East (West) Germany, respectively. We therefore refrain from including bank fixed effects.

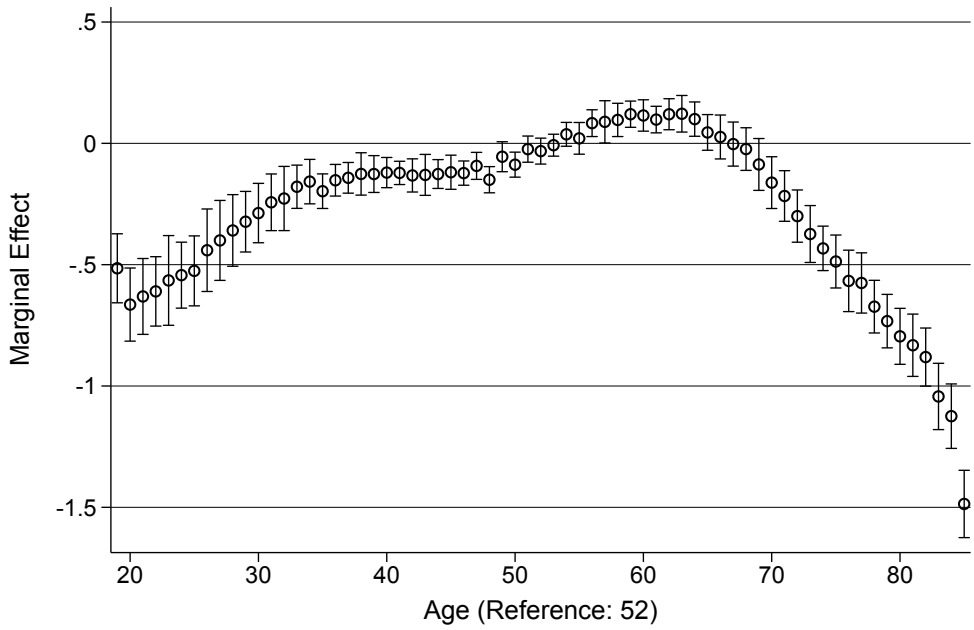

Figure 2. Marginal age effects for total risky assets (logit estimation, 90% confidence band)

external assets in column (3). In order to get an impression of the strength of the effects we report marginal effects for an individual with mean/median characteristics. We also report regionally clustered standard errors and significance levels.

Altogether, our estimations deliver plausible coefficients for the control variables. We find male bank customers in general to exhibit a significantly higher probability to hold risky assets than their female counterparts. Customers receiving social transfers have a significantly lower likelihood to hold risky assets. The marginal effect of age on the decision to hold risky assets (relative to a bank customer in the age of 52 years) is shown in Figure 2. The effect of age follows an inversely u-shaped pattern. We refrain from reporting the marginal age effects for every estimation shown in Table 5.[30] However, the pattern is very similar for all estimations and fits well to the age patterns described and modeled in Fagereng, Gottlieb, and Guiso 2017. Customers living in mixed or in rural districts in general turn out to have a slightly higher probability of holding risky internal assets, while the opposite holds true for risky external assets. Income is positively related to total risky asset participation. However, the log-linear relationship is only found to be significant for internal risky assets. The likelihood to hold risky assets is higher whenever bank customers also hold sizable liabilities with their bank. As expected, we find gross financial wealth to increase the likelihood to hold any type of risky assets.

When comparing our estimation results for the set of employed control variables to those found in the previous empirical literature, either based on administrative (Calvet, Campbell, and Sodini 2007) or survey data (e.g. Guiso, Sapienza, and Zingales 2008), our results turn out to be qualitatively similar. Nagelkerke's Pseudo R-Square measure indicates a satisfactory explanatory power of the described logit estimations. Interestingly enough, the regressions explaining participation in the market for risky external assets turns turn out to have much more explanatory power than those for risky internal assets.

For total risky assets, the coefficient of the East dummy turns out to be positive but statistically insignificant. Thus, East and West German bank customers do not differ systematically in their

30. The figure shows the marginal effects for model (1) reported in Table 5.

Table 5. Determinants of risky asset market participation (logit regressions)

	(1) $Risky$ Coef./(SE)/[dydx]	(2) $Risky_{int}$ Coef./(SE)/[dydx]	(3) $Risky_{ext}$ Coef./(SE)/[dydx]
$Male$	0.121***	0.094***	0.175***
	(0.012)	(0.010)	(0.026)
	[0.017]	[0.010]	[0.008]
$Transfer$	-0.875***	-0.831***	-0.647***
	(0.076)	(0.082)	(0.066)
	[-0.096]	[-0.067]	[-0.025]
$Age\ dummies$	yes	yes	yes
$Area_{mixed}$	0.067	0.235***	-0.269*
	(0.055)	(0.071)	(0.160)
	[0.009]	[0.024]	[-0.014]
$Area_{rural}$	0.042	0.240***	-0.328***
	(0.055)	(0.071)	(0.110)
	[0.006]	[0.024]	[-0.016]
$log\ Income$	0.063***	0.077***	0.007
	(0.013)	(0.012)	(0.016)
	[0.009]	[0.008]	[0.000]
$Liab_{10,000}$	-0.040*	0.114***	-0.281***
	(0.023)	(0.031)	(0.028)
	[-0.005]	[0.012]	[-0.012]
$Liab_{100,000}$	0.379***	0.415***	0.237***
	(0.038)	(0.033)	(0.047)
	[0.059]	[0.050]	[0.013]
$Liab_{high}$	0.550***	0.277***	0.597***
	(0.067)	(0.062)	(0.046)
	[0.091]	[0.032]	[0.037]
$log\ GFW$	0.284***	0.260***	0.525***
	(0.018)	(0.015)	(0.016)
	[0.040]	[0.027]	[0.025]
$East$	0.017	0.232***	-0.229*
	(0.041)	(0.063)	(0.139)
	[0.002]	[0.023]	[-0.012]
N	1,774,457	1,774,457	1,774,457
AIC	1,619,938	1,335,984	909,222
$Pseudo\ R^2$	0.073	0.061	0.142

We report marginal effects at the mean. Standard errors (clustered on the NUTS III level) in parentheses. Age dummies included, but not reported.

Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

decision to hold any sort of risky asset, a finding which is in line with the results reported in Fuchs-Schündeln and Haliassos 2015. However, our disaggregated analysis detects systematic and economically meaningful differences between East and West German bank customers with respect to their willingness to hold risky internal and risky external assets. While East German bank customers are more likely holding risky internal assets (+2.3 percentage points), they less likely hold risky external assets (-1.2 percentage points). In the light of the fact that both types of assets are only held by roughly ten percent of all savings bank customers, these effects are not only statistically but also economically significant.

4.3 Robustness checks

In order to study the stability of our estimation results we run a battery of robustness checks. To ease the comparison with our baseline results we report them in the first line of Table 6.

One might argue that incomplete information on bank customers' wealth could drive our results. Especially the omission of real estate wealth might be problematic. East and West German bank customers might differ in the likelihood to own real estate, and, even more severe, real estate prices might differ systematically. In order to get an impression whether our results are affected by this problem we construct an indicator of regional real estate wealth $Wealth_{RE}$ by multiplying regional home ownership rates and regional real estate prices and add this indicator to our estimation equations.[31] The referring estimation results are shown in the second line of Table 6. In fact, the inclusion of the real estate wealth variable turns out to have some effect on the estimation results. For total risky assets, the estimated coefficient for the East dummy increases, but remains to be insignificant. For risky internal and external assets the coefficients increase in (absolute) size, however remains significant only for risky internal assets. Thus, the inclusion of a control variable for regional real estate wealth delivers at least similar qualitative results.

As explained earlier, we have no information where the bank customers in our dataset lived before German Reunification. Lacking this information, we assumed that the current living place was also the living place before German Reunification. Obviously this assumption does not hold true for all bank customers in our sample as after German Reunification migration between East and West Germany took place. Thus, our dataset of East German bank customers likely also includes some individuals from West Germany and the other way round. One might suspect that as a consequence existing differences between East and West Germans are harder to identify in our somewhat mixed up dataset. When we follow this line of argument, the true differences between East and West Germans might be even larger. However, we might also suspect that especially individuals with low levels of risk aversion decided to migrate. Again, this would be unproblematic when the share of the population which migrated in both directions would have been similar. However, in the first years after German Reunification much more East Germans moved to West Germany than the other way round. Thus, our results might be driven by the fact that as a consequence of East-West migration the share of bank customers with low levels of risk aversion has increased in West Germany.

The data shown in Table 7 indicates that this is unlikely to be the case. Normally, bank customers have their bank account with a savings bank which is close to the bank customer's living place. Bank customers living in West Germany but holding a bank account with an East German savings bank likely moved at some time in the past from East to West Germany (see column (3) in Table 7). Comparing the portfolios of these bank customers with those of East German bank customers which also live in East Germany (column (2) in Table 7) helps us judging whether our results are in fact likely driven by those bank customers which moved from East to West Germany. We find that movers less likely hold risky internal and risky external assets. And even conditional on holding

31. Regional home ownership rates were taken from the 2011 Mikrozensus, regional house prices were provided by the Bulwiengesa Company on request.

Table 6. Robustness checks for extensive decision to hold risky assets, estimates of East coefficient (logit)

	$Risky$	$Risky_{int}$	$Risky_{ext}$
	Coef./SE/[dydx]	Coef./SE/[dydx]	Coef./SE/[dydx]
Benchmark	0.02	0.23***	-0.23*
	(0.04)	(0.06)	(0.14)
	[0.00]	[0.02]	[-0.01]
Inclusion of housing wealth	0.14	0.53***	-0.30
	(0.10)	(0.12)	(0.21)
	[0.19]	[0.05]	[-0.02]
Living close to bank	0.02	0.24***	-0.22
	(0.05)	(0.07)	(0.15)
	[0.00]	[0.02]	[-0.01]
Only low East migration regions	0.02	0.30***	-0.33***
	(0.04)	(0.04)	(0.09)
	[0.00]	[0.03]	[-0.02]
Only assets>50	0.03	0.25***	-0.22
	(0.04)	(0.06)	(0.14)
	[0.00]	[0.02]	[-0.01]
Only assets>100	0.04	0.26***	-0.21
	(0.04)	(0.06)	(0.14)
	[0.01]	[0.02]	[-0.01]
Only age≤80	0.03	0.22***	-0.20
	(0.04)	(0.06)	(0.14)
	[0.00]	[0.02]	[-0.01]
Only income>0	0.03	0.25***	-0.22
	(0.05)	(0.05)	(0.14)
	[0.00]	[0.03]	[-0.01]
Only income>1000	-0.01	0.22***	-0.25
	(0.08)	(0.04)	(0.18)
	[-0.00]	[0.03]	[-0.02]

Line one reports the estimation results for the East dummy in the benchmark specification, line two those under inclusion of a housing wealth variable, line three those for bank customers living in the region of their savings bank, line four those under exclusion of West German regions with the highest 75 percent of East migration, line five and six those under correction for holders of very low assets, line seven for those in the age of less than 81 years and line eight and nine those under the exclusion of bank customers receiving either no or less than 1000 monthly income. Standard errors (clustered on the NUTS III level) are reported in parentheses. Marginal effects are reported in brackets and relative to the benchmark individual. Full set of control variables included. Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

risky assets at all, the amount held in either risky internal or risky external assets is at least similar. In the light of these findings it is at least unlikely that our results are in fact primarily driven by East-West migration. To further substantiate this judgment we repeat our baseline regression for a subsample only consisting of individuals living in the retail district of their savings bank. While doing so surely does not eliminate all movers from our sample data, at least a significant share of them is removed by this procedure. The estimation results, which are reported in the third line of Table 6, deliver similar results as our baseline regressions. However, the negative coefficient for risky external assets becomes slightly insignificant.

An additional possibility to study whether our results are likely driven by East Germans that

Table 7. Asset market participation of East German bank customers living in East and West Germany

	(1)	(2)	(3)
Bank location	East	East	East
Living place	East or West	East	West
	Mean	Mean	Mean
$Risky$	0.20	0.20	0.16
$Risky_{int}$	0.14	0.14	0.13
$Risky_{ext}$	0.08	0.08	0.05
$Risky$(>0)	13,560	13,552	12,176
$Risky_{int}(>0)$	9,873	9,873	7,866
$Risky_{ext}(>0)$	14,764	14,749	18,912
N	1,417,205	1,416,869	15,099

moved to West Germany is to analyze where in West Germany the East Germans typically moved and how strongly our sample regions were affected. In order to study this issue we used data on East-West migration over the period of 1991 to 2006, provided by Bundesamt für Bauwesen und Raumordnung Bonn on request. For each West German NUTS III region we calculated the absolute number of migrants from East Germany and related this number to the total population in the year 2006. The results are displayed in Figure 3. The share of East migrants varies to quite some extent in between 1.2 percent (Bottrop) and 22.0 percent (Lüchow-Dannenberg). The three savings banks in West Germany all have their central retail districts in regions with far below average migrants from East Germany. One of the savings banks is even located in one of the 10 regions with the lowest share of migrants from East Germany. Altogether, roughly 85 percent of our sample lives in NUTS III regions with the lowest 25 percent of East migrants. In the light of these results it is again very unlikely that our results are driven by East Germans which moved to the West. However, as all savings banks also have a number of customers living outside of their central retail districts we repeated our estimations for a subsample which excludes all West German NUTS III regions with the 75 percent highest shares of migrants from East Germany. The estimation results are shown in the fourth line of Table 6. Interestingly enough, the results for this subsample deliver qualitatively the same results as in the benchmark case. However, the effects for risky internal and risky external effects are even more pronounced and now both highly significant. In the light of this finding we conclude that our estimation results are not an artifact of highly risk-loving East Germans that moved to the West.

Moreover, we run a number of additional robustness tests. In order to control for the influence of incidental asset holding we reclassify holders of assets less than 50 (100) as non-asset holders. The referring estimation results are shown in lines five and six of Table 6. We also study the effect of excluding individuals in the age of more than 80 years as it is not completely clear whether these individuals still decide themselves on their financial transactions (line seven). Finally, we repeat the estimations for subsamples with a regular income on their giro account (line eight) and an income of at least 1000 (line nine). By doing so we most likely exclude individuals which do not have their income account at the referring savings bank and thus likely hold a significant part of their wealth with another bank.

In all these additional robustness checks the results are qualitatively similar to the baseline estimation. We never find a significant difference between East and West Germans for total risky assets. However, East Germans hold always significantly more likely risky internal assets. While the

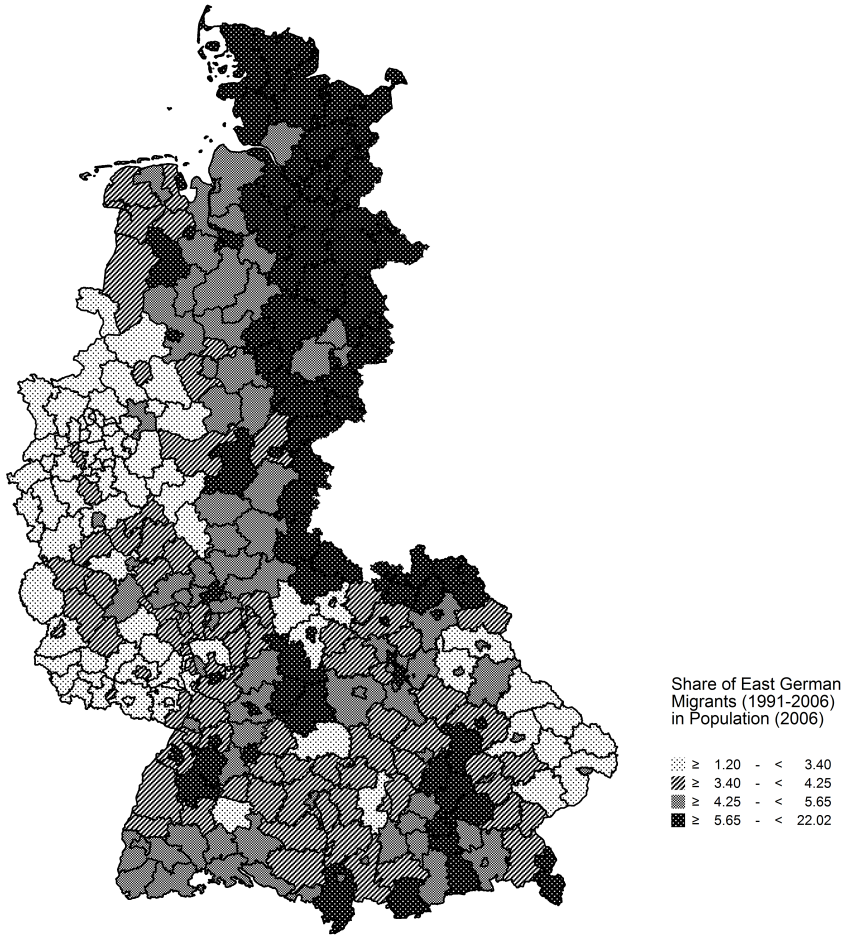

Figure 3. Share of East-German migrants 1991 to 2006 in total population 2006

estimated coefficients for risky external assets are always negative, they turn out to be insignificant.

Finally, we checked the robustness of the results under sequential inclusion of the control variables. The results, which are shown in the Appendix in the upper part of Figure 1, show that the estimation results for the East dummy remain qualitatively unaffected by the included controls.

5 The decision to hold risky assets at the intensive margin

5.1 Estimation strategy

Most of the existing literature on the intensive demand for risky assets focuses on the share of risky assets in total assets (e.g. Guiso, Jappelli, and Terlizzese 1996, Heaton and Lucas 2000, Guiso, Sapienza, and Zingales 2004, Ameriks and Zeldes 2004, Cocco 2005, Cocco, Gomes, and Maenhout 2005, Calvet and Sodini 2014). However, if the available data does not allow to draw a complete picture of individual wealth (as it is often true for bank account data) it is more reasonable to use the level of risky assets as explanatory variable. A prominent example for this approach is Perraudin and Sørensen 2000. As outlined earlier, our bank dataset likely draws an incomplete picture on individual wealth. We therefore follow the latter described strategy and start out with studying the level of risky asset holdings rather than asset shares.[32]

32. However, within the robustness checks subsection we also show the results for an analysis of asset shares, which delivers qualitatively similar results.

As a consequence of the earlier described stockholding puzzle, a large share of bank customers in our dataset does not hold any risky asset at all. Thus, we deal with a heavily censored dataset. Moreover, one might expect that the effect of the control variables on risky asset demand is non-linear. To tackle these problems adequately, Miniaci and Weber 2002 have proposed to use censored quantile regressions to estimate determinants of risky asset demand.[33] In the subsequent empirical analysis, we start out with estimating conditional linear regression models. In order to account for possible non-linearities we then proceed with censored quantile regressions. As it is common in the related literature, we make use of the same set of control variables as in the analysis of the extensive decision to hold risky assets.

5.2 Conditional ordinary least squares estimations

In a first step of our analysis, we estimate conditional OLS regressions to explain risky asset holdings. In order to do so, we drop all bank customers from the dataset, not holding the risky asset under consideration at all. The estimation results are shown in Table 8. The first column shows the results for any type of risky asset. The second column contains the results for risky internal assets, the third for risky external assets.

Many of the employed control variables turn out to be insignificant in the estimation aiming at explaining total risky asset holdings. An inspection of columns (2) and (3) indicates that this finding is likely the consequence of the fact that the determinants of risky internal and external asset holdings differ to quite some extent.[34] For only three control variables we find the same systematic influence on holdings of risky internal and external assets. More wealthy individuals tend to hold more risky internal and external assets. Highly indebted bank customers, i.e. bank customers with debt of more than 100,000 , also tend to hold more risky assets. This finding sounds peculiar at first sight. However, quite likely the highly indebted bank customers use the credit to finance real estate, a sort of wealth we do not have more precise information on. For debtors in the range of in between 1 and 100,000 , we find the opposite effect. These bank customers tend to hold less risky internal and external assets.

For our variable of central interest, the East dummy, we find a negative coefficient in all three regressions. However, the estimated coefficient is comparatively small and turns out to be insignificant for internal risky assets. We find a huge and highly significant effect for risky external assets. On average, a West German bank customer holding risky external assets at all, holds roughly 26,000 more of this asset type than his or her East German counterpart.

5.3 Censored quantile regressions

Parametric models as e.g. ordinary least square estimations capture the effect on the conditional mean of a dependent variable. However, this comes at the price of failing to capture the effects in different parts of the conditional distribution. Intuitively, it seems plausible that individuals with a high level of asset demand might react differently to changes in the control variables than individuals holding less of the referring asset. An adequate solution to estimate the effect on the entire distribution and to deal with possible heterogeneity and outliers is to employ quantile regressions.

The pioneering work of Koenker and Bassett 1978 incorporates a linear model into the minimization of the sum of absolute deviations. The latter can be used to calculate sample quantiles

$$Q_\tau(y_i|x_i) = x_i'\beta_\tau + e_i \tag{2}$$

33. For applications of this method in the household finance context see Hochguertel 2003 and Guiso, Jappelli, and Terlizzese 1996.

34. Note that the explanatory power (in terms of adj. R squared) of the regression explaining total risky asset holdings is somewhat lower than the one of the two regressions explaining risky internal or risky external asset holdings.

Table 8. Determinants of risky asset holdings (conditional OLS)

	(1) $Risky$	(2) $Risky_{int}$	(3) $Risky_{ext}$
$Constant$	4,211.00	-2,535.53	-8,191.03
	(8,106.72)	(2,047.83)	(18,236.45)
$Male$	500.84	664.69***	-531.60
	(485.53)	(167.62)	(761.29)
$Transfer$	-316.18	-594.27*	234.90
	(1,111.59)	(331.05)	(1,249.62)
$Age\ dummies$	yes	yes	yes
$Area_{mixed}$	-2,586.08***	-331.02	-2,220.10***
	(489.50)	(1,635.61)	(614.35)
$Area_{rural}$	-689.60	1,808.69	4,787.05
	(2,378.70)	(1,617.71)	(4,579.51)
$log\ Income$	-37.97	-133.45**	-336.73
	(291.09)	(57.39)	(538.80)
$Liab_{10,000}$	-5,087.47***	-2,688.20***	-6,231.25***
	(1,081.30)	(274.56)	(2,295.22)
$Liab_{100,000}$	-3,871.85**	-1,984.12***	-4,792.94**
	(1,524.82)	(412.57)	(1,991.09)
$Liab_{high}$	23,580.10***	3,751.28***	33,794.93***
	(4,492.77)	(987.74)	(5,209.21)
$log\ GFW$	2,824.93***	1,685.59***	4,941.20***
	(581.13)	(104.23)	(1,388.94)
$East$	-16,010.84***	-2,213.14	-25,938.45***
	(617.88)	(2,046.11)	(762.40)
N	344,837	244,238	156,743
AIC	8,299,402	5,447,252	3,853,201
adj. R^2	0.072	0.082	0.081

Standard errors (clustered on the NUTS III level) in parentheses.

Age dummies included, but not reported. Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

with $i = 1, ..., n$ and $\tau = (0, 100)$. The parameter vector β is estimated separately for each conditional quantile. The minimization procedure concerns the piecewise linear absolute value function

$$\min_{\beta} \frac{1}{N} \left\{ \Sigma_{y_i \geq x_i' \beta_\tau} \tau \left| y_i - x_i' \beta_\tau \right| + \Sigma_{y_i < x_i' \beta_\tau} (1 - \tau) \left| y_i - x_i' \beta_\tau \right| \right\} \tag{3}$$

which can be solved via linear programming (Koenker and Hallock 2001) [35] The technique does not assume any specific error distribution. Furthermore, conditional quantiles are less prone to be affected by outliers.

As a consequence of the stockholding puzzle, our data on risky asset demand is heavily censored at zero. Powell (1984, 1986) proposes a robust way of dealing with censoring in the quantile regression context. He extends the standard quantile regression approach to the non-negative dependent variable case. The approach is again independent of the concrete error distribution. In order to obtain a unique solution, some weaker requirements have to be fulfilled. The regressors have to be non-collinear. Moreover, the conditional regression quantiles to be estimated have to contain a fraction of non-censored observations with sufficient informative variation. As Powell 1984 points out, large samples and at least the upper quantiles should meet these criteria.[36] The case of left-censored data is given by

$$Q_\tau(y_i|x_i) = \max \left\{ x_i' \beta_\tau + e_i, 0 \right\}$$

The maximum takes either the censored value of zero or a non-censored value.

The application of the described method includes the highly complex computation of non-differentiable and non-convex distance functions (Fitzenberger and Winkler 2007). In this context multiple local optima can occur. As Fitzenberger 1997 points out, most algorithms perform quite poorly for high degrees of censoring in the context of this approach. As a consequence, we use a different approach of dealing with our high degree of censoring in this rich data environment. More precisely, we employ the three-step censored quantile regression approach proposed by Chernozhukov and Hong 2002. It is computationally less complex as the necessary steps include a parametric regression and the minimization problems to be solved are convex.

In a first step the censoring probability is estimated parametrically. As we have estimated this probability already in the first step of our analysis we can recur to the referring results (see Section 4). Only observations with a sufficiently small censoring probability are kept in the subsample (J_0). The uncensored subsample J_0 is then used in the second step to run a standard quantile regression. The consistent estimates are used to predict the model with the initial complete sample. We then build a new subsample J_1 containing only predictions exceeding the censoring point. We therefore (asymptotically) select only observations which - conditional on the referring independent variables - deliver predictions above the censoring threshold. In the third step this subsample is used for an additional standard quantile regression. The now larger set of information increases the efficiency of the estimation.

The presented estimator by Chernozhukov and Hong 2002 is distributionally equivalent to the Powell 1986 approach. This means that the developed inference procedures hold for this method. It should be noted that the underlying probability model makes the model more restrictive, even though the model is allowed to be misspecified. Moreover, it keeps the main features of censored quantile regressions. The presented method has been successfully applied to different issues. Chernozhukov and Hong 2002 analyze the determinants of extramarital affairs, whereas Fack and Landais 2010 used it to study the impact of tax incentives on charitable giving. To the best of our

35. For an overview on quantile regression algorithms and computational efficiency, see Fitzenberger 1997.

36. Powell (1984, 1986) also shows under which circumstances the estimator is consistent and asymptotically normal. The presented method holds for fixed censoring, which is the case in our left-censored context.

knowledge, it has not been applied to the analysis of household asset demand yet.

In the following we apply the described three-step procedure to our cross-section of risky asset holdings. In the first step, we preserve the (unlikely) censored observations via our previously used logit specification.[37] The remaining steps follow the described process by Chernozhukov and Hong 2002. Throughout the procedure we use the same set of control variables, but decrease the dimension by replacing age and loan dummies with a second order age polynomial and log sine loans.[38] Due to heavy censoring we concentrate, whenever possible, our analysis on the quantiles in between 75% and 99%. Lower quantiles would induce singularity issues due to a degenerated design matrix.[39]

Due to the non-parametric nature of the applied estimation technique we report the estimation results in diagrams. On the vertical axis of the diagrams we report the estimated effect for the conditional quantile, the horizontal axis reports the referring conditional quantile. The dark solid curve is the distinct censored quantile regression estimate. The dashed lines report 95% confidence intervals which are based on asymptotic normality.

All employed control variables exhibit non-linearities. Thus, the employed estimation approach seems to be justified and turns out to be superior to simple OLS estimation. Due to space restrictions, we refrain from reporting the results for all control variables here,[40] but concentrate on the results for the East dummy in Figure 4.

In the upper part of the figure we show the results for the regression explaining total risky asset holdings. The middle (lower) part of the figure reports the corresponding results for risky internal (external) assets. As depicted in the upper part of Figure 4 we find that, ceteris paribus, savings bank customers living in East Germany hold a systematically lower amount of risky assets. The effect is significantly negative for all displayed quantiles. While the effect is comparatively small for the conditional quantiles in between 75 and 90%, the effect increases strongly in the upper conditional quantiles and amounts to more than 50,000 in the highest quantile. The middle part of Figure 4 indicates that East Germans tend to hold more risky internal assets for all displayed quantiles up to 98%. However, the effect is comparatively small and amounts to slightly less than 2,000 at maximum in all conditional quantiles in between 75 and 97%. In the highest quantiles, we observe a reversal of the effect. Among the bank customers with the highest conditional risky internal asset holdings, West Germans tend to hold roughly 2,000 more of these assets. The most pronounced difference between East and West German bank customers can be observed for risky external assets (shown in the lower part of Figure 4). Even in the lowest displayed conditional quantile of 75% West Germans already hold almost 5,000 more in risky external assets than their East German counterparts. The effect strongly increases over the conditional quantiles and amounts to more than 50,000 in the highest conditional quantile.

5.4 Robustness checks

Again, we conducted a large number of robustness checks to analyze the stability of the previously presented results.

In a first step we conducted a battery of robustness checks for the conditional OLS estimations of the level of risky asset demand. We thereby repeated all robustness tests which we already conducted for our analysis of the extensive dimension of the decision to hold risky assets. The results,

37. In order to construct a conservative sample we follow Chernozhukov and Hong 2002 and aim at excluding another ten percent of the subsample J_0. A similar procedure is applied in step 2. However, here the percentage of excluded observations has to be smaller.

38. This reduces computational effort and prevalence of matrix singularity for lower quantiles.

39. Chernozhukov and Hong 2002 suggest the interior point algorithm by Portnoy and Koenker 1997. We use the algorithm provided in the "quantreg" R-package by Koenker 2015. Moreover, we bootstrap the standard errors via 200 replications of the implemented Markov Chain Marginal Bootstrap (MCMB) procedure (He and Hu 2002).

40. A complete documentation of the estimation results for the control variables can be found in B.

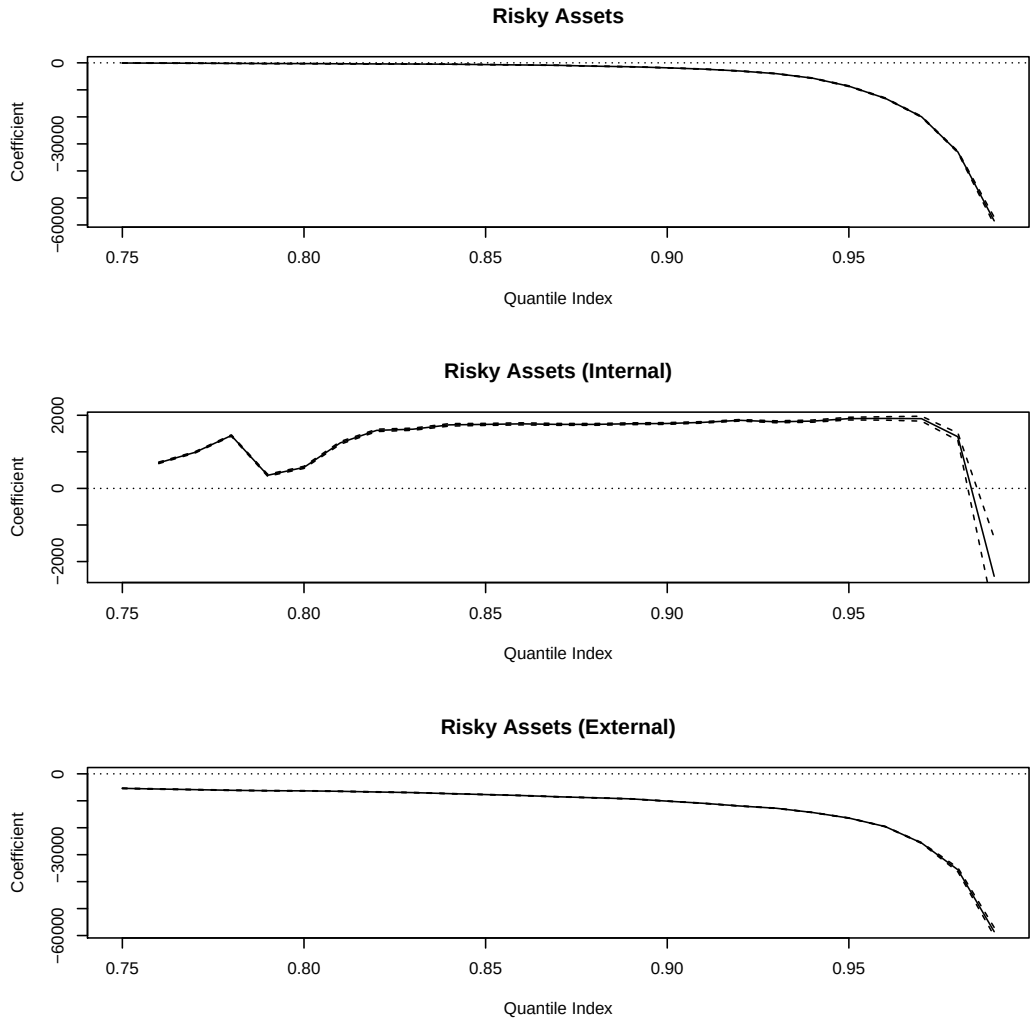

Figure 4. Effect of East dummy on risky asset holdings (censored quantile regressions, 95% confidence bands)

which are summarized in Table 9, turn out to be highly stable. As in the benchmark estimation we always find statistically negative coefficients for the East dummy for total and external risky assets, while the coefficient is always insignificant for risky internal assets (again as in the benchmark case). Moreover, the point estimators turn out to be even numerically stable.

In the second step we repeated the whole analysis for risky asset shares within a conditional OLS estimation framework. The results are reported in Table 10. For the total risky asset share we find no systematic difference between East and West Germans. However, East German savings bank customers hold a higher share of risky internal assets than their West German counterparts while the opposite holds true for the risky external asset share. East Germans also hold a significantly lower share of risky external assets in total risky assets than West German ban customers. When conducting the earlier described additional robustness checks, the results remain stable. The only exception is the case where we include all customers with a maximum of 100 in the group of individuals holding no risky assets. In this case the coefficient for the East dummy is not significantly different from zero anymore while the effect for total risky assets becomes significantly negative. The results for risky external assets remain stable even in this case.

In the third step we again checked the robustness of the results under sequential inclusion of the control variables for both the estimation of the conditional level of risky assets as well as for

Table 9. Robustness checks for intensive decision to hold risky assets, estimates of East coefficient (conditional OLS)

	$Risky$	$Risky_{int}$	$Risky_{ext}$
Benchmark	-16,010.84***	-2,213.14	-25,938.45***
	(617.88)	(2,046.11)	(762.40)
Inclusion of housing wealth	-15,337.69***	-1,673.20	-26,633.63***
	(673.64)	(2,291.34)	(1,045.77)
Living close to bank	-16,245.71***	-2,201.18	-25,954.65***
	(665.90)	(2,373.30)	(717.78)
Only low East migration regions	-16,213.08***	-305.53	-25,955.54***
	(691.97)	(1,669.64)	(648.75)
Only assets>50	-16,282.93***	-2,273.56	-26,272.20***
	(568.62)	(2,074.38)	(774.86)
Only assets>100	-16,536.41***	-2,335.10	-26,532.19***
	(556.56)	(2,105.88)	(804.78)
Only age≤80	-14,472.88***	-1,952.53	-24,069.39***
	(618.54)	(1,958.06)	(671.26)
Only income>0	-15,383.31***	-1,848.00	-24,866.73***
	(850.74)	(2,000.34)	(974.71)
Only income>1000	-14,305.27***	-1,174.16	-23,852.96***
	(1,515.69)	(1,919.43)	(2,044.33)

Line one reports the estimation results for the East dummy in the benchmark specification, line two those under inclusion of a housing wealth variable, line three those for bank customers living in the region of their savings bank, line four those under exclusion of West German regions with the highest 75 percent of East migration, line five and six those under correction for holders of very low assets, line seven for those in the age of less than 81 years and line eight and nine those under the exclusion of bank customers receiving either no or less than 1000 monthly income. Standard errors (clustered on the NUTS III level) are reported in parentheses. Marginal effects are reported in brackets and relative to the benchmark individual. Full set of control variables included. Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

conditional asset shares. The results, which are shown in the Appendix in the middle and lower part of Table 1, show that the estimation results for the East dummy again remain qualitatively unaffected by the included controls.

Finally, we studied whether the estimation results of the conditional quantile regression change when we include the real estate variable. The results, which are displayed in Figure 1 in the Appendix, turn out to be highly stable over all specifications.

6 Experience with and learning about institutions

Our previous empirical analysis revealed that 16 years after German Reunification, East and West German bank customers still exhibited systematic differences in their portfolio behavior. While the stockholding puzzle exists in both parts of Germany, in West Germany the willingness to take over risk and to manage these risks on one's own seems to be still more pronounced, a finding which is in line with the study about long-lasting impacts of macroeconomic experiences by Malmendier and Nagel 2011.

The full effect of institutional reforms will typically manifest the earlier, the more quickly the formerly acquired informal institutions fade out. The previously presented evidence indicates that even after a reform of institutions the former institutions have a comparatively long-lasting effect on portfolio behavior. However, to get an impression of the duration of the effects of the former

Table 10. Robustness checks for risky asset share, estimates of East coefficient (conditional OLS)

	$Risky/Total$ Coef./SE/[dydx]	$Risky_{int}/Total$ Coef./SE/[dydx]	$Risky_{ext}/Total$ Coef./SE/[dydx]	$External/Risky$
Benchmark	-0.02	0.04**	-0.08***	-0.07***
	(0.01)	(0.02)	(0.01)	(0.02)
Inclusion of housing wealth	0.01	0.06***	-0.07***	-0.15***
	(0.02)	(0.02)	(0.02)	(0.02)
Living close to bank	-0.02	0.04*	-0.08***	-0.07***
	(0.02)	(0.02)	(0.01)	(0.02)
Only low East migration regions	-0.02	0.05**	-0.09***	-0.08***
	(0.02)	(0.02)	(0.01)	(0.01)
Only assets>50	-0.02	0.03*	-0.09***	-0.07***
	(0.01)	(0.02)	(0.01)	(0.02)
Only assets>100	-0.03*	0.03	-0.09***	-0.07***
	(0.01)	(0.02)	(0.01)	(0.02)
Only age≤80	-0.01	0.04**	-0.08***	-0.07***
	(0.01)	(0.02)	(0.01)	(0.02)
Only income>0	-0.01	0.04**	-0.08***	-0.07***
	(0.01)	(0.02)	(0.01)	(0.01)
Only income>1000	-0.01	0.04**	-0.07***	-0.07***
	(0.01)	(0.02)	(0.01)	(0.01)

Line one reports the estimation results for the East dummy in the benchmark specification, line two those under inclusion of a housing wealth variable, line three those for bank customers living in the region of their savings bank, line four those under exclusion of West German regions with the highest 75 percent of East migration, line five and six those under correction for holders of very low assets, line seven for those in the age of less than 81 years and line eight and nine those under the exclusion of bank customers receiving either no or less than 1000 monthly income. Standard errors (clustered on the NUTS III level) are reported in parentheses. Marginal effects are reported in brackets and relative to the benchmark individual. Full set of control variables included. Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

institutions, additional empirical evidence is necessary. An obvious way of studying how quickly individuals adapt their portfolio choice behavior to new institutions is to track bank customers' behavior over time. However, due to the fact that our data consists of a cross-section only, this approach is infeasible, here. However, we can study whether the individual experiences with the former institutions have an impact on portfolio choice. As explained earlier, in their study of U.S. immigrants Osili and Paulson 2008 found country-of-origin institutions to play a role especially among those immigrants which were old enough at the time of immigration to have collected their own experiences with their home-country institutions, whereas no such effect could be detected for young immigrants.

In order to study whether institutional experience in fact has an influence on financial risk taking we can basically follow two strategies. First, and in line with Alesina and Fuchs-Schündeln 2007, we could include an interaction effect of age and the East dummy in our estimation equations. Second, we could follow the approach of Osili and Paulson 2008 to define age groups and study whether these groups differ in their behavior in East and West Germany. We apply both approaches in the following. However, as our large sample allows to estimate differences between East and West Germans for each age separately, we mostly refrain from defining arbitrary age groups.

6.1 The decision to hold risky assets at the extensive margin

Table 11 shows the estimation results for the decision to hold risky assets at the extensive margin under the inclusion of the age-East interaction effect. While we included the full set of control variables, the table reports only the results for age, the East dummy and the interaction effect as well as basic regression statistics.[41] The interaction term turns out to be insignificant for total risky assets. For risky internal assets we find a significantly positive interaction effect, indicating that

41. The complete results are available from the authors upon request.

Table 11. Participation decision in risky assets and age-East interaction (logit regressions)

	(1)	(2)	(3)
	Total risky assets	Risky internal assets	Risky external assets
	$Risky$	$Risky_{int}$	$Risky_{ext}$
Age	-0.00	-0.02***	0.01***
	(0.00)	(0.00)	(0.00)
$East$	0.19	-0.10	0.11
	(0.20)	(0.12)	(0.14)
$Age * East$	-0.00	0.01***	-0.01*
	(0.00)	(0.00)	(0.00)
N	1,774,457	1,774,457	1,774,457
AIC	1,648,379	1,353,766	931,399
$Pseudo\ R^2$	0.057	0.048	0.121

We report marginal effects at the mean.

Standard errors (clustered on the NUTS III level) in parentheses.

Full set of control variables included, but not reported.

Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable.

$^{*}\ p < 0.1, ^{**}\ p < 0.05, ^{***}\ p < 0.01$

older East German bank customers more likely hold this type of asset. For risky external assets we find the opposite effect; here, the coefficient of the interaction effect is significantly negative. Thus, the elder bank customers hold less risky external assets than the younger ones. As the older bank customers collected more experiences in the former socialist system, this is a clear indication that the observed difference between East and West German bank customers in fact is a consequence of the former institutional setting.

In Figure 5 we show the estimation results for logit regressions with age-specific East dummies.[42] For each age we display the sum of the East dummy and the corresponding age-specific East dummy as well as the 90 percent confidence interval. For total risky assets we find the joint effect to decrease, however, the point estimators are mostly not significantly different from zero. For risky internal assets there is a significant increase of the point estimator of the East dummy in the early thirties, which, however, starts decreasing in the age of 60. For risky external assets, the point estimator of the East dummy decreases with age and finally becomes significant. Altogether, although the results are not completely clear-cut, we find at least a slight tendency that experience in the former GDR system has an influence on the magnitude of the difference between East and West Germans in the likelihood to hold risky internal and external assets. However, the evidence at the extensive margin turns out to be comparatively weak.

6.2 The decision to hold risky assets at the intensive margin

We now turn to the decision to hold risky assets at the intensive margin. In a first step we repeat the conditional OLS estimations and again include an interaction effect of age and the East dummy into the regressions. The results are shown in Table 12. The interaction effect turns out to be significantly negative for total risky assets, for risky internal and for risky external assets. Thus, on average every additional year of experience with the former communist system increases the differences between asset holdings of East and West German bank customers. However, the effect is much more pronounced for risky external than for risky internal assets.

42. The complete results are available from the authors upon request.

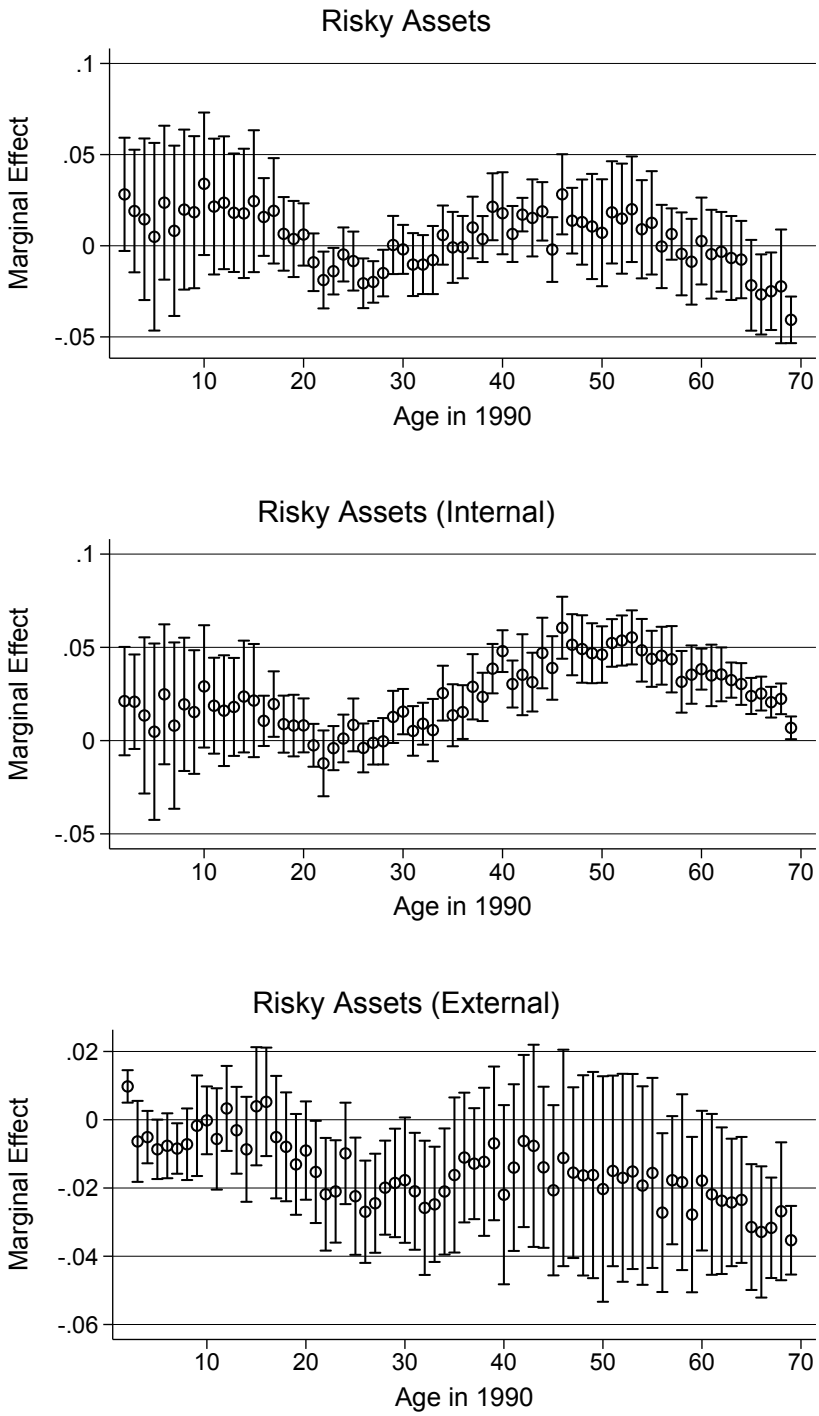

Figure 5. Risky asset holdings and age-East interaction (logit regressions, 90% confidence bands)

Table 12. Risky asset holdings and age-East interaction (conditional OLS)

	(1)	(2)	(3)
	Total risky assets	Risky internal assets	Risky external assets
	$Risky$	$Risky_{int}$	$Risky_{ext}$
Age	886.20***	269.91***	912.86***
	(29.86)	(51.55)	(34.45)
East	26,078.19***	6,577.13***	25,185.24***
	(3,369.10)	(918.49)	(2,491.17)
Age · East	-787.36***	-180.36***	-867.58***
	(53.16)	(52.48)	(44.18)
N	344,837	244,238	156,743
AIC	8,293,908	5,446,981	3,851,493
Adj. R^2	0.086	0.082	0.091

Standard errors (clustered on the NUTS III level) in parentheses.

Full set of control variables included, but not reported.

Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

In the second step of our analysis we repeat the earlier described conditional OLS regressions, but now include an East-Dummy for each age-class separately. In Figure 6 we again show the sum of the East dummy and the corresponding age-specific East dummy as well as the 90 percent confidence interval.[43] Basically, we find a similar pattern for total, risky internal and risky external assets. The difference between East and West German bank customers tends to increase with age, thereby supporting the hypothesis that more experience with the former GDR system increases the difference between East and West German savings bank customers. However, for risky internal assets, the difference between East and West Germans becomes significant only for individuals which were around 50 years old at the time of German Reunification. For risky external assets, the differences between East and West Germans are again much more pronounced and turn out to be significant for almost all considered ages.

In the third step of our analysis we repeat the earlier conducted censored quantile regression analysis. As in the conditional OLS approach we first add an interaction term between age and the East dummy to the estimation equation. In Figure 7 we show the graphical representation of the estimation results for the interaction effect for total, internal and external risky assets. For risky internal assets the interaction effect is slightly positive for the conditional quantiles until 96%, but numerically close to zero. It turns negative in the highest quantiles but still is small in magnitude. For risky external assets, the interaction effect is significantly negative for all quantiles. Moreover, the difference between East and West Germans grows steadily over the displayed quantiles. Thus, experience with the former GDR system matters most for those bank customers which have properties favoring large amounts of risky external asset holdings.

An age-specific analysis within a (censored) quantile regression approach is infeasible even with our comparatively large dataset.[44] However, at least we can conduct our analysis separately for two subgroups. In order to study whether collecting own financial experiences in the former GDR system is a necessary precondition to be influenced by the GDR treatment we divide the dataset

43. The complete estimation results are available from the authors upon request.

44. Note that due to the earlier described stockholding puzzle only the large minority of bank customers holds risky assets at all. Moreover, we would need to draw the distributional effects for each age group.

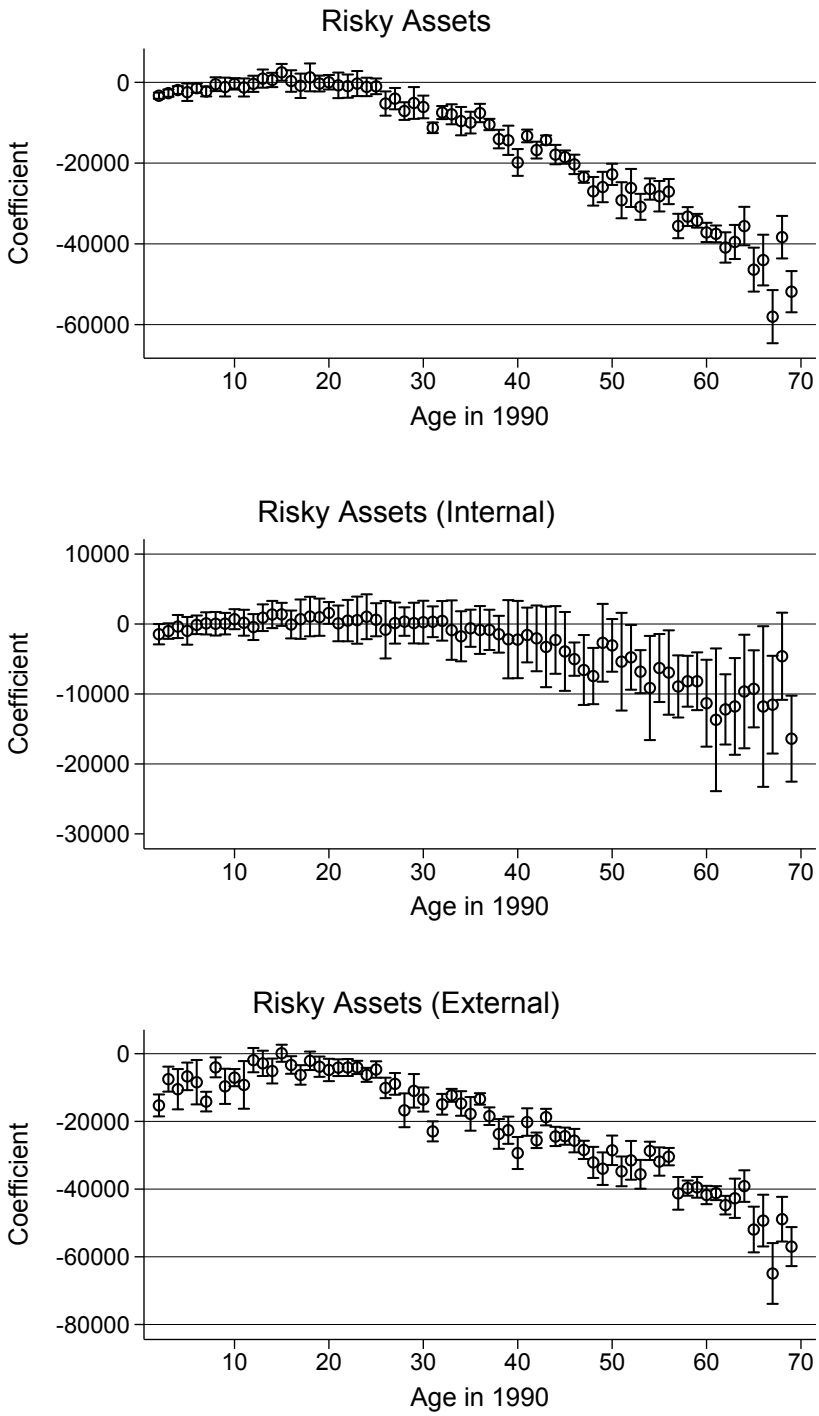

Figure 6. Risky asset holdings with age-specific East dummies (conditional OLS, 90% confidence bands)

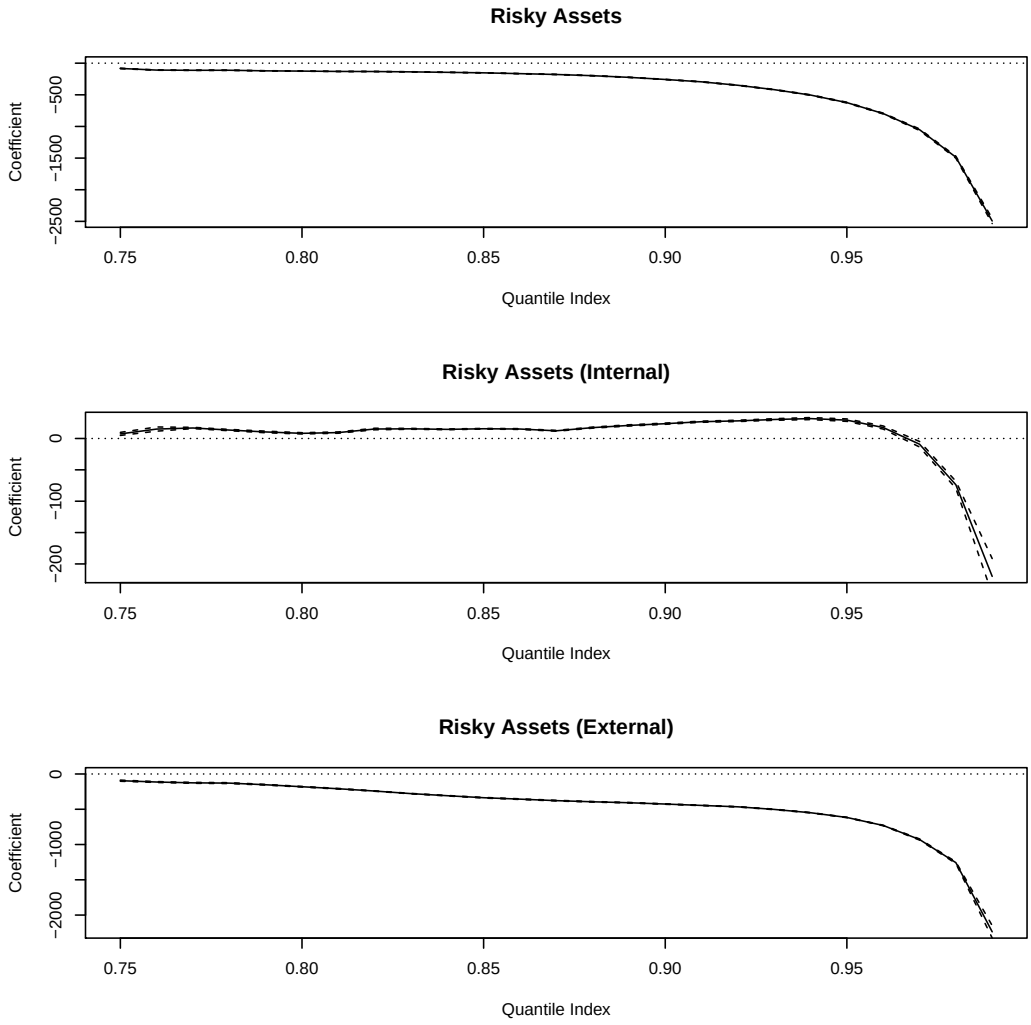

Figure 7. Risky asset holdings and age-East interaction (censored quantile regressions, 95% confidence bands)

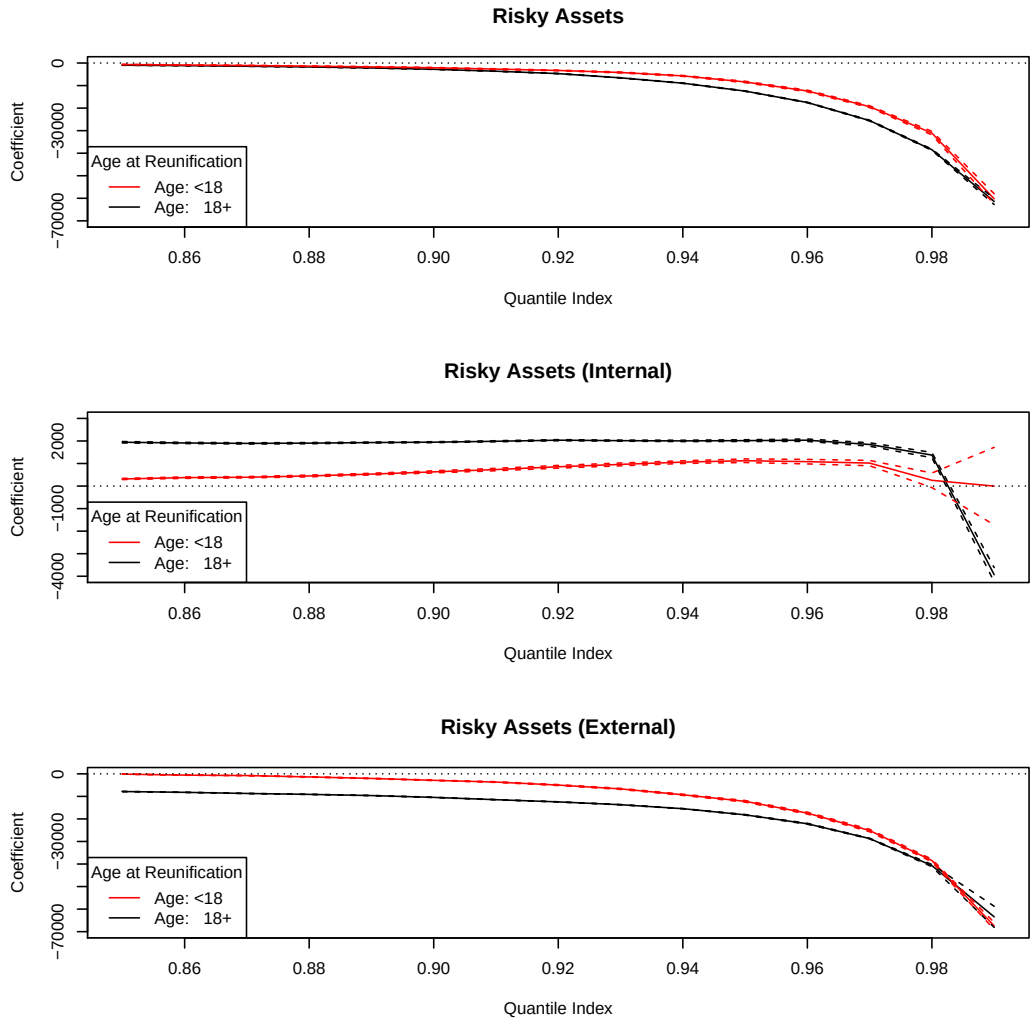

Figure 8. Risky asset holdings and institutional experience (censored quantile regressions, 95% confidence bands)

into two subgroups for which we conduct the censored quantile regression analysis separately. The first group consists of individuals which were younger than 18 years at the time of German Reunification and thus can be assumed not to have collected their own financial experiences in the former GDR system. The second group contains all individuals which were at least 18 years old when Germany was reunified. The estimation results are shown in Figure 8. The light line describes the results for the young subsample of East German bank customers whereas the dark line depicts the results for the experienced group.

For the elderly group of bank customers we find a significantly positive effect on internal risky asset holdings for the lower quantiles which reverses in the highest conditional quantiles. For the lower quantiles, the effect amounts to roughly 2,000 . For the younger group of bank customers, the effect is qualitatively similar, but less pronounced. Thus, again we find that own experience with the former GDR system tends to have a significant effect on the magnitude of the differences between East and West Germans.

The same qualitative finding can be observed for external risky assets. While we find negative coefficients of the East dummy for all conditional quantiles and for both age groups, the effects for the elderly age group is more pronounced. However, the effects for risky external assets are much

larger than for risky internal assets and again, they tend to increase strongly over the conditional quantiles. The fact that we find a significant difference between East and West German bank customers in risky external asset holdings even for the subgroup of individuals which were too young at the time of German Reunification to have collected their own financial experiences indicates that the differences in informal institutions between East and West Germans tend to prevail even in the younger generations, although they are less pronounced.

7 Discussion and conclusions

Using bank account data of 11 eleven savings banks located in both East and West Germany we studied whether the strong institutional differences between East and West during the time of German division are still visible in portfolio behavior of savings bank customers 16 years after German Reunification. Besides delivering supporting evidence for the well-known stockholding puzzle we end up with the following major results.

First, the decision to hold risky assets at the extensive margin is not influenced by the institutional past when considering total risky assets. Thus, the likelihood that two savings bank customers in East and West Germany hold any sort of risky asset is roughly the same. This result is in line with the analysis of Fuchs-Schündeln and Haliassos 2015, derived from survey data. However, we find a comparatively strong composition effect. While East German bank customers have a significantly larger probability to hold risky internal assets (e.g. mutual funds that are managed by their own bank), the opposite holds true for risky external assets (e.g. stocks, derivatives and externally managed mutual funds). As the Blinder-Oaxaca-Decompositions reported in Table 13 indicate, the observed differences between East and West German bank customers in the likelihood to hold risky internal and risky external assets cannot primarily be explained by the prevailing differences in the socio-demographic characteristics.

Second, we find pronounced differences in the decision, how many assets a bank customer holds (i.e. the intensive decision to hold risky assets). Bank customers in West Germany hold significantly more total risky assets than their East German counterparts. Whenever East and West Germans hold risky internal assets at all, the amount of assets they hold is comparatively similar. However, given they hold risky external assets at all, the amount West Germans hold in risky external assets is much higher. Again Blinder-Oaxaca-Decompositions indicate that only a small part of the observed differences between East and West German bank customers can be explained by differences in socio-demographic characteristics, income, liabilities and wealth (see Table 14).

Third, we find the differences between East and West Germans to be correlated with experience under the former institutions (approximated by age at German Reunification), especially for the intensive dimension of the decision to hold risky (external) assets. Thus, the former formal institutions seem to be manifested especially in the prevailing informal institutions of those East Germans which collected more experience under these institutions. However, even for the young generation of savings bank customers in the age of less than 18 years at the time of German Reunification we found systematic differences between East and West Germans at the intensive margin to hold risky external assets. As this generation was too young to have collected its own experiences with financial institutions in the GDR, we might suggest that the informal institutions of the elderly generations have been transmitted to younger generations, at least to a significant extent.

Our results indicate that the effects of reforms of formal institutions on portfolio behavior are more persistent as the results presented in Osili and Paulson 2008 seem to imply. Different from Osili and Paulson's (2008) study of U.S. immigrants we study the portfolio behavior of individuals which experienced a strong institutional change within their country of origin. These individuals live among individuals which themselves are inexperienced with the new institutions. Thus, they primarily communicate with individuals having very similar experiences and also similar informal institutions. Moreover, their peer groups turn out to be very similar to themselves. It seems that

Table 13. Blinder-Oaxaca decomposition for extensive decision to hold risky assets (logit regression, Yun (2005))

	Total risky assets	Internal risky assets	External risky assets
	$Risky$	$Risky_{int}$	$Risky_{ext}$
West	0.191***	0.114***	0.108***
	(0.004)	(0.007)	(0.011)
East	0.195***	0.144***	0.083***
	(0.008)	(0.009)	(0.010)
Difference	-0.005	-0.030***	0.025*
	(0.009)	(0.011)	(0.015)
Explained	-0.002	-0.005	0.008
	(0.006)	(0.007)	(0.009)
Unexplained	-0.003	-0.025***	0.017*
	(0.005)	(0.006)	(0.010)
N	1,774,457	1,774,457	1,774,457

Standard errors (clustered on the NUTS III level) in parentheses.

Full set of control variables included.

Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Table 14. Blinder-Oaxaca decomposition for intensive decision to hold risky assets (conditional OLS)

	Total risky assets	Internal risky assets	External risky assets
	$Risky$	$Risky_{int}$	$Risky_{ext}$
West	30,658.92***	11,740.21***	41,588.42***
	(1,242.43)	(1,582.12)	(1,283.05)
East	13,559.66***	9,873.34***	14,764.11***
	(609.10)	(496.47)	(547.87)
Difference	17,099.26***	1,866.87	26,824.30***
	(1,383.70)	(1,658.18)	(1,395.12)
Explained	1,088.42	-346.27	885,85
	(1,250.19)	(944.71)	(942.02)
Unexplained	16,010.84***	2,213.14	25,938.45***
	(588.04)	(1,866.88)	(918.09)
N	344,837	244,238	156,743

Standard errors (clustered on the NUTS III level) in parentheses.

Full set of control variables included.

Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable.

* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

these circumstances tend to delay the change in informal institutions, at least in as far as risky portfolio composition and the intensive decision to hold risky assets is concerned.

It is an intriguing question which are the driving forces behind our results. While we cannot provide direct empirical evidence on this issue in this paper, we at least can speculate about them against the background of our results and those reported in the related literature. In line with the results reported in Fuchs-Schündeln and Haliassos 2015 there is little reason to believe that the observed differences between East and West Germans are the result of differences in product familiarity. More likely, differences in the internal locus of control and self-reliability can account for the observed results. As Friehe, Pannenberg, and Wedow 2015 report, socialist education left their traces in East Germans' personalities. Especially, East Germans exhibit lower levels of internal locus of control than their West German counterparts. Thus, they in general believe less in the possibility to influence their own future. Similarly, Bauernschuster *et al.* 2012 find that East Germans show systematically lower levels of self-reliance than their East German counterparts, a fact which can explain why there is much less entrepreneurial activity in East Germany. Personalities evolve strongly in young age. Throughout that time the former German Democratic State influenced school education excessively (Fuchs-Schündeln and Masella 2015). As a consequence, young adults left school as "products of the regime" (Fulbrook 2005). Besides school education, parental education played an important role in the former German Democratic Republic. Parents taught their children how to come along with the existing political system, which involved to accept the social rules established by the state and to avoid causing any trouble (Friehe, Pannenberg, and Wedow 2015). Self-initiative is unlikely to evolve under such circumstances. Finally, the experiences the citizens of the German Democratic Republic made themselves within the former political system likely shaped their personalities. As Hillman 1994 argues, the experience of central planning is likely crowding out self-reliance. We suggest that as a consequence of these differences in personality, East Germans more often decide to buy mutual funds issued and managed by their savings bank rather than relying on their own expertise in buying stocks and derivatives. And it might also explain why East Germans invest much less wealth in risky external assets even when they in principle, decide to make use of this option. The fact that we still find systematic differences between East and West Germans in the younger age groups which themselves were neither exposed to socialist education nor collected their own experiences in the former political system are likely due to the still effective informal institutions. These institutions might have been passed on to the younger generation via parental education but also through interaction with social networks in which the former informal institutions still prevail.

Our findings have important implications for financial development of countries reforming their formal and especially their economic institutions. While formal institutions can be changed quite quickly, our results indicate that informal institutions turn out to be highly persistent. The example of Germany is a fruitful lesson in this respect. When Germany was reunified in 1990, West Germany was among the financially and economically most well developed countries. Soon after German Reunification almost all formal institutions were transferred to East Germany. However, although East Germany thus faced a highly favorable starting position into the process of transformation, our results indicate that the informal institutions in East Germany still differ to a significant extent from those in West Germany sixteen years after reunification. Since the earlier presented empirical evidence indicates that informal institutions are passed along to later generations, we should expect these informal institutions to change only very slowly. Transformation (or more general reform) countries with less favorable starting positions and later starting points of their transformation processes will need long periods of time before the degree of stock market capitalization will reach similar levels as in traditional market economies.

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A Robustness Checks

Table 1. Robustness checks, sequential inclusion of controls

	Unconditional	+Demographics	+Region	+Income	+Liabilities	+Gross Wealth
			Extensive dimension (logit)			
$Risky$	0.03	0.00	-0.03	-0.03	-0.01	0.02
	(0.06)	(0.06)	(0.05)	(0.03)	(0.03)	(0.04)
	[0.00]	[0.00]	[-0.01]	[-0.00]	[-0.00]	[0.00]
$Risky_{int}$	0.27**	0.27**	0.16**	0.15**	0.18**	0.23***
	(0.11)	(0.11)	(0.06)	(0.07)	(0.08)	(0.06)
	[0.03]	[0.03]	[0.02]	[0.02]	[0.02]	[0.02]
$Risky_{ext}$	-0.29*	-0.38**	-0.27***	-0.26***	-0.26***	-0.22*
	(0.16)	(0.16)	(0.10)	(0.10)	(0.10)	(0.12)
	[-0.03]	[-0.03]	[-0.02]	[-0.02]	[-0.02]	[-0.01]
			Intensive dimension (conditional OLS)			
$Risky$	-17,099.26***	-18,125.75***	-16,587.18***	-16,759.52***	-16,798.37***	-16,010.84***
	(980.70)	(773.82)	(577.18)	(685.15)	(785.43)	(617.88)
$Risky_{int}$	-1,866.87	-2,767.94	-2,484.67	-2,499.35	-2,770.54	-2,213.14
	(1,772.34)	(1,776.42)	(2,229.02)	(2,249.22)	(2,167.12)	(2,046.11)
$Risky_{ext}$	-26,824.30***	-27,706.58***	-26,722.24***	-26,971.07***	-26,749.18***	-25,938.45***
	(754.39)	(693.71)	(504.89)	(607.41)	(698.23)	(762.40)
			Intensive dimension, share (conditional OLS)			
$Risky$	-0.02*	-0.02	-0.00	0.01	0.01	-0.02
	(0.01)	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)
$Risky_{int}$	0.04**	0.05***	0.06***	0.06***	0.07***	0.04**
	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.02)
$Risky_{ext}$	-0.09***	-0.09***	-0.07***	-0.06***	-0.06***	-0.08***
	(0.01)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)
$\frac{Risky_{ext}}{Risky}$	-0.07***	-0.07***	-0.06***	-0.06***	-0.06***	-0.07***
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)

Each panel refers to a different margin of risky asset demand. Inside each panel each row corresponds to the respective dependent variables total, internal and external risky assets.From left to right each column sequentially extends the set of control variables from none (column 1) to our benchmark specification (column 6). As before, cells display the estimate of the East coefficient. Standard errors (clustered on the NUTS III level) in parentheses. Full set of control variables included. Gross financial wealth (GFW) excludes the risky asset class belonging to the left hand variable. * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

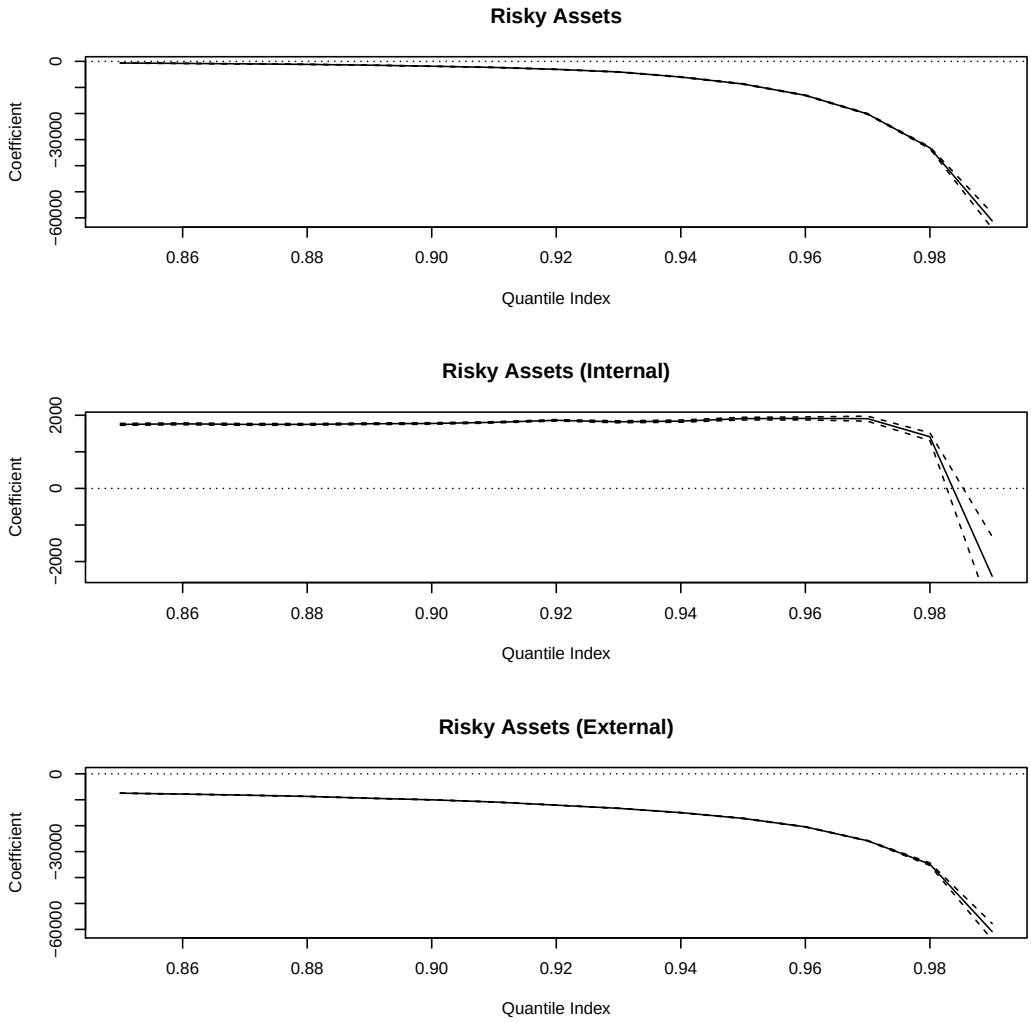

Figure 1. Robustness check for intensive decision to hold risky assets with housing-wealth control (censored quantile regressions, 95% confidence bands)

B Full estimation results

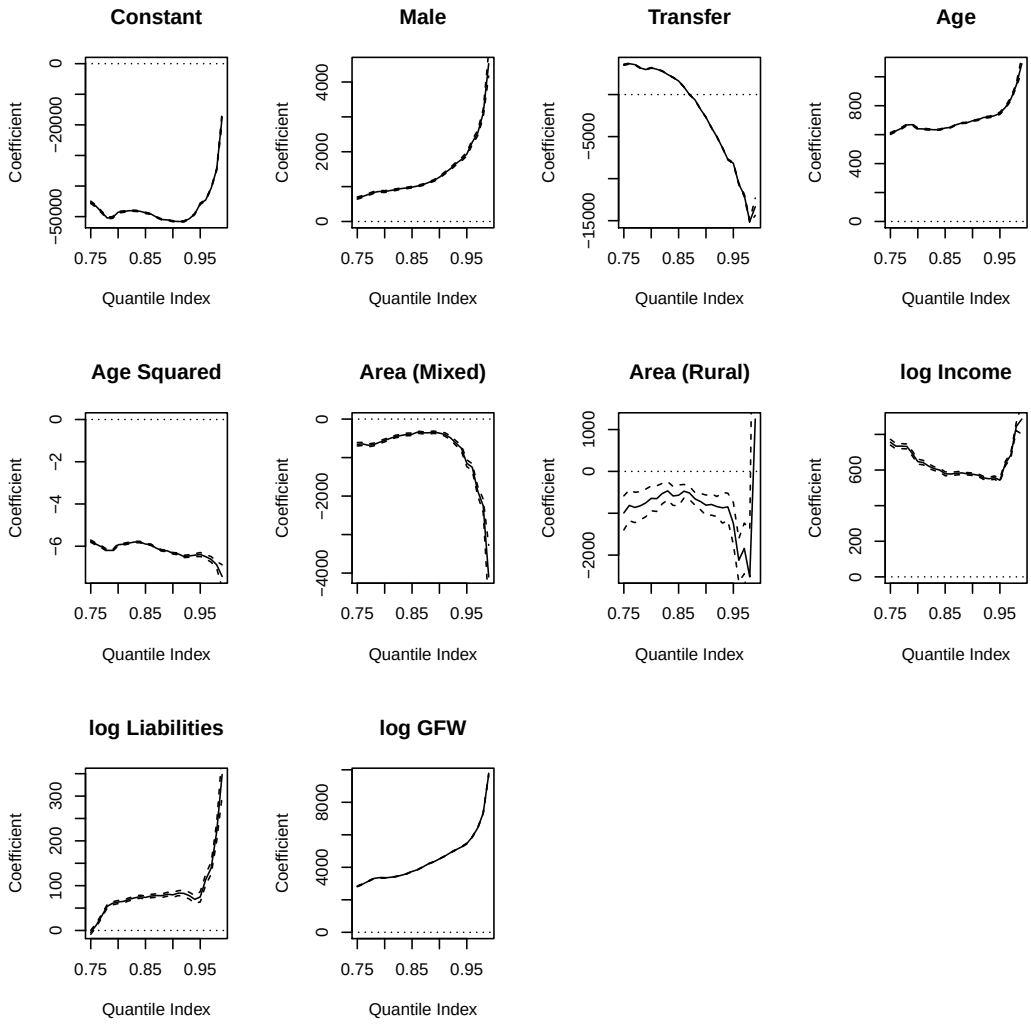

Figure 1. Determinants of total risky asset holdings (censored quantile regressions, 95% confidence bands)

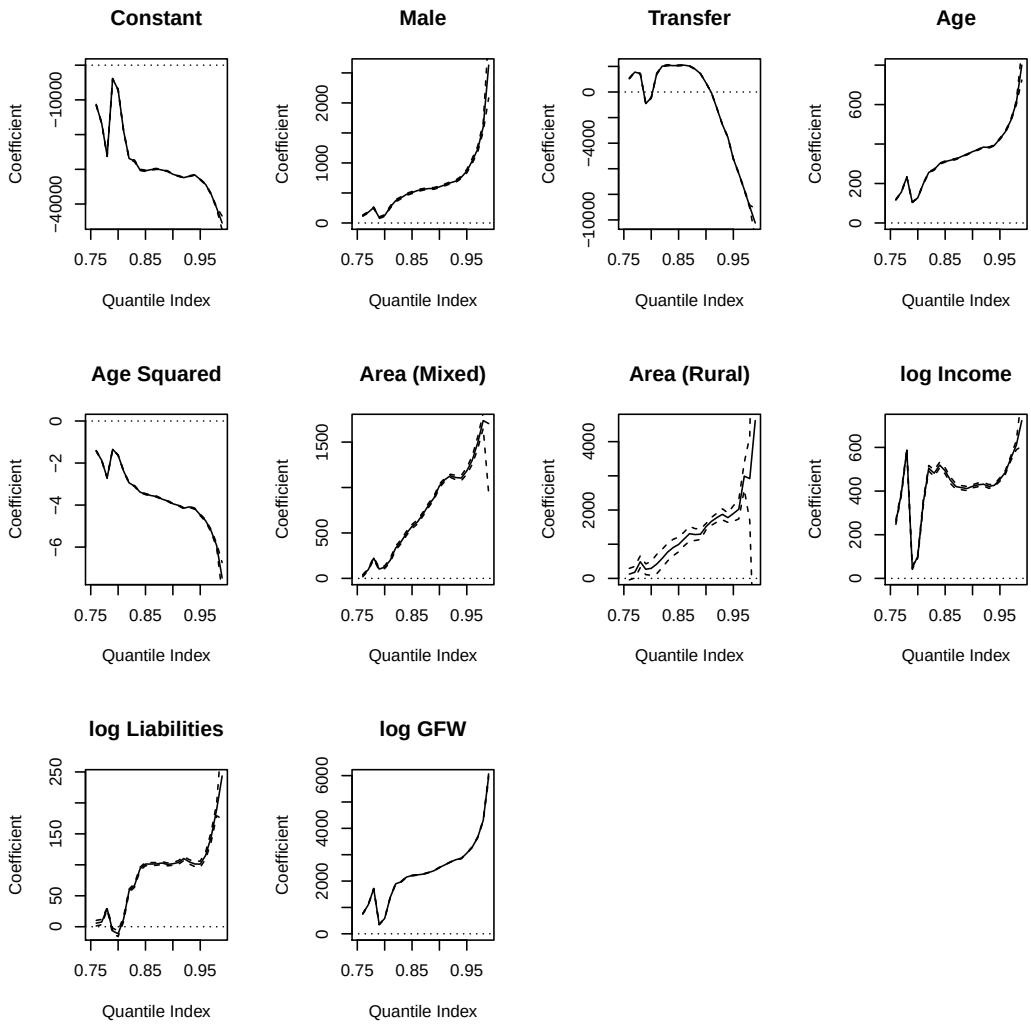

Figure 2. Determinants of internal risky asset holdings (censored quantile regressions, 95% confidence bands)

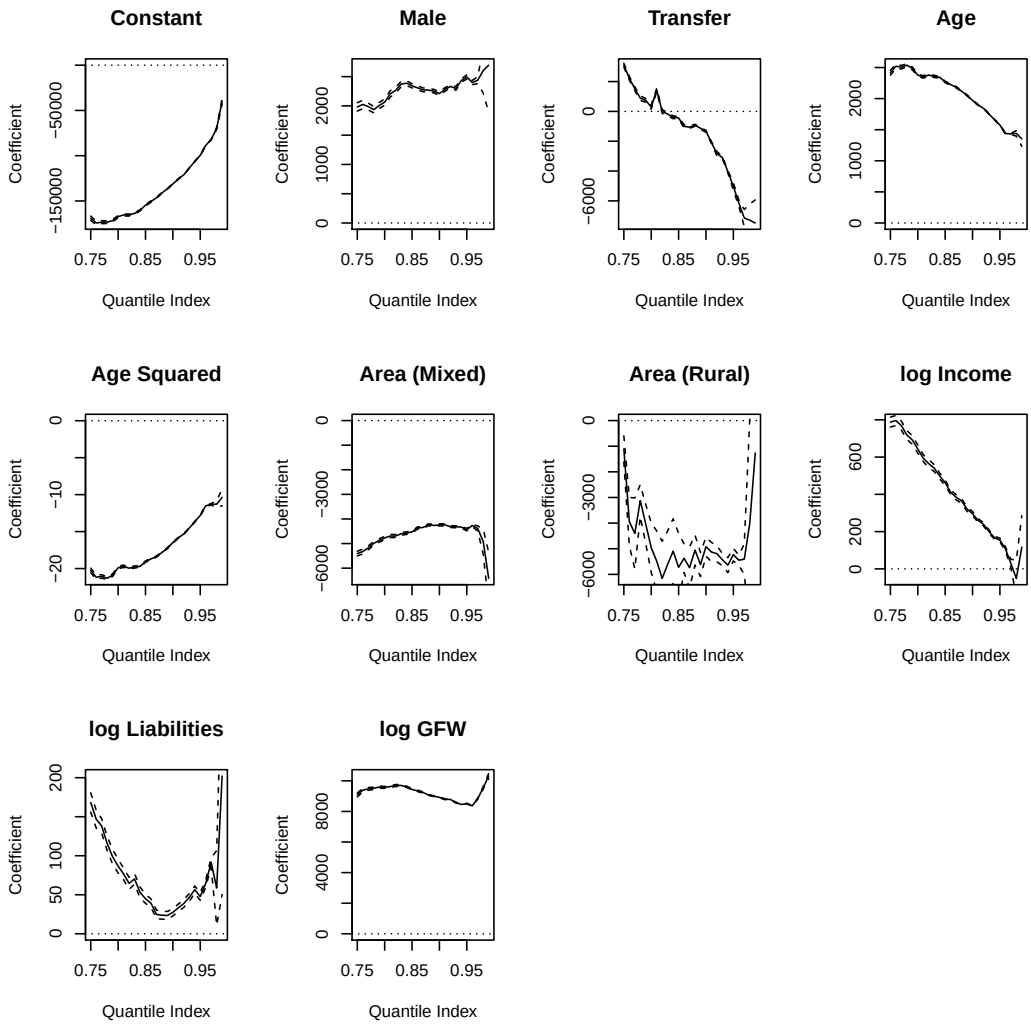

Figure 3. Determinants of external risky asset holdings (censored quantile regressions, 90% confidence bands)

C Additional descriptive statistics

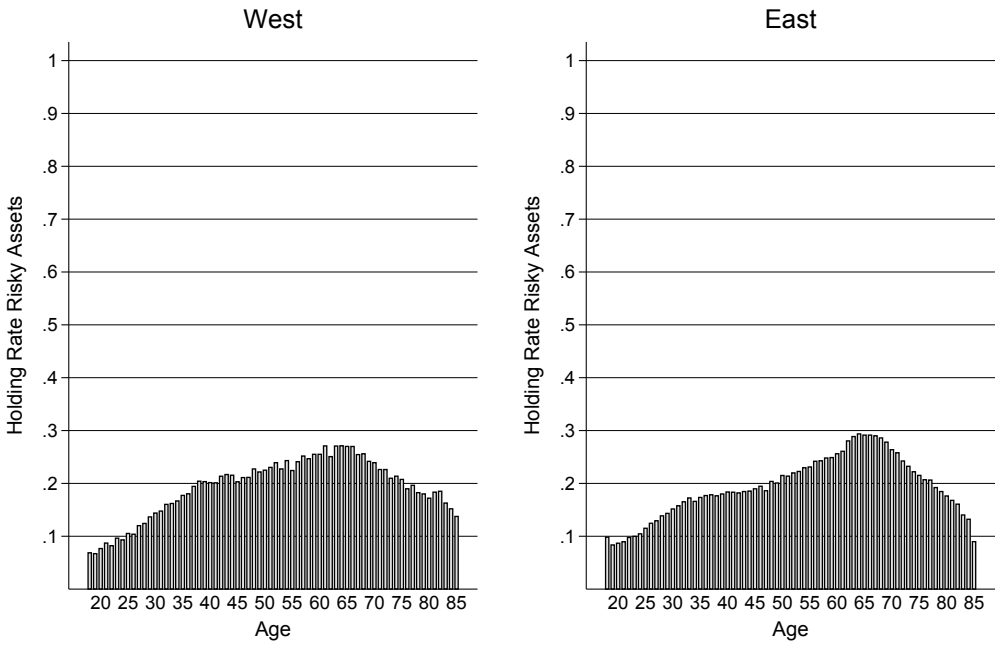

Figure 1. Average holdings of risky assets by age group and region

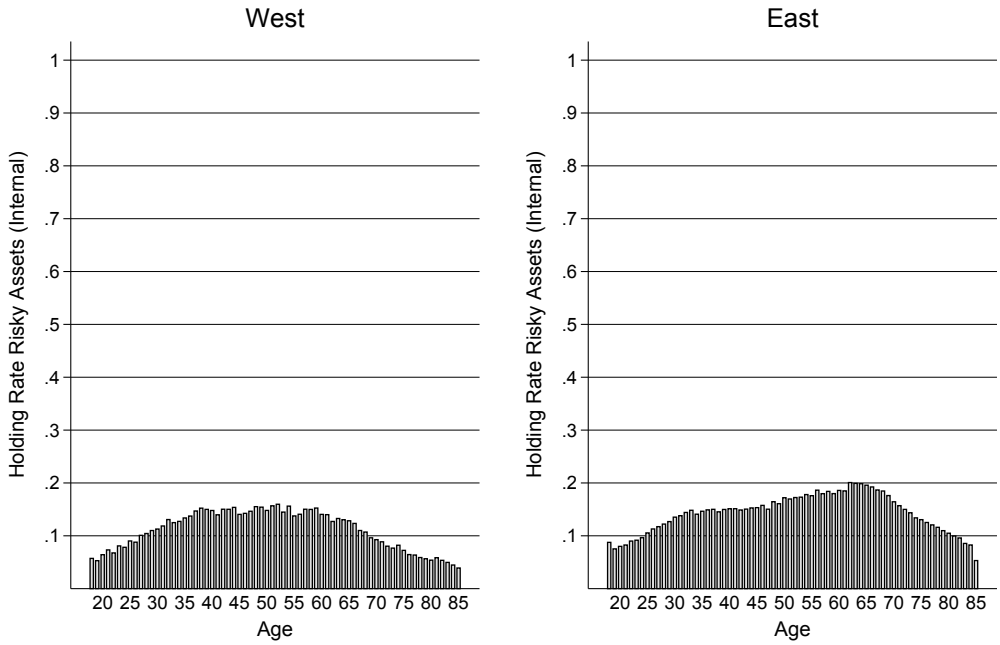

Figure 2. Average holdings of risky internal assets by age group and region

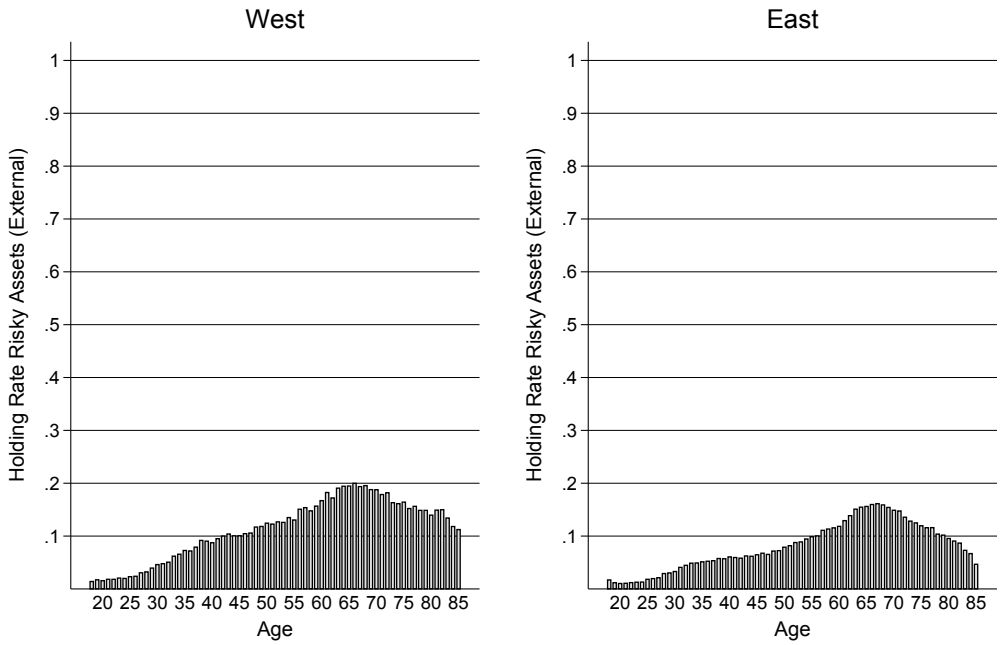

Figure 3. Average holdings of risky external assets by age group and region

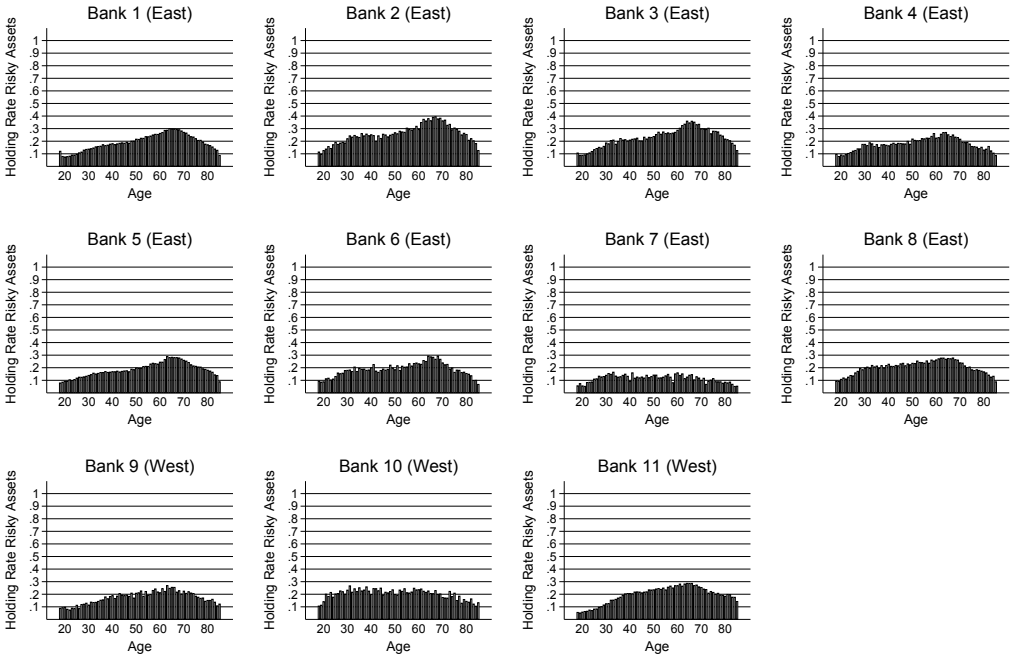

Figure 4. Average Holding of Risky Assets by Age Group and Bank

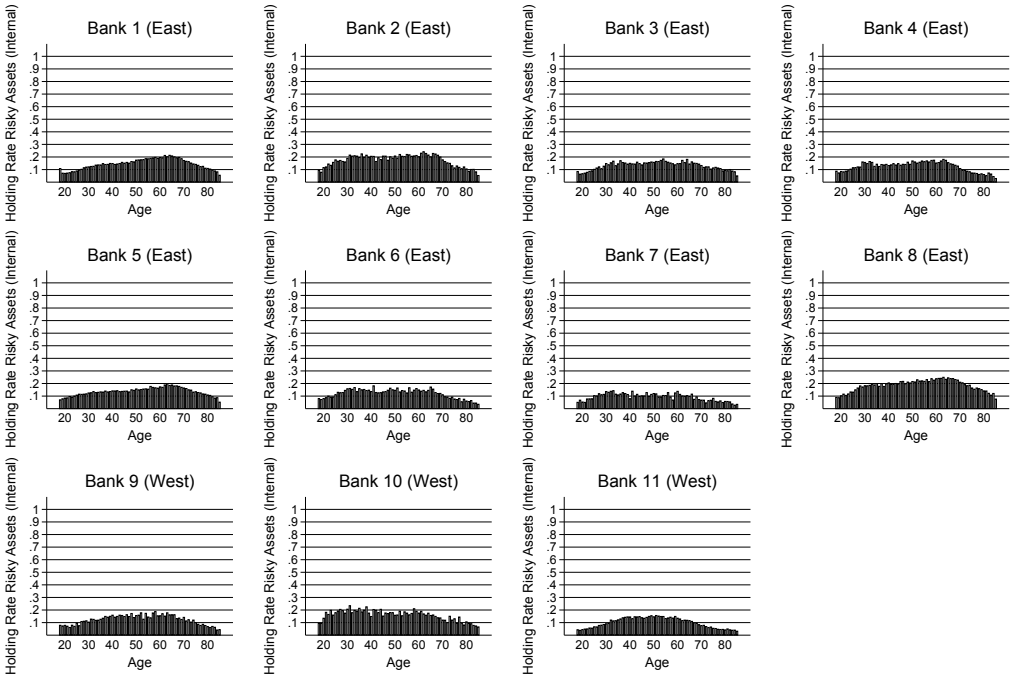

Figure 5. Average holdings of risky internal assets by age group and bank

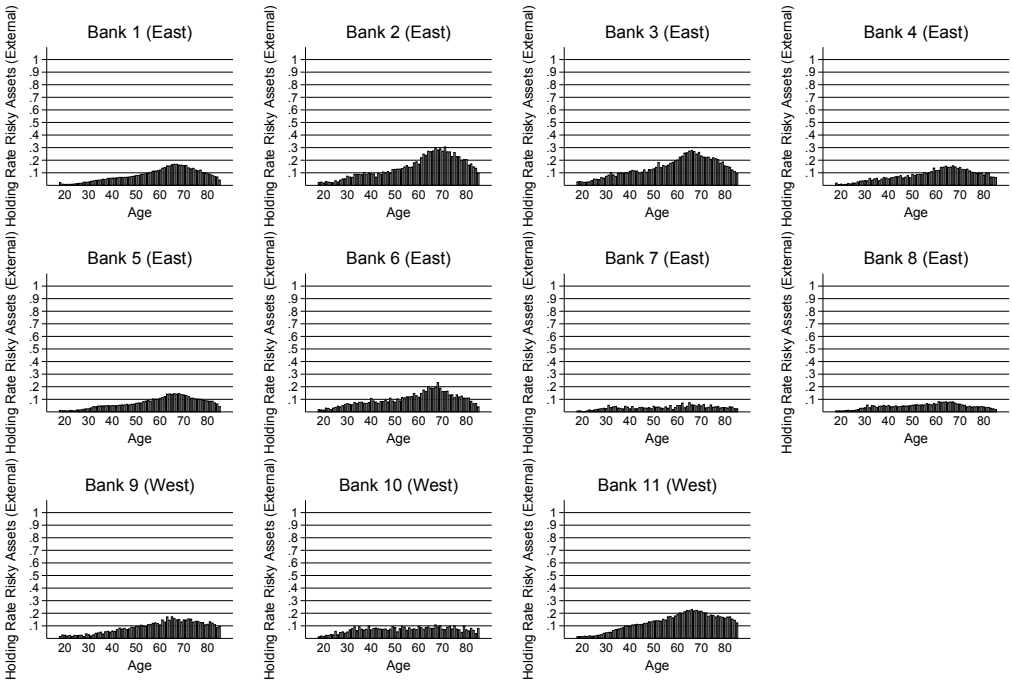

Figure 6. Average holdings of risky external assets by age group and bank

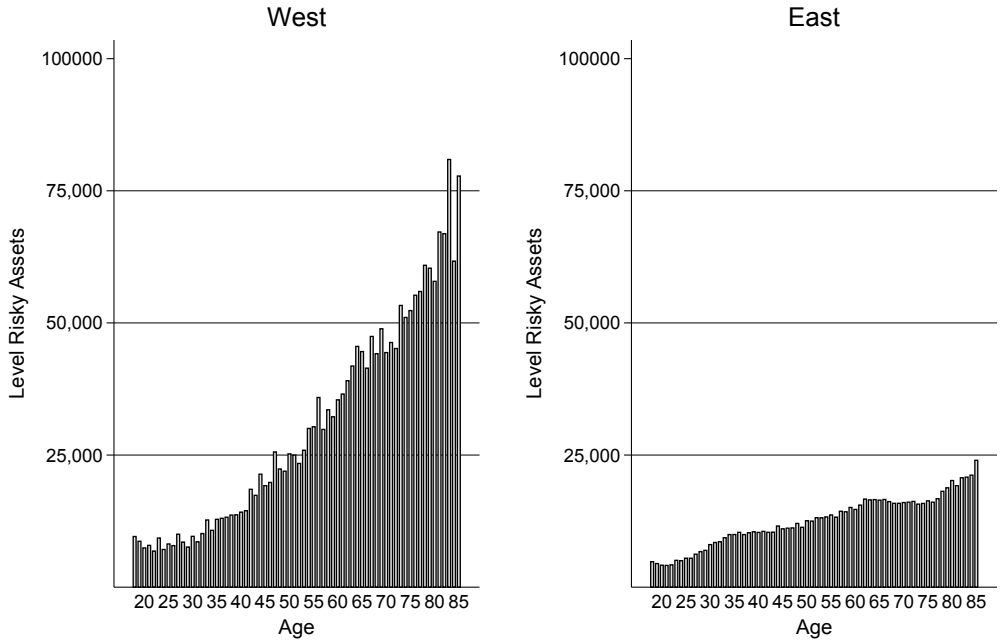

Figure 7. Average conditional level of risky assets by age group and region

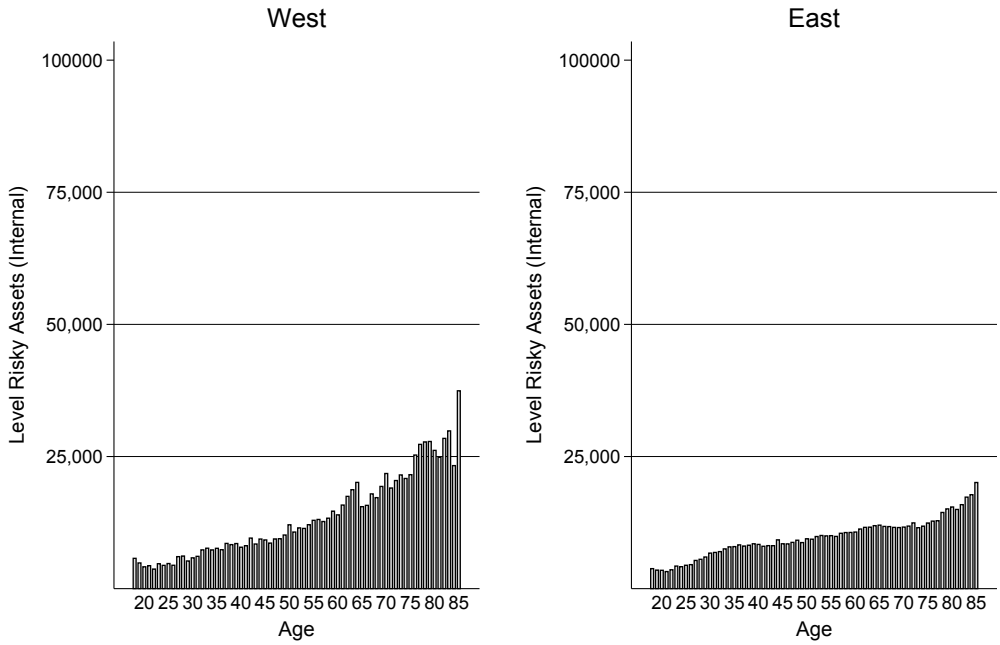

Figure 8. Average conditional level of risky internal assets by age group and region

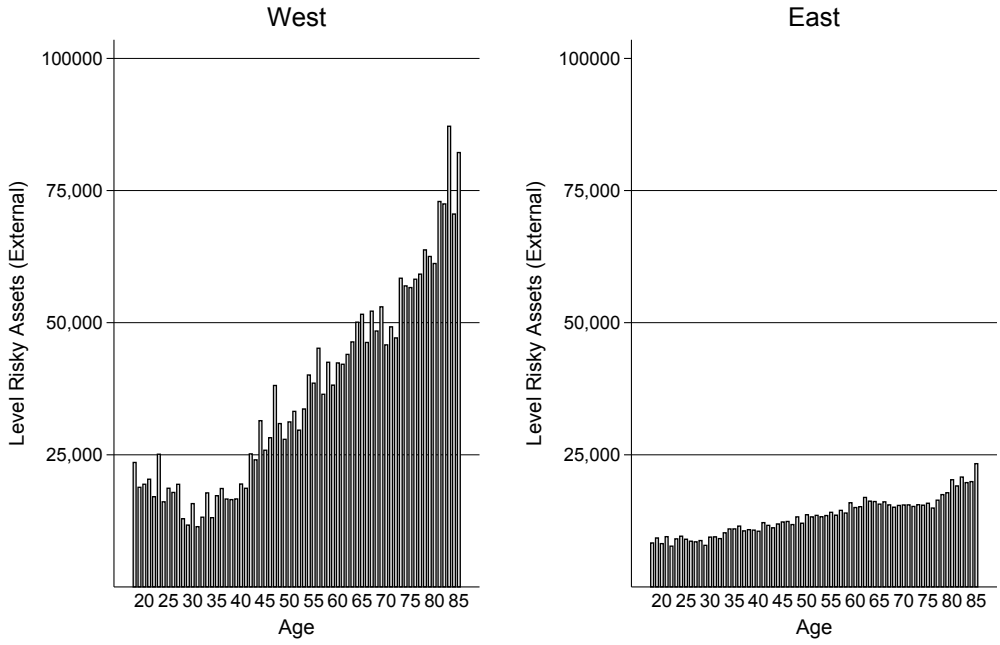

Figure 9. Average conditional level of risky external assets by age group and region

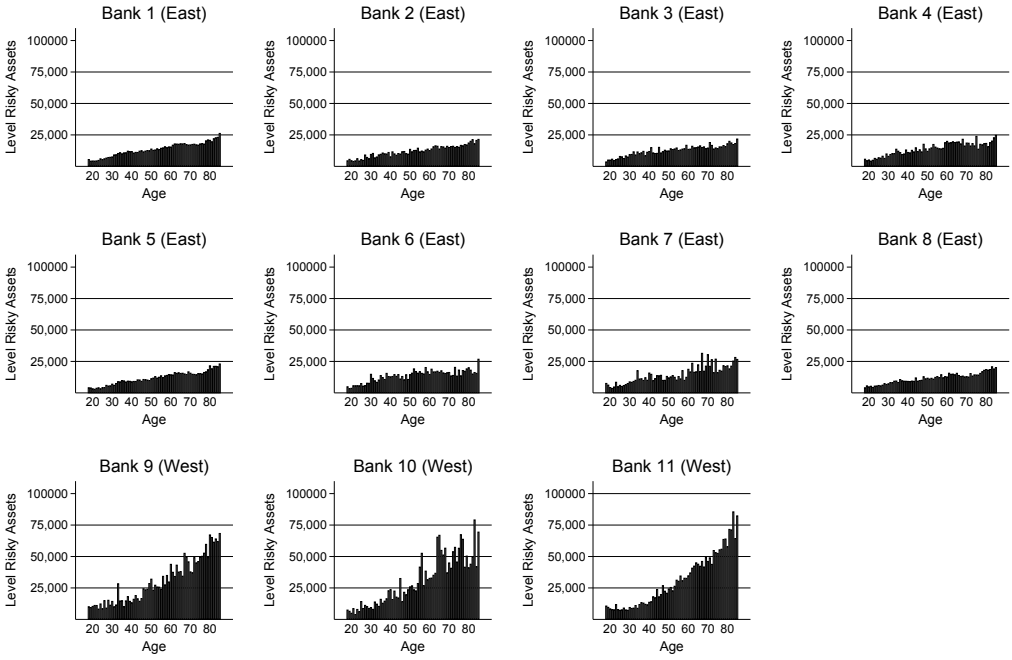

Figure 10. Average conditional level of risky assets by age group and bank

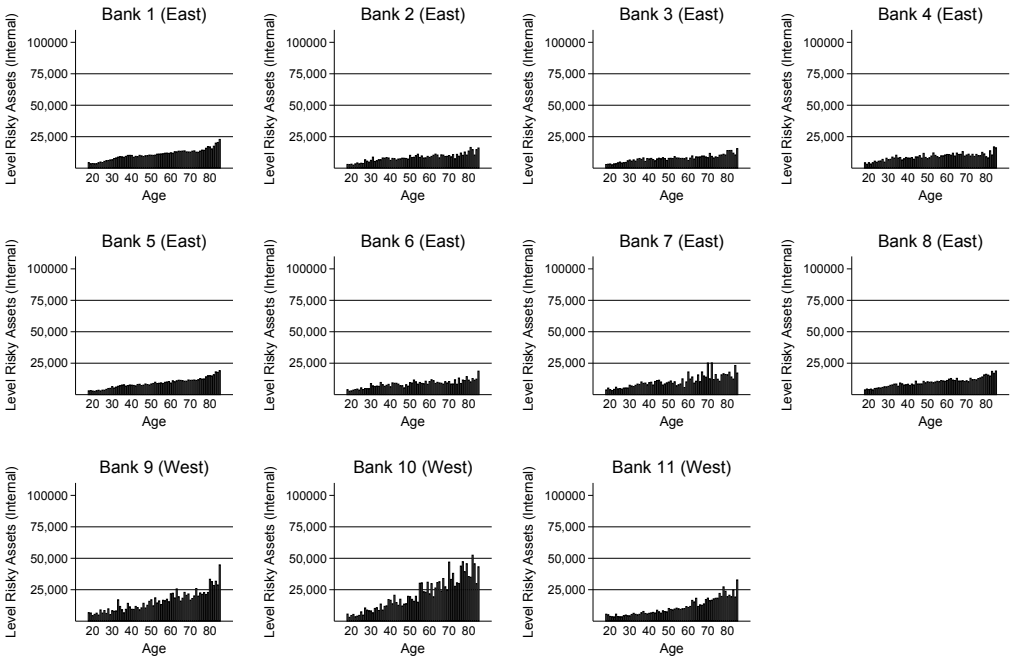

Figure 11. Average conditional level of risky internal assets by age group and bank

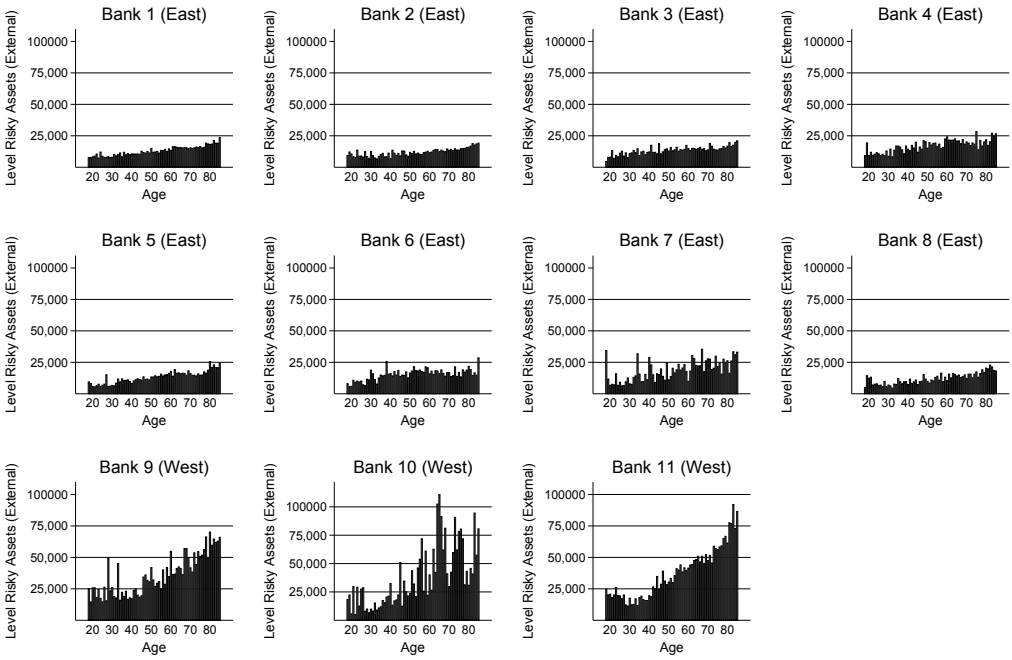

Figure 12. Average conditional level of risky external assets by age group and bank

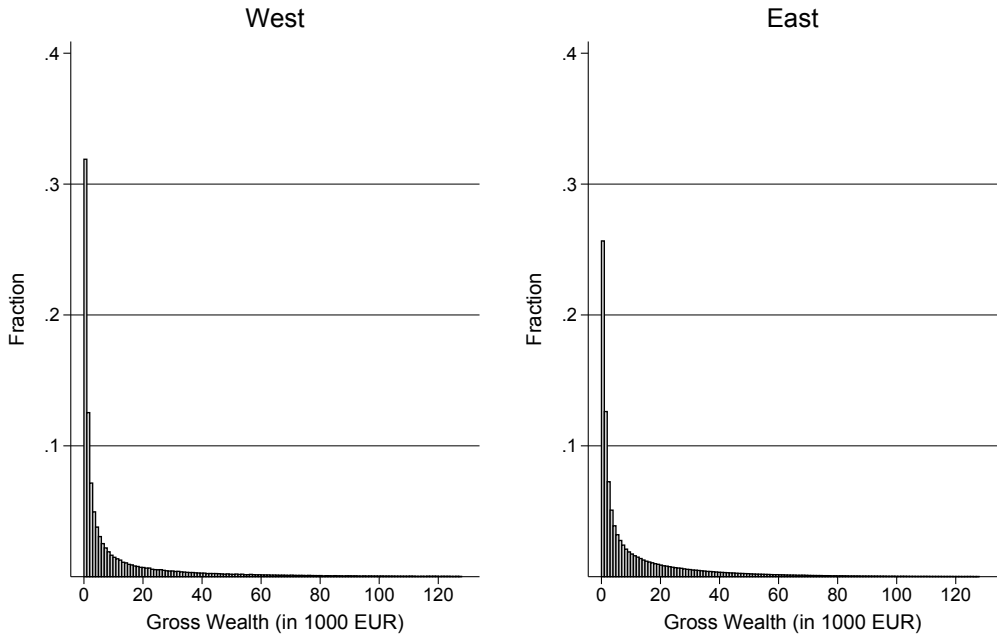

Figure 13. Histogram gross wealth by region

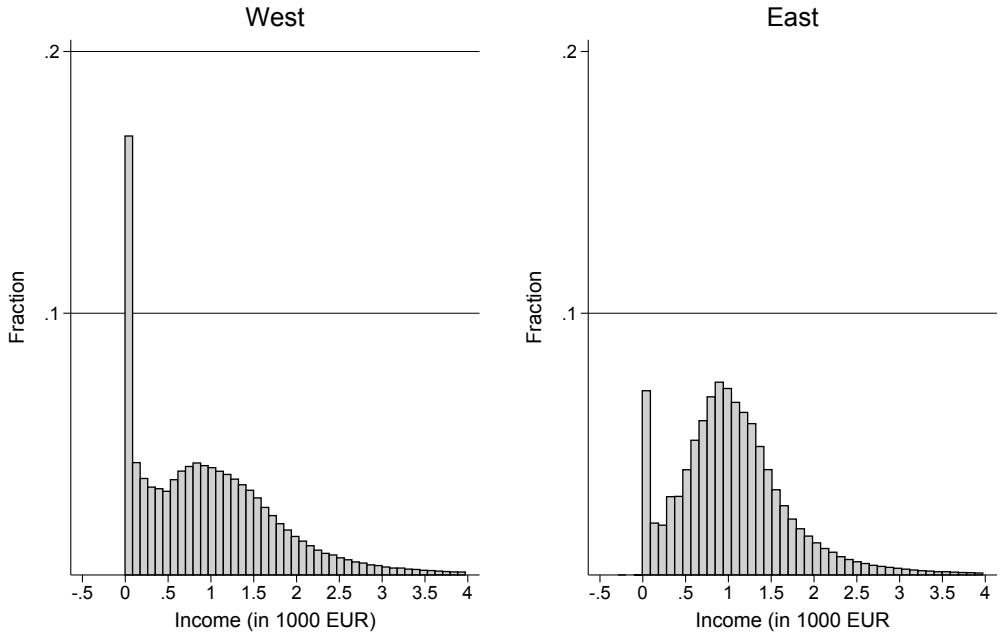

Figure 14. Histogram income by region