CENTER FOR
ECONOMIC
BEHAVIOR &
INEQUALITY

CEBI WORKING PAPER SERIES

Working Paper 01/17

FINANCIAL TROUBLE ACROSS GENERATIONS: EVIDENCE FROM THE UNIVERSE OF PERSONAL LOANS IN DENMARK

Claus Thustrup Kreiner
Søren Leth-Petersen
Louise C. Willerslev-Olsen

ISSN 2596-44TX

CEBI
Department of Economics
University of Copenhagen
www.cebi.ku.dk

FINANCIAL TROUBLE ACROSS GENERATIONS: EVIDENCE FROM THE UNIVERSE OF PERSONAL LOANS IN DENMARK*

Claus Thustrup Kreiner, University of Copenhagen and CEPR
Søren Leth-Petersen, University of Copenhagen and CEPR
Louise C. Willerslev-Olsen, University of Copenhagen

Abstract

Do people end up in financial trouble simply because of adverse shocks to income and wealth, or is financial trouble related to persistent differences in financial attitudes and behavior that may be transmitted from generation to generation? We address this question using a new administrative data set with longitudinal information about defaults for the universe of personal loans in Denmark. We provide non-parametric evidence showing that the default propensity is more than four times higher for individuals with parents who are in default compared to individuals with parents not in default. This intergenerational relationship is apparent soon after children move into adulthood and become legally able to borrow. The intergenerational relationship is remarkably stable across age groups, levels of loan balances, parental income levels, childhood school performance, time periods and different measures of financial trouble. Basic theory points to three possible explanations for the correlation across generations in financial trouble: (*i*) children and parents face common shocks; (*ii*) children and parents insure each other against adverse shocks; (*iii*) financial behavior differs across people and is transmitted across generations. Our evidence indicates that the last explanation is the most important. Finally, we show that the intergenerational correlation in financial trouble is not fully incorporated in interest setting on loans, pointing to the existence of an interest rate externality in the market for personal loans.

Keywords: Household borrowing decisions, default, intergenerational dependency
JEL: D12, D91, G20

---

*We thank Steffen Andersen, Sumit Agarwal, Chris Carroll, Lucifora Claudio, Mette Ejrnæs, David Laibson, participants at the CFPB Research Conference in Washington, participants at the CEPR Network Event on Household Finance, and numerous seminar participants for constructive comments and discussions. Kristoffer Balle Hvidberg and Lene Troen Lundgård provided excellent research assistance. We are grateful to the Danish tax administration (SKAT) for providing data on loans and to the credit bureau companies Experian and Debitor Registret for allowing access to their bad payer files. Financial support from The Danish Council for Independent Research (Social Science) and from the Economic Policy Research Network (EPRN) is gratefully acknowledged. Contact info: ctk@econ.ku.dk, soren.leth-petersen@econ.ku.dk, louise.willerslev-olsen@econ.ku.dk.

1 Introduction

Why do some people not meet their debt obligations and end up in financial trouble while others do not? Is it simply because of temporary shocks to income or wealth, for example caused by unemployment or asset price movements, or is it related to persistent differences in financial attitudes and behavior that may even be transmitted from generation to generation?

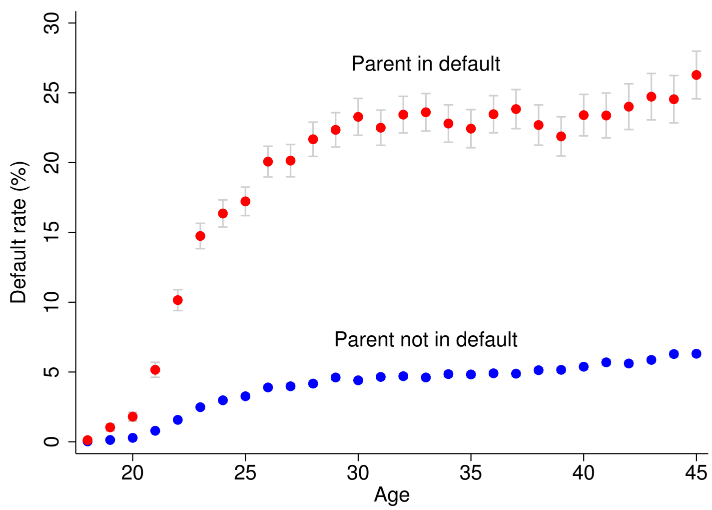
Providing answers to these questions may have important policy implications: Adverse shocks call for debtor-friendly bankruptcy systems with debt relief, but prevalence of risky financial behavior may call for more creditor-friendly bankruptcy laws (White 2007). Risky financial behavior and accumulation of too much debt may be related to self-control problems, inexperience and lack of knowledge about financial decision-making (Laibson 1997, Lusardi and Mitchell 2014). This may call for paternalist policies prohibiting particular types of risky loans or education of young people in financial planning. A better understanding of the nature of financial trouble may also have macroeconomic implications, as people in financial trouble have to cut back on spending, implying that a macroeconomic shock is amplified by spending cuts of people in financial difficulty or at risk of coming into financial difficulty (Carroll et al. 2017).

Our analysis documents a large correlation in financial trouble across generations and provides evidence indicating that the main reason behind the correlation is transmission of financial behavior from generation to generation. In addition, we show that banks do not fully incorporate the risk factor related to the intergenerational dependency of financial trouble when setting interest rates, pointing to the existence of an interest rate externality in the credit market for personal loans.

Our analysis is based on a new administrative longitudinal data set covering the period 2004-2011 with information about loan defaults for the universe of personal loans in Danish financial institutions. The data contain personal identifiers for all borrowers making it possible to see all accounts held by all individuals in the Danish population and to link this information to other registers and, thereby, among other things, identify the parents of any account holder. In total, we have information about some 30 million loans held by about five million individuals over the period. Our primary indicator of financial trouble is whether an individual has defaulted on a loan, defined as being more than 60 days behind with payments on the loan at the end of the year. According to this definition, about five percent of the adult population are in financial trouble in any given year.

We provide three sets of results, which are presented in Sections 4, 5 and 6. Section 4 shows some stylized facts documenting a strong intergenerational link in the propensity to get into financial trouble. The starting point is the basic intergenerational relationship displayed in Figure 1. It shows the share of individuals in financial trouble in 2011 plotted by their age and stratified by whether the parents are in financial trouble or not. The figure shows, for example, that the share of 30 year old individuals in financial trouble is 5 percent among those whose parents are not in financial trouble, while it is 23 percent for the group whose parents are recorded as being in financial trouble. These effects are very precisely estimated as evidenced by the tight confidence intervals.

Figure 1: Default propensity by age and by parental default status



Notes: The figure shows the mean default rate surrounded by 95% CIs for each age group in 2011. Standard errors are clustered at the child level. Each age group is categorized into two groups according to parental default in 2011. An individual is defined as being in default if having at least one delinquent loan at the end of the year. Obs: 2,533,969
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.

The nonparametric age relationship shows some remarkable features: The intergenerational correlation is apparent soon after children turn 18 years old and become legally eligible to establish debt. The default rates for both groups increase until the late twenties and are then almost constant at 22-23 percent for individuals with parents in default and at 4-5 percent for individuals with parents not in default. Thus, the probability of being in financial trouble is more than 4 times higher for those with parents in financial trouble. This relationship holds when using alternative measures of financial trouble, it exists at all levels of middle school grade point averages of the individuals, and at all income levels of the parents. This indicates that the intergenerational correlation in financial trouble is not simply driven by an intergenerational correlation in ability levels.

Section 5 explores factors that may explain the intergenerational persistence in financial trouble.

We use basic theory to show that three mechanisms are potentially able to explain the intergenerational correlation in financial trouble: people have different financial behavior and this is transmitted across generations (financial behavior); shocks faced by children and parents are correlated (common shocks); children and parents pool resources and insure each other against adverse shocks (resource pooling). Our empirical strategy is to provide a series of tests to screen for each of these factors in order to piece together an overall understanding of the importance of transmission of financial behavior for explaining the observed intergenerational correlation in financial trouble.

As a first test of the common shock hypothesis, we reproduce the intergenerational correlation in Figure 1, but measure parental default seven years earlier than child default. The graph is almost identical to Figure 1. If contemporanous arrival of temporary shocks to both parents and children is important then we should observe that the intergenerational correlation attenuates when introducing a difference in the time of measurement. Hence, this result does not provide support for the common shock hypothesis. Our analysis is not able to rule out the possibility of long-lasting shocks, say health shocks, that lead to permanent reductions in income, that are correlated across generations, but it indicates that common shocks at the business cycle frequency are not likely to be the underlying reason for the intergenerational correlation. This conclusion is supported by the results from an event study where we consider severe unemployment shocks. We focus on unemployment shocks as an example because they are quantitatively important, i.e. they appear frequently in the population and often have serious consequences for the household economy. As expected an unemployment event causes a drop in disposable income and a rise in the default propensity of the individual. However, critically, the unemployment event is not associated with any change in the income or default propensity of the parents. This shows that parents and children do not face contemporaneous unemployment shocks that cause both to end up in financial trouble.

The hypothesis of resource pooling implies that parents transfer resources to their children when the children are hit by an adverse shock. In the context of the unemployment event study, we observe a drop in financial wealth of the individuals experiencing unemployment, but do not detect any significant change in the financial wealth of the parents. The strong intergenerational persistence in financial trouble is also robust to controlling for other major life events such as family instability and health events. These findings jointly indicate that common shocks and resource pooling are unlikely to be the main drivers of the intergenerational correlation in financial trouble.

In order to learn about the role of transfer of financial behavior across generations we pursue two stragegies. The first strategy is inspired by standard consumption-savings theory (Deaton 1991, Carroll 1997), which predicts that impatient and risk-willing individuals tend to persistently hold low levels of precautionary savings relative to their permanent income. Based on this insight, we exploit information about historical holdings of financial assets of parents over a ten-year period observed almost two decades earlier (1987-1996). The idea is that the historical asset path of the parents serves as a proxy for parental financial behavior and is by construction orthogonal to recent random shocks that may drive parents into default. We show that the historical asset holdings of the parents is a strong predictor of parental default in 2011, and when using it as an instrument for parental default in 2011, the estimates of the intergenerational correlation in financial trouble become considerably larger. This method cannot distinguish between fixed differences in behavioral types and very persistent or permanent shocks occuring before 1997 and affecting default propensities in 2011, but it filters out the impact of shocks occuring after 1997. Thus, it indicates that persistent differences in financial behavior passed on from generation to generation are important for observed financial trouble. Under certain assumptions, it is possible to show that about half of the variation in defaults across individuals is due to persistent differences in financial behavior, and that 30 percent of the behavioral component is transferred across generations. This suggests that transfer of persistent financial behavior is quantitatively important.

The second strategy is to elicit key preference parameters, using established survey instruments, for a small subset of the population and link this data at the individual level to our register data in order to analyse whether financial trouble is correlated with preferences. We find that elicited preference parameters are correlated across generations and that they predictreal-life financial trouble in the register data for both parents and their children. This evidence is consistent with the existence of persistent differences in financial behavior that are passed on from generation to generation. Overall, the different pieces of evidence collectively point towards the transfer of financial behavior as an important factor in explaining the intergenerational correlation in financial trouble.

Section 6 analyses whether the intergenerational dependency in default rates is incorporated in the interest rate setting on loans. To do this we select out all loans for persons who were not in default on any loan in 2004 and divide them into groups of loans carrying the same interest rate and subdivide each of these groups into two subgroups dependent on whether the parents are in default or not in 2004. We then follow the loans of the individuals and compute the share of the loans in each group that become delinquent at some point during the period 2005-2011. The evidence shows that the loan specific interest rates predict defaults and, more importantly, that the default rate within each group of loans carrying the same interest rate is substantially higher for the group where the parents are in default. This indicates that the market for personal loans is characterized by the existence of an interest rate externality where individuals with parents who are not in default on avergae pay an interest rate penalty to cover the losses incurred by individuals who default because they have adopted the financial behavior of their parents.

The next section describes how the results relate to existing literature. Section 3 describes the data and the institutional environment. Sections 4 to 6 present the results. The final section provides some concluding remarks.

2 Relationship to existing literature

The objective of this paper is to study a new source of persistent heterogeneity that is important for describing why people end up in financial trouble. Our agenda and results are related to different strands of literature. Perhaps the most closely related work is a recent study by Kuhnen and Melzer (2017) using data from the National Longitudinal Survey of Youth (NLSY) to show that self-efficacy measured during childhood predicts differences in the likelihood of being in financial distress in adulthood. This is remarkable because it shows that financial distress is related to factors measured very early in life, and is consistent with our finding that financial distress is related to very persistent factors. Consistent with these results Parise and Peijnenburg (2016) and Gathergood (2016) find that individual level noncognitive abilities are predictive for ending up in financial distress, highlighting the importance of personal traits in determining financial decision making.

Our results are also related to the literature using survey and experimental methods to elicit preference parameters. This literature has demonstrated significant heterogeneity in risk preferences (e.g. Bruhin et al. 2010) and also a strong correlation in risk preferences across generations (e.g. Alan et al. 2017, Dohmen et al. 2012, Kimball et al. 2009). Our evidence on intergenerational preference correlation is consistent with these results. People who characterize themselves as risk tolerant are more prone to be in financial trouble than individuals who characterize themselves as risk averse. The intergenerational correlation in financial trouble that we document may, therefore, be linked to intergenerational transmission of preferences. A related literature has documented that preference heterogeneity is needed in order to rationalize the observed heterogeneity in consumption and wealth levels across individuals (e.g. Alan and Browning 2010, Carroll et al. 2017, Bozio et al. 2017). Because preferences are thought to be relatively fixed throughout adulthood, this is consistent with the persistence of financial trouble in our study.

An extensive literature has studied intergenerational correlation in income, education and many other economic outcomes (see surveys in Solon 1999 and Black and Devereux 2011). We find strong intergenerational linkages in financial trouble , also after controlling for school grade point average, education and income of children and parents. This suggests that the intergenerational correlation in financial trouble does not simply reflect a correlation in ability levels, but may be related to a correlation across generations in behavioral factors. Our results are also broadly related to recent papers studying intergenerational wealth correlations. For example, Fagereng et al. (2015) find that being raised by parents taking more financial risk makes adoptees engage in risky behavior in financial decision making. Relatedly, using Swedish adoption data Black et al. (2017) find that stock market participation is correlated across generations. The results from both these studies point to nurture being the most imprortant driver of the intergenrational correlation in wealth and stock market participation. Considering a different outcome our results also suggest an important role for transfer of behavior across generations, but our research design does not allow us to enter the nature versus nurture debate.

We present a theory pointing towards the possibility of risk sharing between parents and children as one potential explanation of the intergenerational correlation in financial trouble. Our empirical evidence does not provide strong support for this effect. This is in line with results from other studies of risk sharing. Altonji et al. (1992) investigate whether US households in the Panel Study of Income Dynamics (PSID) exhibit intergenerational risk sharing. They find that parental resources do not break the link between variations in income and the food consumption of their children, thus providing evidence against intergenerational risk sharing. Attanasio et al. (2015) reach the same conclusion of no risk sharing within extended families observed in the PSID. Kolodziejczyk and Leth-Petersen (2013) find no evidence of risk sharing on Danish data when examining whether parents help out their children in a situation where they are likely to be in particular need, namely when they have just bought their first house, have a very small liquidity buffer, and are exposed to unemployment.

Finally, our topic is related to the empirical literature studying consumer delinquency and bankruptcy, which has focused on the the importance of adverse shocks, such as unemployment, health events and divorce, strategic motives in relation to bankruptcy arrangements, and default costs as drivers of defaults on loans (Agarwal and Liu 2003, Agarwal et al. 2003, Fay et al. 2002, Gross and Souleles 2002). The conclusions from this literature are mixed, but there appears to be a consensus that adverse shocks can only explain some part of the default events. Generally, this literature has little to say about why some people end up in financial trouble while others do not. Consequently, little is known about the characteristics of those who end up in financial trouble apart from credit scoring and characteristics of the loan as observed by banks. Our study adds by documenting that financial trouble is also influenced by persistent financial behavior.

3 Description of institutional environment and data

3.1 Measurement of financial trouble and the Danish institutional environment

We define a person as being in financial trouble if having made insufficient payments to service debt obligations. We think of this 0-1 outcome as being a result of (ex ante) financial behavior/risk willingness and (ex post) adverse shocks. This is formalized theoretically in Section 5.

In practice, the measurement of default and the degree of risk-taking also depend on the institutional setting. The Danish tax law requires all banks and other financial intermediaries offering interest-bearing personal loans to report to the Danish Tax Agency (SKAT), for each loan of each individual, whether the person has defaulted on the loan, defined as being at least 60 days late with payments on the loan at the end of the year.[1] This is our primary measure of financial trouble on which we have obtained detailed longitudinal data for the period 2004-11 from the Danish Tax Agency. The records are collected annually and contain all loan accounts of all Danes and also contain information about the level of debt on each account at the end of the year and the interest payments accrued during the year. The Danish tax authorities collect this third-party information to crosscheck whether tax deductions for interest payments are correct and to estimate changes in net-wealth, which is used in the process of selecting taxpayers for audit (see Kleven et al. 2011). The information on loan balances allows us to work with different degrees of severity of financial

[1] Bank regulatory systems work with different definitions when defining performing and non-performing loans. According to the Bank for International Settlements, for banks to be advanced and use risk weights "Banks must be able to access performance in formation on the underlying pools on an ongoing basis in a timely manner. Such information may include, as appropriate: exposure type; percentage of loans 30, 60 and 90 day past due ..." (BIS 2014 p. 13). For banks using the standardised approach "Delinquent underlying exposures are underlying exposures that are 90 days or more past due ..." (BIS 2014 p. 26).

trouble by, for example, confining our default definition to delinquencies on large loans.[2]

To corroborate our main analysis based on loan defaults, we also study another measure of financial trouble based on other data obtained from the two credit bureau companies—Experian and Debitor Registret—that specialize in running files on bad payers in Denmark. A person is recorded in these files if a creditor, e.g. a bank or a shop, has reported him as not having fulfilled payment obligations. There are regulations about who can be recorded in these registers and for how long time, and other potential creditors can then buy access to these files to verify that a potential new customer is not in the bad payer files.[3] Being recorded in the register effectively removes the possibility of obtaining new loans or credit (at least in the short run) and it is therefore a signal of severe financial trouble. We have gained access to a snapshot of the persons registered in 2009, which has been collected by the Danish Ministry of Economics and Business (Økonomi- og Erhvervsministeriet 2010).

The bankruptcy system in Denmark, as in many continental European countries, is creditor-friendly compared to the US (Livshits et al. 2007). In year 2011, about 1,500 individuals were granted personal bankruptcy (Domstolsstyrelsen 2011), corresponding to 1 out of 3,000 of the adult population (18+ years), and even when bankruptcy is granted it can be associated with wage garnishment for up to five years. In this system, where debt discharge is rare, people may stay in financial trouble for a long time if they continue not to service their debt obligations.

3.2 Other data, sample selection and summary statistics

All Danes have a unique personal identification number (CPR), and our data sets on financial trouble include this identification number of the account holder. This enables us to link the data to the population register and, thereby, link individuals to their parents. We also link the data to the income-tax register and other public administrative registers giving information about labor market history and about annual income and level of wealth going back to 1987. These data have also been used in previous studies of household financial behavior (Leth-Petersen 2010; Chetty et al. 2014). By virtue of being based on administrative records for the entire population there is no attrition

[2] As the data is collected for tax-purposes, it does not hold any information about the type of loan or credit except that mortgage loans can be identified because they are supplied in separate files. Neither does the data contain information about whether default has been associated with any punishment, for example a fee, or information about internal credit scoring used by the banks or information about personal bankruptcy.

[3] People can be recorded in the files if they have received at least three reminders and a letter warning that they will be recorded in the file if they do not pay their dues. People can at most be recorded in the files for five years for each missing payment.

apart from what derives from death and migration.

We consider all individuals who are 18-45 years old in the sample period 2004-2011 and with at least one living parent. We organize the data so that each unique parent-child-year cell provides the unit of observation. This implies that for a child with two parents, there will be a child-mother and a child-father observation for each year. If parents are divorced and have found new partners then we do not consider the new partners.

Table 1 presents summary statistics for the sample. There are 28,027,610 unique parent-child observations in our data set, and 5 percent of the children and 6 percent of the parents are recorded as having defaulted on unsecured loan payments during the data period. Very few are recorded as having defaulted on a mortgage loan. The default risk on Danish mortgage loans is generally low due to credit screening based on the availability of collateral and the ability to service the loan, first lien status, a maximum loan-to-value ratio of 80 percent of the house value when taking up the mortgage loan, as well as several other regulatory features (see Jensen et al. 2015 for a more detailed description of the Danish mortgage system). Therefore, default and foreclosure on mortgage loans are not so common in Denmark and were less of a problem during the recent financial crisis than in many other countries as described by Campell (2012).

Danish households generally have a high level of debt compared to many other countries (IMF 2012), which may reflect a low need for precautionary savings due to a high universal public pension benefit level, substantial labor market pension savings, and an extensive social safety net. The average level of bank debt is DKK 118,747 (median DKK 39,677), and the average level of mortgage debt is DKK 321,718.[4] Debt is highly unequally distributed as is witnessed by the significant differences between average and median debt levels. Individuals who are recorded as defaulters on unsecured debt have a higher level of bank and credit card debt, on average, but they have less mortgage debt reflecting that they are more likely to be renters. While highly unequally distributed, the mean balance on defaulting accounts is economically significant at DKK 190,367, suggesting that defaults are not confined to small loans only.

In a sub-analysis we use information about the grade point average (GPA) obtained in middle school (9$^{\text{th}}$ grade). The school grades are only available for people completing middle school in 2001/2002 or later. When we use this information, we confine the sample to those cohorts where the information is available.

[4]The exchange rate has been in the range 5-6 DKK per USD in the period from 2004 to 2011.

Table 1: Summary statistics for full sample 2004-2011

	Mean	Median	SD
Main persons			
Default on bank/credit card debt (d)	0.05	0.00	0.21
Bank/credit card debt	190,367	126,807	204,702
Delinquent bank/credit card debt	84,768	43,071	129,577
Default on mortgage (d)	0.00	0.00	0.02
Bank/credit card debt	118,747	39,677	192,169
Mortgage debt	321,718	0	500,447
No. of bank/credit card loans	3.08	3.00	2.83
No. of mortgages	0.61	0.00	0.90
Financial assets	68,363	18,675	146,657
Homeowner (d)	0.40	0.00	0.49
Housing assets	420,798	0	662,247
Affected by unemployment (d)	0.05	0.00	0.22
Age	31.99	32.00	8.17
Female (d)	0.51	1.00	0.50
Gross income	294,264	282,128	185,004
College degree (d)	0.22	0.00	0.42
Married or cohabiting (d)	0.57	1.00	0.50
No. of children	0.99	1.00	1.15
Number of individuals		2,501,088	
Number of observations		28,027,610	
Parents			
Default on bank/credit card debt (d)	0.06	0.00	0.24
Bank/credit card debt	253,963	168,718	265,344
Delinquent bank/credit card debt	130,133	63,812	194,468
Default on mortgage (d)	0.00	0.00	0.02
Bank/credit card debt	113,748	12,670	207,106
Mortgage debt	307,568	0	492,264
No. of bank/credit card loans	2.49	2.00	2.83
No. of mortgages	0.72	0.00	1.01
Financial assets	181,834	44,957	365,578
Homeowner (d)	0.53	1.00	0.50
Housing assets	708,752	418,500	945,381
Affected by unemployment (d)	0.03	0.00	0.18
Age	58.35	58.00	10.54
Female (d)	0.56	1.00	0.50
Gross income	315,883	285,405	181,170
College degree (d)	0.19	0.00	0.39
Married or cohabiting (d)	0.75	1.00	0.43
No. of children	2.56	2.00	1.08
Number of individuals		1,802,251	
Number of observations		25,194,524	

Notes: All amounts in 2011-DKK. A dummy variable is denoted by (d).
Sources: Loan register from the Danish Tax Agency (SKAT) and various registers from Statistics Denmark.

Administrative data lack subjective information about financial behavior and attitudes that may help explain why some people are in financial trouble while others are not. In order to learn whether key preference parameters are correlated with the propensity to get into financial trouble, we issued a survey to 1,748 individuals in January 2014, where we asked people about their own preferences (risk willingness, patience and impulsivity) and the preferences of their parents using established survey questions. We merge these data at the individual level to the administrative register data described above and investigate in Section 5.2.2, whether the subjectively stated preference indicators correlate with our measures of financial trouble from the administrative registers.

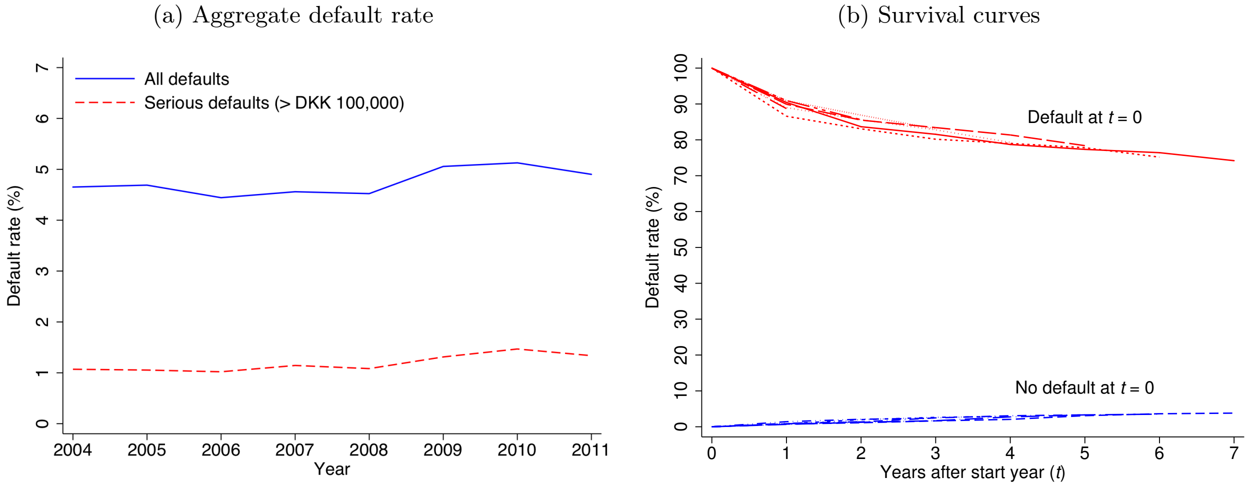
4 Financial trouble: Basic facts and correlation across generations

The solid line in Panel A of Figure 2 shows the development over time in the share of 18-45 year old people who are registered as having defaulted on a loan payment. It shows that the aggregate default propensity is relatively constant over the period at a level of about 5 percent, with the level being somewhat lower before 2008 and a little higher afterwards with a difference of about 0.5 percentage points. Thus, the default rate increased after the financial crisis, but the change is moderate. In particular, it seems difficult to rationalize the reasonably stable level of defaults with a theory of financial trouble based only on adverse shocks to unemployment, income and asset prices, which have fluctuated substantially over the period. White (2007) makes a similar point in the context of personal bankrupticies in the US in the 1980s and 1990s.

The broken line in Panel A shows the aggregate propensity to default on large loans with a balance of at least DKK 100,000. The level of default is obviously smaller, but at a level of about 1 percent it is still significant. This shows that defaults are not concentrated only on small and insignificant loans.

The stable default rate in Panel A may reflect a high flow of individuals defaulting on a loan each year and quickly moving out of the default state again, or it may reflect a high persistency with people being in default for many years and only few people moving across the two states. In Panel B of Figure 2, we follow the default propensities of individuals over time. Specifically, we identify individuals who were in default/not default in a given year and then follow them forward as long as we can. For example, the upper solid line starting at 100 percent in 2004 follows individuals who were in default in 2004 and plots the fraction of this group of individuals who are in default in the

Figure 2: Aggregate default rate over time and persistence in default



Notes: Panel A shows the development over time in the aggregate default rate for people of age 18-45 in each year. Along with the overall default rate the graph shows the default rate when default only counts for loans with a loan balance>DKK 100,000. For both categories the individual is defined as being in default if defaulting on at least one loan with the given characteristics. Obs: 2,501,088. In Panel B individuals are grouped by their default state in the initial year, 2004-2010, and followed until 2011. The curves in the top of the panel show the default rate for people who were in default in the initial year, while the curves in the bottom show the default rate for people who were not in default in the initial year. Default status can be tracked for 7 years using 2004 as initial year down to 1 year when using 2010 as initial year. Each curve represents a given initial year. Obs: 1,743,743.
Sources: Loan register from the Danish Tax Agency (SKAT).

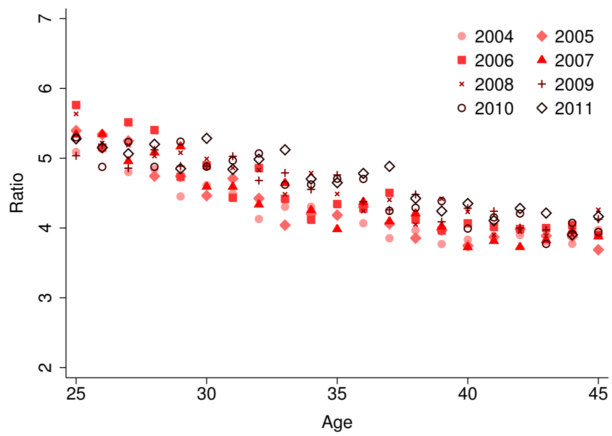
subsequent years. The graph shows that almost 3/4 of those who default on loan payments in 2004 are also defaulting on loans seven years later. Half of those who defaulted initially have defaulted on a different loan seven years later (not reported) showing that the persistency is not simply related to a single account.

The curves at the top of Panel B may be compared to the lower level curves showing the risk of defaulting for individuals who were not in default in the initial years. The solid curve shows that less than 5 procent of this group default on a loan seven years later. The large difference of around 70 percentage points after seven years, depending on the initial default status in 2004, shows that individual default rates are more persistent than the duration of standard business cycles. Note, finally, that all the curves at the top follow a similar pattern over time, as do all the curves at the bottom, showing that the degree of persistency is stable.[5]

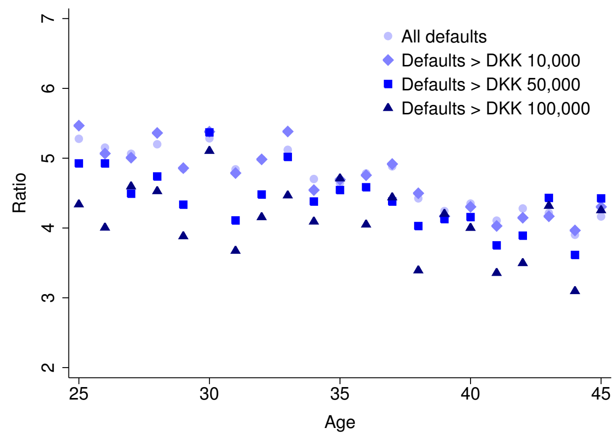
[5]Default rates are strongly correlated with birth weight within each cohort-gender combination. For example, for men who are 30 years old in 2011 the average birth weight is 110 gram lower for those who have defaulted on a loan in 2011 compared to those who have not defaulted. This shows that the high persistency in default rates reflects, at least to some extent, predetermined differences across individuals. It is well-known that birth weight is correlated with many economic outcomes (Currie 2011) and that many different explanations may underlie such correlations. The only point we want to make here is that some of the variation in financial trouble across individuals has to be

Figure 3: Intergenerational correlation by year and loan balance

(a) Ratio of default propensities by year



(b) Ratio of default propensities by loan levels



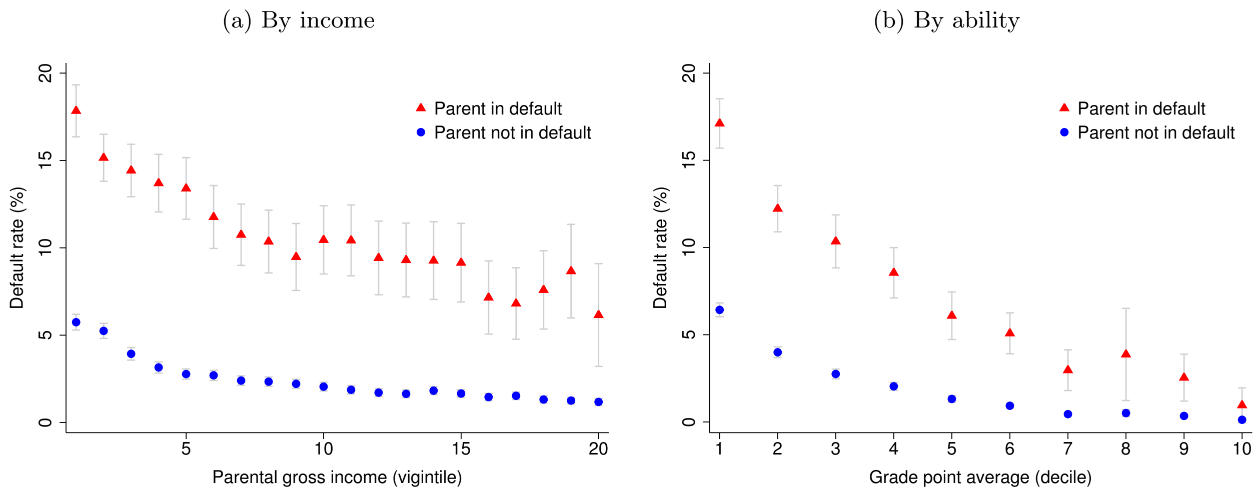
Notes: The graphs show the ratio between the default propensity for individuals where the parent is in default relative to the default propensity for individuals of the same age where the parent is not in default. In Panel A the ratio is calculated for each year, 2004-2011. Obs: 1,791,489. In Panel B the graph displays the ratio for defaulting at loan levels exceeding DKK 0, DKK 10,000, DKK 50,000 and DKK 100,000, respectively. The default loan level may reflect defaults on several smaller loans that, in total, add up to the defined amount. The default status for both the individual and the parent is measured in 2011 and the default loan level threshold applies for both parent and individual. Obs: 2,552,493. For the younger age groups, especially at high loan levels, the default rate is low and consequently the ratio is not well-defined. For this reason we display the ratio only from age 25 and up.
Sources: Loan register from the Danish Tax Agency (SKAT).

A strong kind of persistency exists if financial trouble is related across generations. Figure 1, discussed in the Introduction, documents a striking intergenerational dependency in the propensity to default. This relationship is stable. In Panel A of Figure 3, we plot the ratio of default for children with parents in default to children with parents not in default for each of the eight years in our sample. The ratio is quite stable across the years, starting at 5-6 for the youngest age groups and converging to a level of 4-5 from age 30. Panel B shows the ratio of defaults of the two groups when we vary the criteria for financial trouble by only including delinquency of large loans (≧ DKK 10k, 50k and 100k, respectively) in the definition of default. Along this dimension, the ratio is also stable at a level of 4-5. We find a similar intergenerational pattern when using the credit bureau files on bad payers, which is a different measure of financial trouble and from a different data source (see Appendix A). We therefore conclude that the intergenerational correlation in Figure 1 is not confined to the specific measure of financial trouble that we use throughout the paper.

Figure 1 shows that the intergenerational relationship appears soon after children turn 18 years old and become eligible to establish debt. We obtain the same result if we follow young individuals

predetermined.

Figure 4: Intergenerational correlation by income and ability



Notes: Panel A shows the default rate with 95% CIs for individuals aged 22-24 in 2011, grouped by parental default status in 2004 and by vigintile of average parental income over the period 1989-2003. Income vigintiles are constructed separately for each parental cohort. Obs: 276,254. Panel B groups the same sample by parental default status in 2004 and plots the average default rate within deciles of grade point averages (GPA) from the 9th grade graduation exam in Danish and Mathematics. Deciles of GPA are constructed separately for each cohort. Obs: 262,390. Standard errors in both panels are clustered at the child level. *Sources*: Loan register from the Danish Tax Agency (SKAT) and various registers from Statistics Denmark.

over time (not reported). This shows that the relationship is not driven by cohort effects. Moreover, if we restrict the sample to children and parents not living together, we also find the same pattern (not reported). This suggests that the intergenerational correlation is not simply the result of parents and children living together and deciding jointly on household finances.

It is natural to expect that financial trouble is related to income and cognitive ability, implying that our finding of an intergenerational dependency in financial trouble may just reflect the well-established intergenerational correlations in income levels and ability measures (Solon 1999, Black and Devereux 2011). In Panel A of Figure 4 we rank parents (within their cohort) by their average gross income in the five years leading up to 2004 binned into vigintiles, and plot the default rate by parental default status in 2004 within each vigintile of parental income.

As expected, the overall tendency for children to get into financial trouble is declining in parental income, i.e. children with more affluent parents tend to be less likely to get into financial trouble. However, the level of default is significantly higher for children with parents who are themselves in default, and this is the case for all levels of parental income. The ratio between the default rate of children with parents in and out of default is in the range 4-7, which is of the same magnitude as for the basic intergenerational correlation in Figure 1.

Panel B displays the default propensity against deciles of the middle school (9th grade exam) grade point average (GPA) of the child. We only consider the subsample who completed the 9th grade in 2001/2002 or later because we only have middle school GPAs available for this subsample. Previous studies have demonstrated that IQ and cognitive ability, in particular mathematical knowledge, predict financial distress, a lower incidence of mortgage delinquency, fewer mistakes in credit card usage and loan choices (Zagorsky 2007, Gerardi et al. 2013, Agarwal and Mazumder 2013, Stango and Zinman 2009). Our data also show that financial hardship is negatively correlated with cognitive ability, measured by middle school GPA. However, the graph also shows that children with parents in default are much more likely to be in default than other children at all levels of GPA. The difference exists for all cohorts, and is therefore not related to grade inflation, and it also exists when considering only grades from the math exam (results not reported).

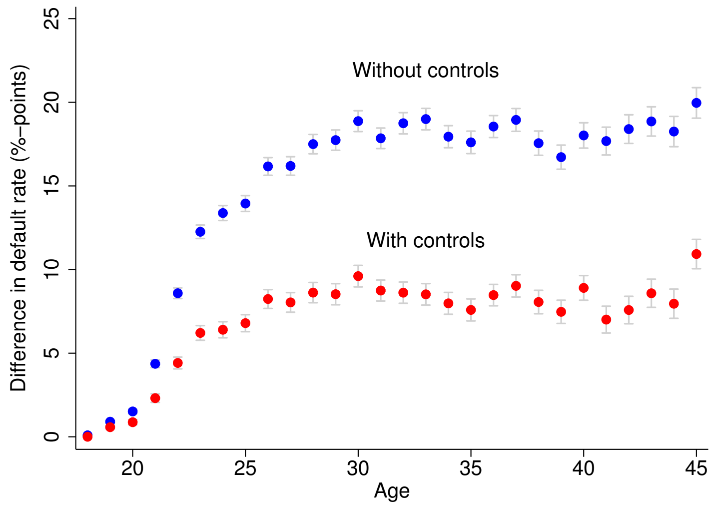
In Figure 5, we look at the difference in default rates between children of parents in default and children of parents not in default, before and after including a large number of control variables. We include dummy variables measuring the within cohort income decile of children and parents, respectively, the within cohort GPA decile of the child, college education of both child and parents, gender, parent cohort, region of residence and, finally, bank fixed effects.

The graph shows that 30 year old children with parents in default are, on average, 18 percentage points more likely to be in default compared to children without parents in default, corresponding to the vertical difference between the curves in Figure 1. After including all the controls, the difference is close to 10 percentage points. Thus, parental default is still a very strong predictor of child default showing that a major part of the intergenerational correlation in financial trouble is not captured through intergenerational transmission mechanisms related to income, education etc. Note, finally, that education and income may be related to preference parameters, which also determine financial behavior. If this is the case, the control variables may also be removing variation in default that is related to variation in behavior and preferences across people.

5 Factors that may explain intergenerational correlation in financial trouble

This section explores factors that may explain the finding of a significant intergenerational correlation in financial trouble. First, we provide a simple theory of financial trouble where the variation across individuals in defaults on loans may be due to both random shocks and persistent differences in risk

Figure 5: Intergenerational correlation with controls



Notes: The figure shows the difference in the mean default rate with 95% CIs in 2011 between individuals with a parent in default in 2011 and individuals with a parent not in default in 2011. The intergenerational relationship is shown with and without controls, where the included controls are within-cohort deciles of gross income (dummies), within-parental cohort deciles of parental gross income (dummies), within-cohort deciles of GPA for those cohorts where GPA is available (dummies), gender of individual and of parent (dummy), college education of individual and parent (dummy), residential region for individual and parent (dummy), parental cohort (dummies for 5-year intervals) and bank of child and parent (dummy). All control variables are measured in 2011. Standard errors are clustered at the child level. Obs: 2,533,844.
Sources: Loan register from the Danish Tax Agency (SKAT) and various register from Statistics Denmark.

taking behavior. The theory points to three possible explanations of intergenerational persistence in financial trouble. Afterwards, we provide empirical evidence on the relative importance of these three explanations of intergenerational persistence.

5.1 Basic theory

5.1.1 Distinction between adverse shocks and risky behavior

We consider a simple two-period model of individual consumption where c_1 and c_2 are the consumption levels in the two periods. Preferences are characterized by the utility function

$$u = (1+\theta)\, c_1 + c_2, \tag{1}$$

where $\theta \in (0,1)$ is supposed to capture the degree of impatience and risk willingness of the individual. More generally, it may also reflect behavioral biases and cognitive limitations leading to high risk taking behavior (Angeletos et al. 2003).

The interest rate is normalized to zero and the average income of an individual over the two periods is normalized to 1, implying that amounts of consumption and loan are measured in proportion to permanent income. The average (permanent) income is known to the individual but the distribution of income across the two periods is unknown when deciding consumption in the first period. The income realization in the first period is determined by a stochastic variable ε distributed on the domain $(0,1)$ according to the density function $f(\varepsilon \mid \theta)$ and the cumulative distribution function $F(\varepsilon \mid \theta)$. In this formulation, we allow the probability of income shocks ε to be related to the type parameter θ, reflecting that the risk type of an individual may also influence income risk, for example through job choices.

Consumption c_1 takes place at the beginning of the first period while income ε is received at the end of this period, with the remaining income equal to $2-\varepsilon$ being received at the beginning of period two. Consumption in the first period is therefore financed by borrowing the amount $\alpha \equiv c_1$ and the loan has to be repaid at the end of the first period. This implies that the individual defaults on the loan repayment if $\varepsilon < \alpha$. In this case, the person will have to repay the loan in period two and pay default costs. The cost of default is modelled as a resource cost but may also represent a utility loss from being in financial trouble. The expected consumption in period two of a type θ individual then becomes

$$c_2^e = 2 - \alpha - \int_0^\alpha (\alpha - \varepsilon) f(\varepsilon \mid \theta) \, d\varepsilon, \tag{2}$$

where the last term is the costs of default and where the cost per dollar of the delinquent loan is normalized to one unit of consumption in period two.

The individual maximizes expected utility, which is solved by inserting $c_1 = \alpha$ and c_2^e from eq. (2) into the utility function (1) and maximizing with respect to α. This gives the optimality condition

$$F(\alpha^*(\theta) \mid \theta) = \theta, \tag{3}$$

where $\alpha^*(\theta)$ denotes the optimal level of credit relative to permanent income of a type-θ individual. In this optimum, the probability of default equals $F(\alpha^*(\theta) \mid \theta)$ and the default risk of a type-θ individual therefore equals θ according to eq. (3). Thus, default is determined both by the degree of riskiness in behavior — captured by the latent risk type factor θ — and by adverse shocks — captured by the stochastic variable ε. Note that the risk type parameter θ fully characterizes the risk of default in this model, implying that the default risk is independent of the correlation between the distribution of income shocks and the risk type parameter embodied in $F(\cdot)$. For example, a higher risk of job loss due to a higher θ does not influence the probability of default, which is still θ.

The reason is that the individual responds to the higher risk of income loss by adjusting the amount of credit $\alpha^*(\theta)$.

The population consists of a continuum of individuals with risk types θ distributed on the unit interval according to a density function $h(\theta)$ and we assume shocks ε are idiosyncratic. The aggregate default rate of the population then becomes

$$d = \int_0^1 F(\alpha^*(\theta) \mid \theta) h(\theta) d\theta = \int_0^1 \theta h(\theta) d\theta. \tag{4}$$

The role of financial behavior and shocks in explaining the variation in observed defaults across individuals may be illustrated by considering two special cases of the model, both giving rise to the same aggregate default rate d: Shocks: All individuals are homogenous with $\theta = d$, in which case all the variation in defaults across individuals are caused by differences in the realization of shocks ε. Risk types: A share d of the population is characterized by $\theta = 1$ and the rest of the population is characterized by $\theta = 0$, in which case all the variation in defaults across individuals is caused by differences in risk taking behavior θ.[6] In the general case, the variation in defaults across individuals is due to both shocks and heterogeneity in financial behavior, and the relative importance of these two explanations is an empirical question.

5.1.2 Explanations of intergenerational correlation in financial problems

The simple theory described above points naturally to three possible explanations for why financial trouble may be correlated between parents and children:

#1 **Financial behavior**: Financial behavior differs across individuals and is transmitted from generation to generation. In the model, this corresponds to a correlation between θ_g and θ_{g-1}, and, therefore, in the choices of credit α_g^* and α_{g-1}^*, where g denotes the generation.

#**2a Common shocks**: Shocks faced by children and parents may be correlated, for example, because they have similar skills or sort into similar occupations, and because shocks vary across these characteristics. In the model, this corresponds to a correlation between ε_g and ε_{g-1}.

[6] Related to the business cycle variation in defaults shown in Figure 2, we may also consider the case where ε represents common shocks to all individuals—macro shock—instead of idiosyncratic shocks. In this interpretation, the Shock model described above predicts that the aggregate default rate switches between 0 and 1 over the business cycle with an average default rate of d. In contrast, the Risk type model predicts that the aggregate default rate stays constant at d over the business cycle. The observed moderate increase in the aggregate default rate following the Great Recession is consistent with the general model explaining variation in defaults by both shocks and heterogeneity in risk attitudes.

#2b Resource pooling: Generations may pool resources and insure each other against adverse shocks (or, related, parents may help children in financial trouble). For example, parents and children may jointly maximize a family utility function of the form $u_g + u_{g-1}$. In this extreme example, they only experience financial troubles if $\alpha_g + \alpha_{g-1} > \varepsilon_g + \varepsilon_{g-1}$, in which case both generations default at the same time, while in the opposite case none of them default.

The first explanation is based on heterogeneity and inheritability of financial behavior, while the two other explanations are related to income shocks. Each of the three explanations are distinct and may explain the intergenerational correlation in financial problems independent of the other explanations. For example, in the third explanation, individuals may have the same risk parameter θ and parents and children may face independent shocks ε, but defaults on loans become correlated because ressources are pooled within the family. On the other hand, the three possible explanations are not mutually exclusive and may complement each other in explaining the intergenerational correlation documented in Figure 1.

5.2 Empirical evidence

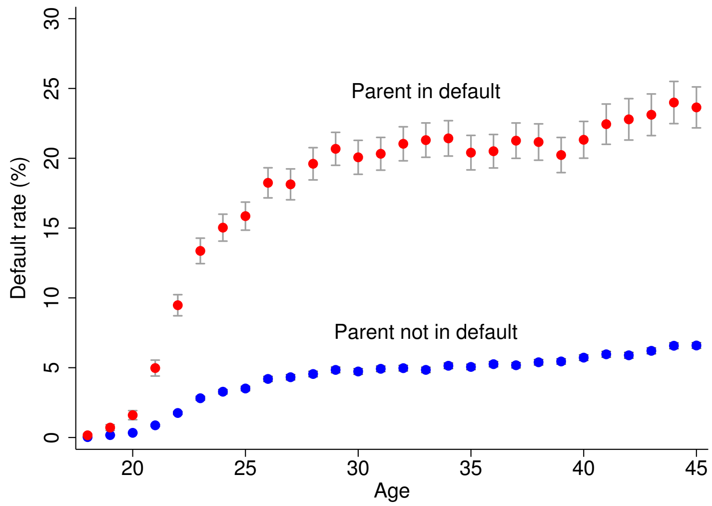
The theory of default operates with two causal factors, shocks and behavior, and motivates three channels through which default can be correlated across generations. In this section, we provide different types of evidence to shed light on the importance of the different channels. We exploit the longitudinal dimension in our data and use differences in the timing of default across children and parents to study the effects of severe unemployment shocks. We also use the longitudinal aspect of the data to construct proxies for financial behavioral types from historical levels of financial assets, and study how these predict current default patterns. Finally, we link the register data to survey data where we use standard questionnaire techniques to elicit key preference parameters, and analyse the correlation with financial trouble.

5.2.1 Common shocks and resource pooling

Different timing of default across children and parents

We start with a simple analysis where we reproduce the intergenerational correlation in Figure 1, but measure parental default seven years earlier than child default, that is we measure parental default in 2004 and child default in 2011. The result is illustrated in Figure 6 and provides the first piece of evidence related to the common shock hypothesis.

Figure 6: Default propensity in 2011 by age and by parental default in 2004



Notes: The figure shows the mean default rate surrounded by 95% CIs for each age group in 2011. Each age group is categorized into two groups according to parental default in 2004. Standard errors are clustered at the child level. Obs: 2,649,161
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.

The idea is that if contemporaneous arrival of temporary shocks to both parents and children is important, then we should observe that the intergenerational correlation attenuates when introducing a difference in the time of measurement. For example, if consequences of shocks die out over a seven-year period then we should not see any intergenerational correlation. As is evident from the figure the pattern is almost identical to Figure 1, which suggests that contemporaneous transitory shocks are not a main driving factor behind the intergenerational correlation. This evidence does not exclude the possibility of long-lasting shocks, say permanent reductions in income because of health shocks, that are correlated across generations, but the result shows that shocks at business cycle frequencies are not crucial in understanding the intergenerational correlation.

Unemployment event analysis

Next, we look directly at the consequences of shocks. We focus on unemployment shocks, which may have large, unanticipated economic consequences at the individual level without being rare events. In addition, this type of shock is well identified in our data, which contains the unemployment histories for all individuals.

Our approach is very similar to the classical unemployment event study by Jacobson et al. (1993). We consider individuals experiencing unemployment shocks in 2007, 2008 and 2009 (event year t), respectively, defined as an unemployment spell of at least three months, and we consider only individuals who are employed, and without any unemployment spells in the five years up to the unemployment shock (t-5, t-4,...,t-1).[7] This will be our treatment group. The control group consists of individuals who are employed, and without any unemployment spells in the five years up to time t, and who do not experience any unemployment shock in the event year t. We select people who are 18-38 years old five years before the shock $(t-5)$ and follow them up to two years after the shock $(t+2)$. For this balanced panel, we study the impact of the unemployment shock on the disposable income, the default propensity and the financial wealth of both children and parents. All amounts are index-adjusted to 2009-DKK by computing $x_{y,c,i} * \bar{x}_{2009,c}/\bar{x}_{y,c}$, where $x_{y,c,i}$ is the original amount for individual i in cohort c observed in year y, $\bar{x}_{2009,c}$ is the sample average of cohort c in year 2009, and $\bar{x}_{y,c}$ is the sample average of cohort c in year y.

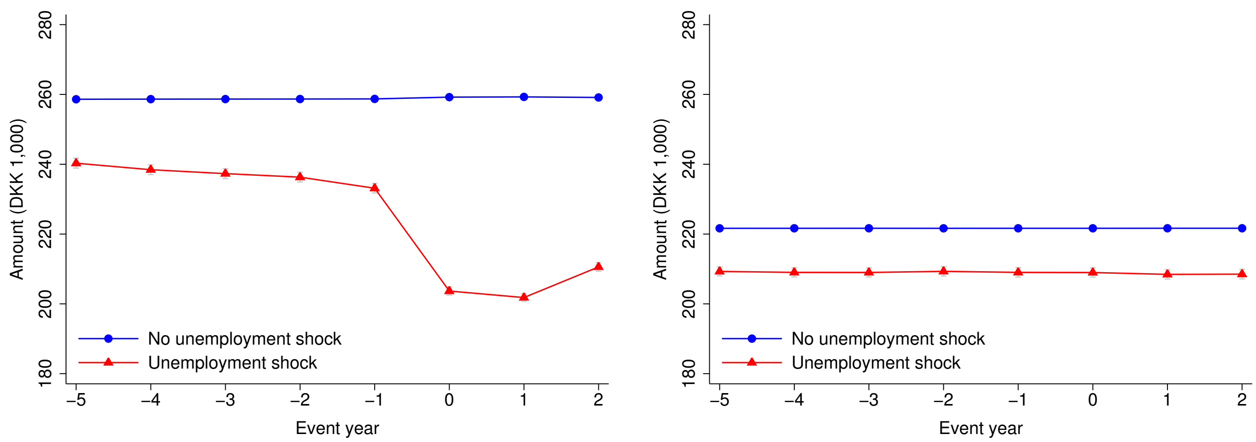
Figure 7 displays the impact of the unemployment shock on the disposable income of children (Panel A) and parents (Panel B). The curves are almost flat for the control group in the two diagrams. This is a consequence of the index-adjustment and of the fact that the control group is big compared to the treatment group. Individuals who become unemployed have a lower overall income level, as seen by the graph for the treatment group, and the gap between the treatment and control group increases a little over time. It is also clear that disposable income drops considerably at the unemployment event. However, the drop in disposable income of around DKK 40,000 in Panel A is considerably lower than the drop in gross earnings, which is around DKK 125,000 (see Appendix B) because of the insurance incorporated in the tax-benefit system. When looking at the graphs for the parents in Panel B, we see no change in disposable income around the time children become unemployed. There is thus no indication that the children and parents are hit by shocks at the same time.

In Figure 8, we analyse the effect on the default propensity by looking at the difference in default rates between the treatment and control group. Panel A indicates that the default rate of the children increases after the unemployment shock by about 1.5 percentage points but also that these individuals already have a 2 percentage point higher default rate before the event. This may be related to type-heterogeneity across people leading both to differences in the default propensity and to differences in the risk of unemployment, as described in the theory section. The graph in Panel B, displaying the default rate of parents, is almost completely flat. Thus, we do not find any

[7] Some of the unemployment shocks may be anticipated by the individuals. We are unable to use plant closures as a way to better isolate unanticipated shocks because of its low frequency.

Figure 7: Effect of child unemployment on disposable income

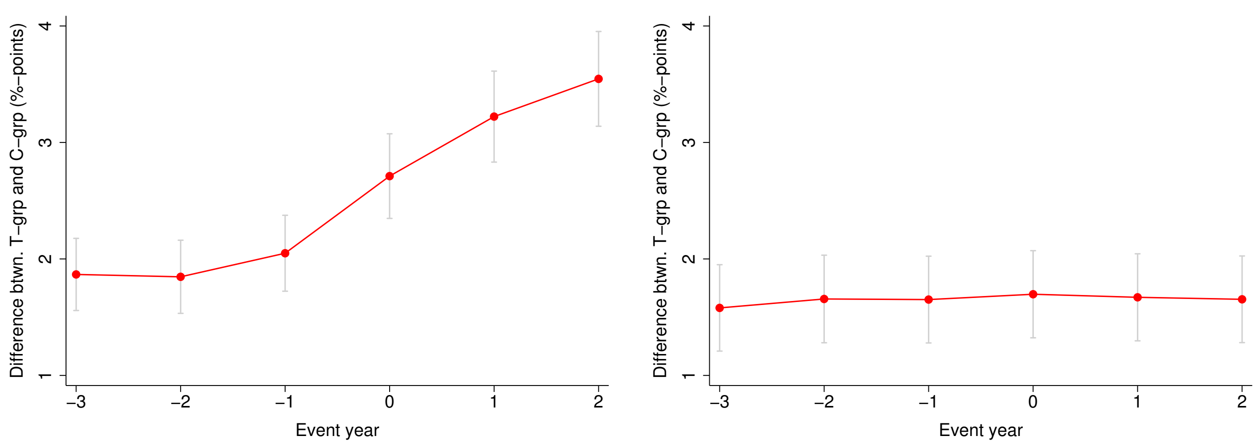
(a) Child (b) Parent



Notes: Panel A shows the annual disposable income with 95% CIs for the T-group and the C-group. The T-group consists of individuals affected by more than 3 months unemployment in year 2007, 2008 or 2009 ($t = 0$), who were employed and not affected by any unemployment in any of the five years prior to the shock and of age 18-38 five years before the shock. The same selection criteria are used for the C-group with the exception that they have experienced less than 3 months of unemployment in the event year. This gives 12,384 individuals in the T-group and 1,399,746 individuals in the C-group. Individuals with missing parental information in any year 2002-2011 are excluded from both groups. The C-group is reweighted to account for age asymmetries between the two groups and to give each shock year the same weight in the pooled regression. All amounts are index-adjusted to 2009-DKK by computing $x_{y,c,i} * \bar{x}_{2009,c}/\bar{x}_{y,c}$, where $x_{y,c,i}$ is disposable income for individual i from cohort c in year y, $\bar{x}_{2009,c}$ is the sample average of disposable income for cohort c in year 2009, and $\bar{x}_{y,c}$ is the sample average of disposable income for cohort c in year y. Panel B shows the annual disposable income for parents of individuals in the T-group and parents of individuals in the C-group. In both panels standard errors are clustered at the child level.
Sources: Loan register from the Danish Tax Agency (SKAT) and population and income register from Statistics Denmark.

Figure 8: Effect of child unemployment on propensity to default

(a) Child (T-group – C-group) (b) Parent (T-group – C-group)



Notes: The graphs show the difference in the default rate, with 95% CIs, between the T-group and the C-group (Panel A) and the difference in the default rate between parents of the T-group and parents of the C-group (Panel B). The construction of the two groups is described in the notes to Figure 7. In both panels standard errors are clustered at the child level.
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.

evidence indicating that children and parents simultaneously start defaulting on loans when children are hit by unemployment events. To summarize, none of our evidence points to common shocks as the main reason behind the intergenerational correlation in default.

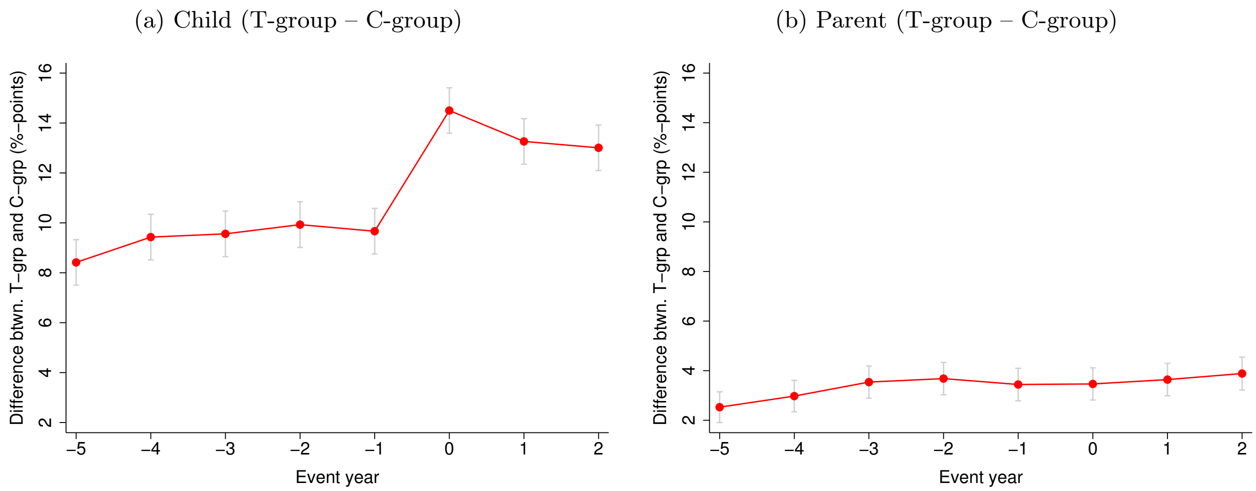
The resource pooling hypothesis implies that parents transfer resources to their children if they are hit by a shock and the parents have the means to help. To measure whether parents help out their children, we construct a dummy variable taking the value one if parental financial wealth amounts to less than one month of disposable income where disposable income is calculated as an average over five years of disposable income before the unemployment event. If parents help out their children then we should expect to see an increase in the fraction of parents with a low ratio of financial wealth to income.[8] For comparison, we do the same for the children.

The results are displayed in Figure 9, which plots the share of individuals with low financial wealth in the treatment group relative to the control group over time. It shows that the share of children with low financial wealth is 9-10 percentage points higher in the treatment group during the five years leading up to the unemployment event, and a similar relationship—although not as strong—occurs for parents. More importantly, we observe a significant increase of more than 4 percentage points in the share of children with low financial wealth after the unemployment shock, but do not observe a similar increase for parents, as we might have expected if significant resource pooling takes place.

In Appendix B, we provide a number of sensitivity analyses: (*i*) We examine the consequences of more severe unemployment shocks. (*ii*) We investigate whether the results change if we use a two month income threshold for the definition of low financial wealth. (*iii*) We restrict the sample to parents not in default at any time and who should therefore be more able to help their children financially. (*iv*) We investigate the sensitivity of the results to using pooled resources of the parents instead of looking separately at each child-parent pair. (*v*) We investigate whether the share of child financial wealth drops in proportion to the sum of child-parent financial wealth. The results from these cases confirm our previous conclusion of no evidence in favor of strong resource pooling effects. This conclusion also aligns with other studies as described in Section 2.

[8] Wealth measures are generally noisy and wealth is very unequally distributed across the population. This makes it difficult to obtain precise estimates using the raw wealth data, which is the reason for using a threshold approach. This has also been done in the empirical consumption/savings literature, where it is common to use a threshold approach (see for example Chetty et al. 2014). In Appendix B, we display the results from using two months of disposable income as the threshold, which gives the same results.

Figure 9: Effect of child unemployment on propensity to hold low levels of financial wealth



Notes: Panel A shows the difference, surrounded by 95% CIs, between the T-group and the C-group in the probablity of having less financial assets at the end of the year than what corresponds to one month's worth of the individual's average disposable income in the five years preceding the shock year. Financial wealth is the sum of stocks, bonds and bank deposits. All amounts in the calculation are indexed as described in the notes to Figure 7. Panel B shows the difference between parents of the T-group and parents of the C-group. Construction of T-group and C-group is described in the notes to Figure 7. In both panels standard errors are clustered at the child level.
Sources: Population and income register from Statistics Denmark.

In the event analyses, we have focused on unemployment shocks because unemployment occurs relatively frequently and has important implications for the household economy. Other important life events such as adverse health shocks and family break-ups may also put households finances under strain. In Appendix B we show that the intergenerational correlation shown in Figure 1 is virtually unaffected even when individuals experiencing unemployment, unstable family patterns or adverse health events are left out of the sample. This indicates that the common shock and resource pooling hypotheses are unlikely to be the main underlying explanations for the observed intergenerational correlation in financial trouble.

5.2.2 Financial behavior

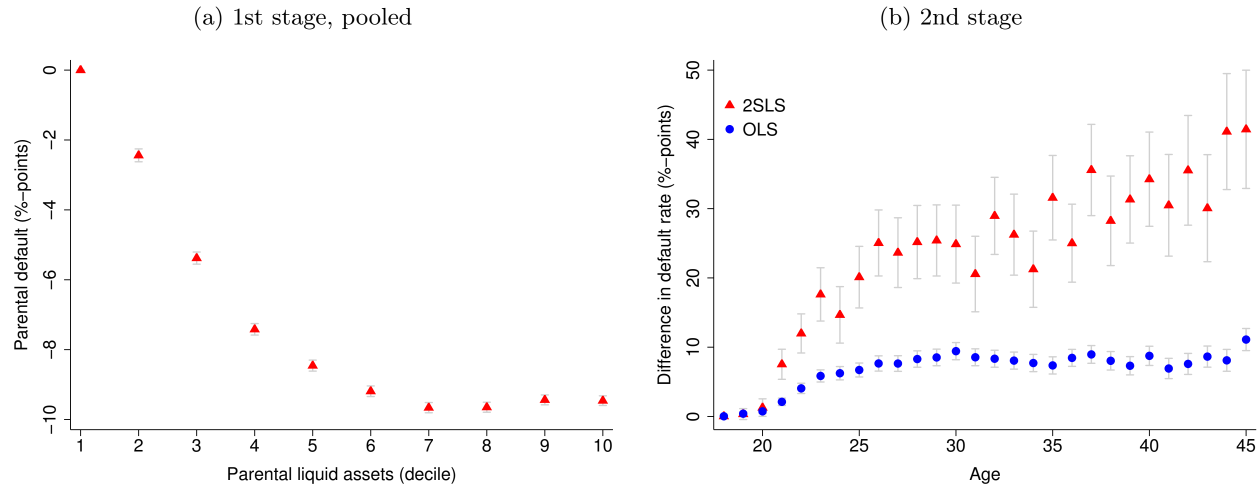
Historical financial behavior of parents

In this section, we exploit information about parents' historical holdings of financial assets over an extended period of time in the past as a proxy for differences in financial behavior of parents in order to classify parents into different behavioral types (θ in the theory). Standard consumption-savings models (Deaton 1991, Carroll 1997) suggest that impatient and risk-willing individuals tend to persistently hold low levels of precautionary savings relative to their permanent income. Consistent with these models, empirical studies have found that people with low levels of precautionary savings, measured by financial assets relative to income, exhibit stronger spending responses to stimulus policies (e.g. Johnson et al. 2006, Leth-Petersen 2010). Building on these insights, we construct an estimate of the intergenerational correlation where we instrument parental default in 2011 with a measure of the financial asset path in the period 1987-1996. The parents are on average 35 years old at the beginning of this period and 44 years old by the end of the period, meaning that the instrument is measured at a phase in life where financial assets and income are expected to be relatively stable. Specifically, we construct the instrument by calculating the ratio of financial assets to average disposable income for the parents for each of the years 1987-1996, and then divide the parents into behavioral types based on the within-cohort decile they belong to with respect to their average asset-income ratio over the ten year period. By predicting parental default using the financial asset paths observed almost two decades earlier, we are attempting to isolate the part of parental default that is related to (persistent) behavioral differences rather than shocks that have occurred close to the period where we observe financial default. The key underlying assumption is that the financial asset path of the parents for the years 1987-1996 does not directly determine the default status of their children in 2011 conditional on parental default in 2011 and other control variables included. This method cannot distinguish between fixed differences in behavioral types and very persistent or permanent shocks occuring before 1997 and affecting default propensities in 2011, but it filters out the impact of short-lived shocks occuring after 1996.

Figure 10 shows the result of this exercise. Panel A provides a graphical representation of the first stage relationship between parental default in 2011 and the average asset-to-income level over the period 1987-1996. This non-parametric evidence reveals a strong negative relationship: parents with financial assets in the top five deciles are more than 10 percentage points less likely to default than parents in the bottom decile. The relationship is very precisely estimated and is in itself a strong indication of very persistent financial behavior.

Panel B shows the difference in default propensities between children with parents in default and children with parents not in default in 2011. The bottom curve repeats the OLS estimates with controls shown in Figure 5. The top curve shows the corresponding relationship derived from 2nd stage estimates where we have used the historical level of financial assets of parents as an instrument for their default in 2011 based on the first stage relationship displayed in Panel A. The IV estimate shows a much larger impact of parental default than the OLS estimate. This is consistent with the

Figure 10: Default correlation when instrumenting parental default with historical financial wealth



Notes: For individuals aged 18-45 in 2011, Panel A shows the difference in the default rate in 2011 between parents in a given decile of financial wealth compared to parents in the bottom decile. Financial wealth for the parent is measured as the ratio of average financial wealth to average disposable income in 1987-1996 where financial wealth is the sum of stocks, bonds and bank deposits. Deciles are calculated within-parental cohort. For each age group of children in 2011, Panel B shows the difference in the average default rate for children where the parent was/was not observed to default in 2011 using two different specifications. In one specification the difference is the result of an OLS-regression of child default on parental default, in the other specification parental default is instrumented with deciles of parental financial wealth before regressing child default on instrumented parental default. All regressions in panel B are performed separately for each age group of the children while the first stage regression presented in Panel A is performed on children aged 18-45 pooled together. In both cases a large set of covariates are included, see notes to Figure 5. All estimates are shown with 95% CIs. In both panels standard errors are clustered at the child level. Obs: 2,376,036.
Sources: Loan register from the Danish Tax Agency (SKAT) and various registers from Statistics Denmark.

theoretical conjecture whereby the default of children and parents, respectively, is determined by a latent risk factor and a realization of a shock, and where the risk factors are correlated across generations while shocks are uncorrelated. It is therefore consistent with the hypothesis that intergenerational correlation in default is caused by similar financial behavior between parents and children. Robustness results on the instrument used to measure parental financial behavior are provided in Appendix C.

If we are willing to impose additional (strong) assumptions then it is possible to measure how much of the variation in default across parents is driven by persistent behavioral differences and how much is driven by shocks. To do this, assume first that the default outcome may be approximated by the linear relationship

$$D^j = \theta^j + \varepsilon^j \tag{5}$$

for children $j = C$ and parents $j = P$, where θ^j is the latent risk-factor of the individual and ε^j is an independent shock/noise component, such that $E\left[D^j\right] = \theta^j$ as in eq. (3) of the theory. Assume also that the latent risk-factor of the children is related to parents according to the basic intergenerational relationship

$$\theta^C = \sigma_0 + \sigma_1 \theta^P + \omega \tag{6}$$

where σ_0 and σ_1 are parameters, and ω is an independent noise term. Consistent with the results from the empirical analysis, these assumptions imply that common shocks and risk pooling are excluded by assumption, and that the intergenerational relationship is governed only by similar financial behavior of children and parents. Finally, if we have an instrument Z^P, which is correlated with the risk-factor of the parents θ^P but uncorrelated with the error terms, then (see Appendix D)

$$\frac{\hat{\sigma}_1^{\text{OLS}}}{\hat{\sigma}_1^{\text{IV}}} = \frac{\sigma_1 \text{var}(\theta^P)/(\text{var}(\theta^P) + \text{var}(\varepsilon^P))}{\sigma_1} = \frac{\text{var}(\theta^P)}{\text{var}(\theta^P) + \text{var}(\varepsilon^P)}, \tag{7}$$

The expression shows that the ratio of the OLS to the IV estimate is informative about the relative importance of the behavioral risk factor across parents in explaining the total variation in parental default. This is because the instrument is able to isolate the variation related to the risk factor, $\text{var}(\theta^P)$, whereas the OLS estimator is affected by the variation relating to both the risk factor and the shock component, $\text{var}(\theta^P) + \text{var}(\varepsilon^P)$. By comparing the OLS and IV estimates reported in Figure 10, we see that $\hat{\sigma}_1^{\text{OLS}}/\hat{\sigma}_1^{\text{IV}} \approx 1/2$. This suggests that the persistent behavioral component is responsible for approximately 50 percent of the defaults observed. In mid-life the IV-estimates of σ_1 are around 0.3 suggesting that 30 percent of the behavioral component is transferred across generations conditional on the control variables. This intergenerational dependency goes beyond intergenerational correlation in ability—captured by income, education and other controls—and is therefore likely to reflect significant inheritability in behavior.

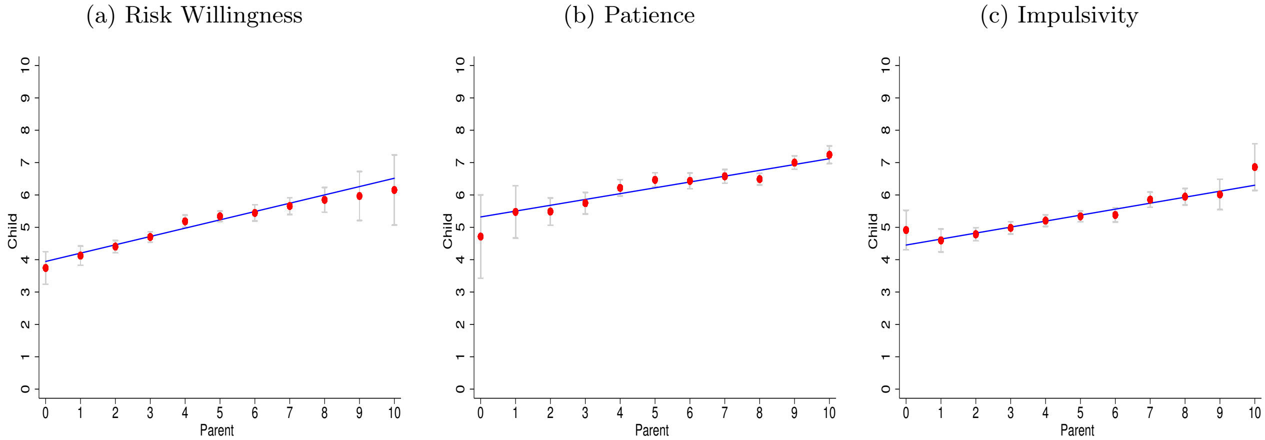
Correlation between elicited preference parameters and financial trouble

The analysis presented so far relies on observed choices and default realizations. In this section, we focus on direct measures of behavioral parameters. For a subsample consisting of 1,748 individuals, we issued a telephone survey in which we asked respondents to self-assess their behavioral type along three dimensions: risk willingness, patience and impulsivity. Risk willingness and patience are traditional neoclassical parameters, while the question about impulsivity may capture that some people get into financial trouble because of self-control problems.

The survey took place in January 2014 and asked the following questions:

- How do you view yourself: Are you in general ready to take a risk or do you try to avoid risk

Figure 11: Child behavioral characteristic on parental behavioral characteristic



Notes: Panel A shows the average value of self-reported child risk willingness with 95% CIs for each possible level of self-reported parental risk willingness. The line in Panel A is the result of a linear regression of child risk willingness on parental risk willingness. Panel B and Panel C show the same relationship for the two other behavioral parameters, patience and impulsivity. Information about behavioral type is obtained from a survey issued in 2014, where the respondents were asked to place themselves and both of their parents on a scale from 1 to 10 for each behavioral characteristic. In all panels standard errors are clustered at the child level.
Obs=2,798 unique child-parent links based on answers from 1,748 children.
Sources: Survey data collected in 2014 and population register from Statistics Denmark.

taking?

- How do you view yourself: Are you in general impatient or do you always exhibit high patience?

- How do you view yourself: Are you in general impulsive or are you not impulsive at all?

In all cases, respondents have to provide an answer on a scale from 1 to 10. This simple survey methodology to elicit behavioral parameters has been used in other studies and validated in large-scale experiments (Dohmen et al. 2011, Vischer et al. 2013). Following the self-assessment, respondents are asked to assess their parents along the same dimensions.

The subjective data from the questionnaire are merged on to the administrative data at the individual level enabling us to correlate the self-assessed behavioral characteristics with the third-party reported data about default on loans. Figure 11 shows three graphs where we plot each of the behavioral characteristics of the child against the corresponding measure of the parents.

The graphs reveal significant positive intergenerational correlation across all three behavioral parameters. In our setup, where we ask children to assess the behavioral characteristics of both themselves and their parents, the relationships in Figure 11 may be spurious. However, the relationships are consistent with the results reported by Dohmen et al. (2012), who show that preference

Table 2: Default dummy on behavioral characteristics

	Parents				Children			
Risk Willingness	0.825***			0.517**	0.595***			0.491**
	(4.37)			(2.69)	(3.31)			(2.81)
Patience		-0.304		-0.0252		0.00836		0.00741
		(-1.84)		(-0.19)		(0.07)		(0.07)
Impulsivity			0.559**	0.184			0.537**	0.171
			(2.92)	(0.94)			(3.21)	(1.18)
Constant	-0.567	4.641***	0.232	-11.55***	-1.688*	1.204	-1.567*	93.67***
	(-0.84)	(3.89)	(0.29)	(-3.48)	(-2.29)	(1.46)	(-2.14)	(21.04)
Controls				X				X
Obs:	2,798	2,798	2,798	2,798	1,748	1,748	1,748	1,748

Notes: Shows results from a LPM where we regress a default dummy on covariates. t-statistics based on robust standard errors in parentheses. In columns 1-3 standard errors are clustered at the child level. *(p<0.05), **(p<0.01), ***(p<0.001)
The control variables in columns 4 and 8 are within cohort deciles of gross income (d), gender (d), college education (d), residential region (d), cohort (dummy per 5-year interval) and bank (d), where "d" denotes dummy variables.
Sources: Survey data collected in 2014, loan register from the Danish Tax Agency (SKAT) and various registers from Statistics Denmark.

measures reported in the German SOEP are correlated across generations in a setup where children and parents are asked separately about their own preference parameters.

More importantly, we investigate whether the reported behavioral characteristics are correlated with the observed default on loans, which is third-party reported and hence collected independently of the behavioral measures. Table 2 reports results from a linear probability model where we regress the 2011 default indicator for the parents against the behavioral characteristics of the parents and the 2011 default indicator for the children against the behavioral characteristics of the children.

Columns 1-3 report the bivariate correlations between the default indicator for the parent and each of the behavioral indicators of the parent. The reported measure of impatience is insignificant but both risk willingness and impulsivity are strongly significant. For example, moving up one unit on the 1-10 scale on risk-willingness increases the average propensity of default by 0.8 percentage points, which is large compared to a baseline default rate of parents of 2.7 percent in the sample. In column 4 we include the three behavioral measures simultaneously and together with the same types of covariates as in Figure 5 (indicators for income deciles, cohort, gender, college education, residential region and bank). In this case impulsivity is no longer significant but risk willingness is still strongly significant and large; moving up one unit on the 1-10 scale on risk-willingness increases the average propensity of default by 0.5 percentage points.

In columns 5-8 we perform the corresponding analysis for the children. This gives basically the same picture as for the parents with respect to the different behavioral characteristics. Risk willingness is still strongly significant and large, both in the univariate regression and in the multivariate regressions with controls.

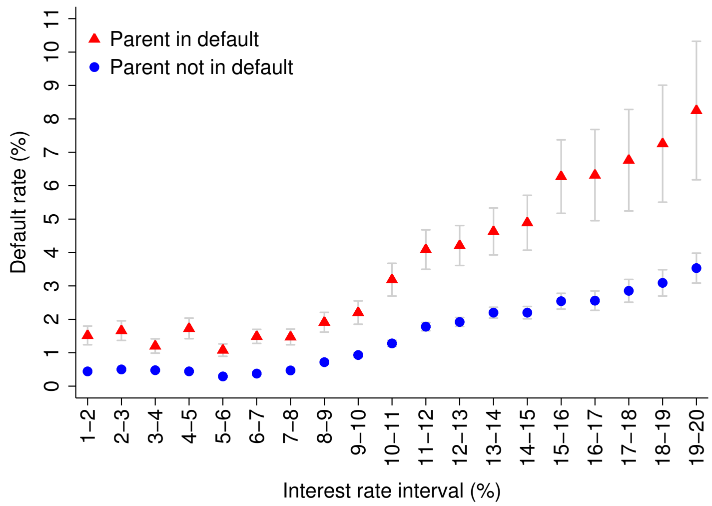
The evidence presented here is suggestive. The telephone survey is collected after the default data and may thus, in principle, be adapted to the default realizations. The sample size is limited and the behavioral parameters are therefore not estimated precisely. However, the fact that subjectively stated data about inherent behavioral characteristics collected by telephone interview correlate with default data collected independently from the subjective data is compelling, and the results are consistent with our other findings suggesting that parents and children share behavior and attitudes when making financial decisions, hence, causing financial trouble to be correlated across generations.

6 Is intergenerational dependency in financial trouble incorporated in interest rate setting?

In this section, we analyse whether the intergenerational dependency in default rates is incorporated in interest rate setting in order to learn whether the intergenerational correlation is indicative of the existence of an interest rate externality. This is the case if differences across individuals in financial behavior, established in Section 5.2, (endogenously) generate differences in default probabilities, which are not priced in by banks. This amounts to a case where consumers facing similar interest rates have systematically different default rates.- In Appendix E, we show this formally in a modified version of the simple model in Section 5.1.

In the model, banks either predict behavioral types perfectly and set the interest rates on loans according to the type of each individual or they cannot identify the individual types and set the same interest rate on all loans. Thus, in the first case, we should expect to observe a positive relationship between interest rates on loans and future default rates and, conditional on the interest rate, it should be impossible to predict default with other information. In particular, information about financial trouble of the parents should be uninformative about the default rate of the children after conditioning on the interest rate on each loan. On the other hand, if financial trouble of the parents predict whether children default on loans in the future—for loans carrying the same interest rate—then this is an indication that a systematic component of the default risk has not been priced

Figure 12: Future default probability by loan specific interest rate and parental default



Notes: The figure shows the average loan-level default rate in 2005-2011, along with 95% CIs, by loan specific interest rates in 2004, binned into one-percentage point interest rate intervals. Sample is restricted to loan accounts of individuals who are not in default on any loan in 2004. Loan accounts are grouped by the individual-level default status of the debtor's parent in 2004. A loan is classified as becoming delinquent if the individual has defaulted on loan payments in any of the years 2005-2011. The ex ante interest rate on a specific loan in 2004 is computed as interest payments during the year divided by nominal debt at the end of the year. Interest rates are censored at the 5th and 95th percentiles and loans with nominal debt below DKK 10,000 in 2004 are excluded. Standard errors are clustered at the child level. Obs: 3,408,588.
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.

into the loan. In Figure 12, we study this relationship empirically.

To construct the graph, we have selected out all loans of persons who were not in default on any loan in 2004 and divided them into two groups dependent on whether the parents are in default or not in 2004. We then follow the loans of the individuals and compute the share of the loans that become delinquent at some time during the period 2005-2011. This is displayed as a function of the interest rate on the loans in 2004, which is approximated by dividing the total interest payments during the year with the loan balance at the end of the year. We have divided all the loans into one percentage point interest rate intervals and compute for each group of loans, and conditional on parental default, the average future default rate on the loans. For the case of parents not in default, Figure 12 shows that the future average default rate increases gradually from 0.5 percent to 3.5 percent when going from loans with an interest rate of 2 percent to an interest of 20 percent, consistent with banks being able to predict delinquency when setting interest rates. We also obtain a clear increasing relationship between the interest rate and the future default rate for the loans of individuals where parents are in default. However, this relationship lies considerably higher in the diagram. At each level of interest rate, the future default rate is significantly higher if parents were in default in 2004. For example, for loans with an interest rate of 5 percent the probability of default within the next seven years is 0.5 percent if the parents are not in default in 2004 but 1.75 percent if parents are in default. Banks are thus unable to fully account for the intergenerational relationship in default propensities when setting the interest rates, and with a difference in the range of 0.7-4.7 percentage points across the interest rates levels, the effect not accounted for is quite large. As argued above, this indicates that the market for personal loans suffers from an interest rate externality because banks are not able to price into the loans a systematic component of the default risk.[9]

7 Concluding remarks

Previous studies of loan defaults have emphasized strategic behavior, adverse shocks and cognitive functioning and abilities as determinants of personal loan defaults. In this paper we have identified a new source of persistent heterogeneity, which is quantitatively important and potentially has implications for both policy and for the modeling of behavior. Using a new data set with administrative information about loan defaults for the entire Danish population we document that being in financial trouble is strongly related across generations. The correlation appears soon after children move into adulthood, and it is robust to controlling for different measures of ability.

We develop a simple theory of financial trouble showing that the correlation across generations can potentially be explained by contemporaneous shocks to children and parents, risk sharing between children and parents in response to shocks, and by financial behavior transmitted from parents to children. We do not find support for the common shock and the risk sharing hypotheses in our data. However, we find that transmission of financial behavior from parents to children is important for explaining the propensity to default. We find that persistent differences in financial behavior across individuals potentially explain half of the variation in default on loans with the other half being explained by random shocks. Finally, we find that banks do not/are unable to fully price in the systematic risk of default related to family background. This finding points to an interest rate externality in the market for personal loans.

[9] For a subsample of the loans, we have information on the actual interest rate charged on the loan. In Appendix F, we reconstruct Figure 12 for this subsample of loans and construct another diagram where we use the actual interest rate on the X-axis instead of the computed interest rate. These graphs are similar and mirror Figure 12 suggesting that measurement error in the computation of the interest rate is of minor importance for the relationships in Figure 12.

Our analysis is limited in a couple of respects. We are not able to rule out that parents have received persistent shocks which have propagated to the children before we begin to observe them. In any case our results indicate that being in financial trouble is an extremely persistent state. Moreover, the fact that our analysis is based on Danish data raises the question of external validity, i.e. whether our results apply to other developed economies. For example, we find that risk sharing is not important for explaining the intergenerational correlation in loan default. This could be related to the fact that there is a high degree of social insurance embodied in the Danish tax-benefit system, free education as well as generous government student grants and guaranteed student loans for young people. In other countries where such institutions do not exist, risk sharing may play a bigger role. This would, however, imply an even bigger intergenerational correlation (holding everything else equal) than we have found in this study, as has also been documented for other economic outcomes in the Nordic countries compared to other countries (see Björklund and Jäntti 2009, Chetty et al. 2014).

Understanding the underlying reasons for default on personal loans has important normative implications. Unfortunately, our approach cannot resolve whether the persistency in default is related to preference heterogeneity, behavioral biases, or perhaps a combination of the two.

In spite of these caveats we believe our findings can have implications for policy and for modeling default on personal loans. Our results suggest it is important to incorporate heterogeneity in household behavior in micro- and macroeconomic theories of financial problems. Our result pointing to banks not being able to price in a systematic component of the default risk calls, in isolation, for creditor-friendly bankruptcy laws. This has to be balanced against social insurance benefits from a more debtor-friendly system. Our analysis does not allow us to estimate this trade-off. This would require a structural approach, for example along the lines of Livshits et al. (2007) extended with heterogeneity in preferences. This is left for future research.

References

[1] Agarwal, Sumit and Chunlin Liu (2003). "Determinants of credit card delinquency and bankruptcy: Macroeconomic factors." *Journal of Econonomics and Finance*, 27, 75-84.

[2] Agarwal, Sumit, Chunlin Liu and Lawrence Mielnicki (2003). "Exemption Laws and Consumer

Delinquency and Bankruptcy Behavior: an Empirical Analysis of Credit Card Data." *Quarterly Review of Economics and Finance*, 43, 273–289

[3] Agarwal, Sumit and Bhashkar Mazumder (2013). "Cognitive Abilities and Household Financial Decision Making." *American Economic Journal: Applied Economics*, 5(1), 193–207

[4] Alan, Sule and Martin Browning (2010). "Estimating Intertemporal Allocation Parameters using Synthetic Residual Estimation." *The Review of Economic Studies*, 77(4), 1231-1261.

[5] Alan, Sule, Nazli Baydar, Teodora Boneva, Thomas F. Crossley, and Seda Ertac. (2017). "Transmission of risk preferences from mothers to daughters." *Journal of Economic Behavior & Organization*, 134, 60–77

[6] Altonji, Joseph G., Fumio Hayashi and Laurence J. Kotlikoff (1992). "Is the Extended Family Altruistically Linked? Direct Tests Using Micro Data." *American Economic Review*, 82(5), 1177-1198.

[7] Angeletos, George-Marios, David Laibson, Andrea Repetto, Jeremy Tobacman, and Stephen Weinberg. 2001. "The Hyperbolic Consumption Model: Calibration, Simulation, and Empirical Evaluation." *Journal of Economic Perspectives*, 15(3): 47-68.

[8] Attanasio, Orazio, Costas Meghir and Corina Mommaerts (2015). "Insurance in Extended Family Networks." NBER Working Paper #21059.

[9] Bank for International Settlements (2014). "Revisions to the securitisation framework." Basel Committee on Banking Supervision. Basel III Document. Available on the BIS website (www.bis.org).

[10] Björklund, Anders and Markus Jäntti (2009). "Intergenerational Income Mobility and the Role of Family Background." In: Nolan, B., W. Salverda and T. Smeeding (Eds.), *Oxford Handbook of Economic Inequality*, Oxford: Oxford University Press.

[11] Black, Sandra and Paul J. Devereux (2011). "Recent Developments in Intergenerational Mobility." In: Ashenfelter, O. and D. Card (Eds.), *Handbook of Labor Economics*. Vol. IVb. North-Holland, Amsterdam, 1487–1541.

[12] Black, Sandra, Paul Devereux, Petter Lundborg, and Kaveh Majlesi (2017). "On the Origins of Risk-Taking." Forthcoming *Journal of Finance*

[13] Bozio, Antoine, Guy Laroque, and Comac O'Dea (2017). "Discount rate heterogeneity among older households: a puzzle?" *Journal of Population Economics*, 30, 647-680

[14] Bruhin, Adrian, Helga Fehr-Duda and Thomas Epper (2010). "Risk and Rationality: Uncovering Heterogeneity in Probability Distortion." *Econometrica*, 78(4), 1375-1412.

[15] Campbell, John Y. (2012). "Mortgage Market Design." *Review of Finance,* 17, 1–33.

[16] Christopher Carroll, Jiri Slacalek, Kiichi Tokuoka, Matthew N. White. 2015. The Distribution of Wealth and the Marginal Propensity to Consume. Manuscript, Johns Hopkins University. Forthcoming in *Quantitative Economics.*

[17] Chetty, Raj, John Friedman, Søren Leth-Petersen, Torben Heien Nielsen and Tore Olsen (2014). "Active vs. Passive Decisions and Crowd-out in Retirement Savings: Evidence from Denmark". *Quarterly Journal of Economics*, 129(3), 1141-1219.

[18] Chetty, Raj, Nathan Hendren, Patrick Kline, and Emmanuel Saez (2014). "Where is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States." *Quarterly Journal of Economics,* 129(4): 1553-1623.

[19] Currie, Janet (2011). "Inequality at Birth: Some Causes and Consequences." *American Economic Review: Papers & Proceedings*, 101:3, 1–22

[20] Deaton, Angus (1991). "Saving and Liquidity Constraints." *Econometrica*, 59(2), 1221-1248.

[21] Dohmen, Thomas, Armin Falk, David Huffman, Uwe Sunde, Jürgen Schupp and Gert G. Wagner (2011). "Individual Risk Attitudes: Measurement, Determinants, and Behavioral Consequences." *Journal of the European Economic Association,* 9(3), 522–550.

[22] Dohmen, Thomas, Armin Falk, David Huffman and Uwe Sunde (2012). "The Intergenerational Transmission of Risk and Trust Attitudes." *Review of Economic Studies*, 79, 645–677.

[23] Domstolsstyrelsen (2011). "Statistik for skiftesager m.v. – 2011." Memorandum from the Danish Court Administration.

[24] Fagereng, Andreas, Magne Mogstad and Marte Rønning (2015). “Why do wealthy parents have wealthy children?” Working paper.

[25] Fay, Scott, Erik Hurst and Michelle J. White (2002). “The Household Bankruptcy Decision.” *American Economic Review,* 92(3), 706-718.

[26] Gathergood, John (2016). “Self-control, financial literacy and consumer over-indebtedness.” *Journal of Economic Psychology,* 33, 590–602

[27] Gerardia, Kristopher, Lorenz Goette and Stephan Meier (2013). “Numerical ability predicts mortgage default”. *PNAS,* 110(28), 11267–11271.

[28] Gross, David B. and Nicholas S. Souleles (2002). “An Empirical Analysis of Personal Bankruptcy and Delinquency.” *The Review of Financial Studies*, 15(1), 319-347.

[29] International Monetary Fund (2012). “World Economic Outlook (WEO): Growth Resuming, Dangers Remain.” April 2012 (Washington)

[30] Jacobson, Louis S., Robert J. LaLonde and Daniel G. Sullivan (1993). “Earnings Losses of Displaced Workers.” *American Economic Review,* 83(4), 685-709.

[31] Jensen, Thais L., Søren Leth-Petersen and Ramana Nanda (2015). “Home Equity Finance and Entrepreneurial Performance – Evidence from a Mortgage Reform.” NBER Working Paper #20583.

[32] Johnson, David S., Jonathan A. Parker, and Nicholas S. Souleles. (2006). “Household Expenditure and the Income Tax Rebates of 2001.” *American Economic Review*, 96(5): 1589–1610.

[33] Kimball, Miles. S., Claudia R. Sahm, and Matthew D. Shapiro (2009). “Risk Preferences in the PSID: Individual Imputations and Family Covariation.” *American Economic Review*, 99(2), 363–368.

[34] Kleven, Henrik Jacobsen, Martin Knudsen, Claus Thustrup Kreiner, Søren Pedersen and Emmanuel Saez (2011). “Unwilling or Unable to Cheat? Evidence from a Tax Audit Experiment in Denmark.” *Econometrica*, 79, 651–692.

[35] Kolodziejczyk, Christophe and Søren Leth-Petersen (2013). "Do First-Time House Buyers Receive Financial Transfers from Their Parents?" *Scandinavian Journal of Economics*, 115(4), 1020-1045.

[36] Kuhnen, Camelia M. and Brian Melzer (2017). "Non-Cognitive Abilities and Loan Delinquency: The Role of Self-Efficacy in Avoiding Financial Distress." Working Paper.

[37] Laibson, David (1997). "Golden Eggs and Hyperbolic Discounting." *Quarterly Journal of Economics*, 112(2), 443-478.

[38] Leth-Petersen, Søren (2010). "Intertemporal Consumption and Credit Constraints: Does Total Expenditure Respond to An Exogenous Shock to Credit?" *American Economic Review*, 100, 1080-1103.

[39] Livshits, Igor, James MacGee and Michèle Tertilt (2007). "Consumer Bankruptcy: A Fresh Start." *American Economic Review*, 97(1), 402-128.

[40] Lusardi, Annamaria and Olivia S. Mitchell (2014). "The Economic Importance of Financial Literacy: Theory and Evidence." *Journal of Economic Literature*, 52(1), 5–44.

[41] Parise, Gianpaolo and Kim Peijnenburg (2016). "Noncognitive Abilities and Financial Distress." Working paper

[42] Solon, Gary (1999). "Intergenerational Mobility in the Labor Market." In: Ashenfelter, O. and D. Card (Eds.), *Handbook of Labor Economics*. Vol III. North-Holland, Amsterdam, 1761–1800.

[43] Stango, Victor and Jonathan Zinman (2009). "Exponential Growth Bias and Household Finance." *Journal of Finance,* 64(6), 2807-2849.

[44] Vischer, Thomas, Thomas Dohmen, Armin Falk, David Huffman, Jürgen Schupp, Uwe Sunde and Gert G. Wagner (2013). "Validating an Ultra-Short Survey Measure of Patience" *Economics Letters,* 120, 142–145.

[45] White, Michelle J. (2007). "Bankruptcy Reform and Credit Cards." *Journal of Economic Perspectives,* 21(4), 175-199.

[46] Zagorsky, Jay L. (2007). "Do You Have to be Smart to be Rich? The Impact of IQ on Wealth, Income and Financial Distress." *Intelligence,* 35, 489–501.

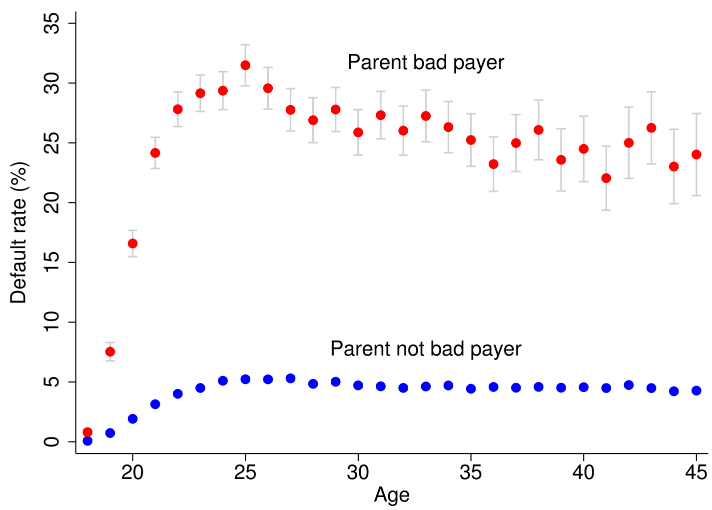
[47] Økonomi- og Erhvervsministeriet (2010). "Familiernes Økonomi." *Økonomisk Tema #10*, August 2010.

Appendices (FOR ONLINE PUBLICATION)

A Intergenerational correlation in financial trouble using the bad payer register

In this appendix, we repeat the analysis in Figure 1, but use the bad payer files of the credit bureaus. The measure of financial trouble is different and from another data source as described in sub-section 3.1. Figure 13 shows the result from this exercise. The graph is very similar to Figure 1. In fact, the conclusion that the intergenerational correlation appears already at a very young age is only reinforced.

Figure 13: Default propensity by age and by parental default: bad payer files



Notes: The figure shows the mean default rate surrounded by 95% CIs for each age group in 2009. Each age group is categorized into two groups according to parental default in 2009. An individual is defined as being in default if the individual is registered as "a bad payer". Standard errors are clustered at the child level.
Sources: Experian and Debitor Registeret (the two credit bureau companies that specialize in running files on bad payers in Denmark) and population register from Statistics Denmark.

B Common shocks and resource pooling: sensitivity analysis

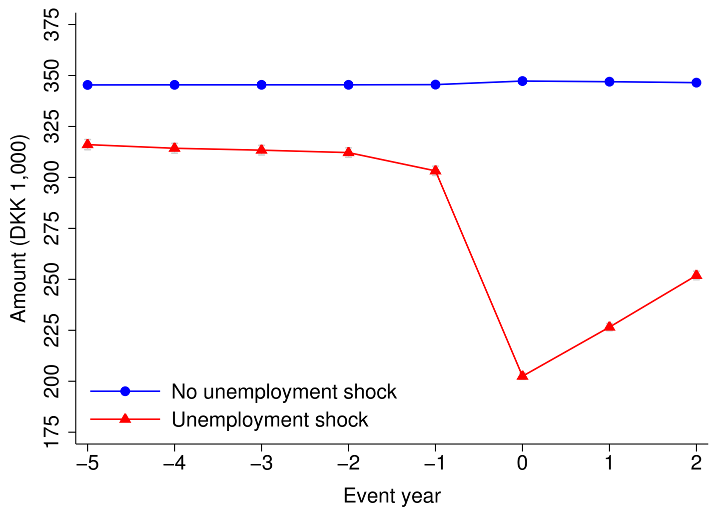
This appendix provides additional results on the role of common shocks and resource pooling studied in sub-section 5.2.1. We start in Figure 14 by deriving the effect of unemployment shocks on gross earnings using the same method as in Figure 7, which studies the impact on disposable income. Figure 14 shows that gross earnings decrease by around DKK 100,000, as stated in the main text, which is 2.5 times the effect on disposable income of around 40,000 in Figure 7.

In Figure 8, showing the effect of unemployment shocks on the default rate, we can only study default up to three years before the unemployment event because the data starts in 2004 and we study unemployment shocks in 2007-2009. In Figure 15, we show the result in isolation for those individuals who become unemployed in 2009. This enables us to study the pre-trend up to five years before the event. Figure 15 shows that the curves for both children and parents are flat prior to the unemployment shock, in accordance with similar trends for treatment and control groups. As in Figure 8, the default rate increases for the child and is unchanged for the parents after the unemployment shock to the child.

Figure 16 is similar to Figure 7, but here we look at more severe unemployment shocks by only letting individuals belong to the treatment group if they have experienced more than 6 months of unemployment in the event year. The figure shows that the drop in disposable income of the children becomes larger and that disposable income of parents is completely unchanged. Thus, the evidence does not provide support for the common shocks hypothesis.

Figures 17–21 provide a number of sensitivity analyses related to the resource pooling hypothesis: (i) In Figure 17, we re-examine the consequences of unemployment on financial wealth for more severe unemployment shocks. The graphs are very similar to Figure 9. (ii) In Figure 18, we investigate whether the results change if we use a two month income threshold for the definition of low financial wealth. The graphs are, in this case, also very similar to the ones in Figure 9. (iii) In Figure 19, we restrict the sample to parents not in default at any time and who should therefore be more able to help their children financially. Again, the graphs are very similar to Figure 9. (iv) In Figure 20, we investigate the sensitivity of the results to using pooled resources of the parents instead of looking separately at each child-parent pair. Again, the graphs are very similar to Figure 9. (v) In Figure 21, we investigate whether child financial wealth drops in proportion to the sum of child-parent financial wealth. If the consequence of the shock is shared equally by children and parents, in proportion to their initial levels of financial wealth, then the child share of overall financial wealth would not change following the shock. This is in contast to the evidence in Figure 21 showing that the child share of overall financial wealth drops significantly. Thus, none of these cases provide evidence in favor of strong resource pooling effects.

Figure 14: Effect of child unemployment shock on gross earnings

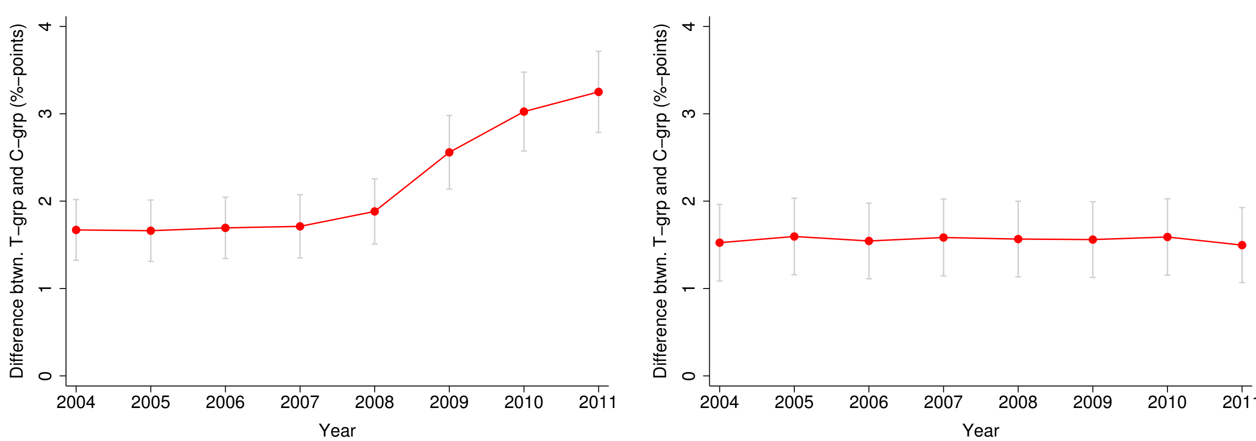


Notes: The figure shows the impact of an unemployment shock at t=0 on gross earnings. The graph is related to Figure 7, studying the impact on disposable income of unemployment, and uses the same method but with gross earnings as outcome instead of disposable income. Standard errors are clustered at the child level.
Sources: Population and income register from Statistics Denmark.

Figure 15: Effect of child unemployment shock in 2009 on default propensities

(a) Child (T-group – C-group)

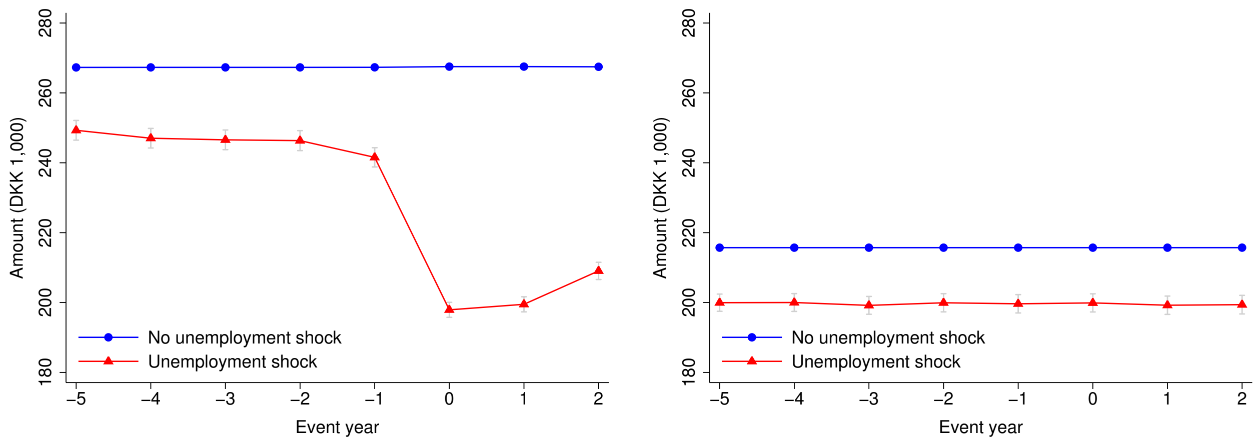
(b) Parent (T-group – C-group)



Notes: The figure resembles Figure 8, but is created for a subsample where the T-group is confined to individuals who become unemployed in 2009, while the control group are individuals who do not become unemployed in 2009. In both panels standard errors are clustered at the child level.
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.

Figure 16: Effect of severe unemployment shock (> 6 months) on disposable income

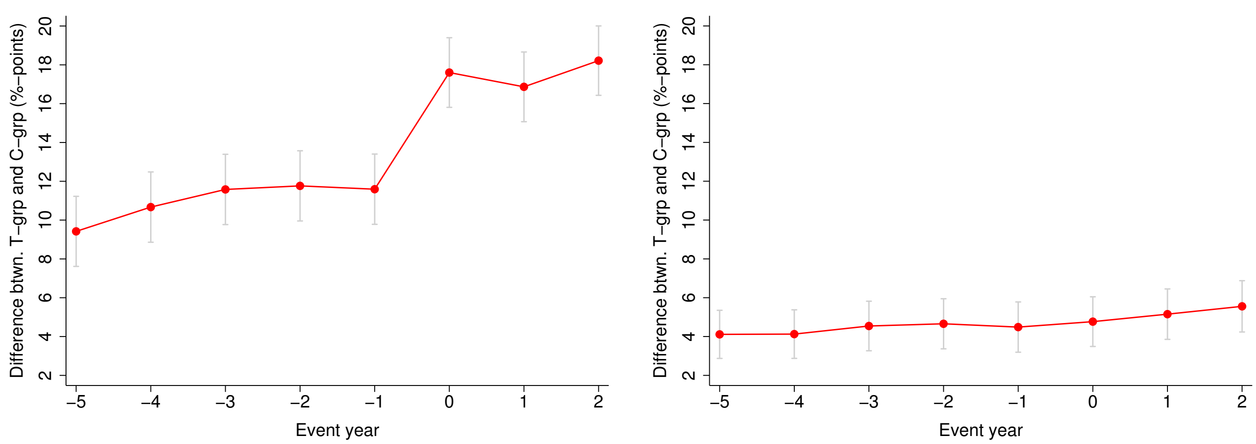
(a) Child (b) Parent



Notes: The figure is similar to Figure 7, but here we look at more severe unemployment shocks by only letting individuals belong to the treatment group if they have experienced more than 6 months of unemployment in the event year. In both panels standard errors are clustered at the child level.
Sources: Loan register from the Danish Tax Agency (SKAT) and population and income register from Statistics Denmark.

Figure 17: Effect of severe unemployment shock (> 6 months) on propensity to hold low financial wealth

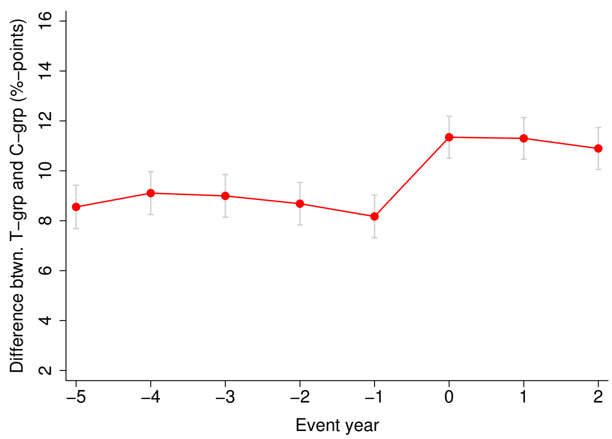
(a) Child (T-group – C-group) (b) Parent household (T-group – C-group)



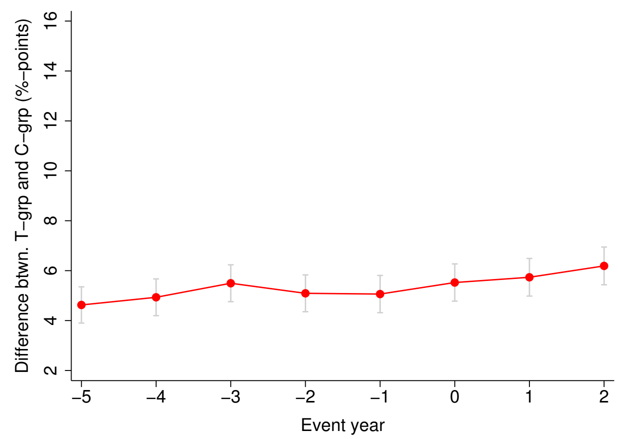
Notes: The figure is similar to Figure 9, but here we look at more severe unemployment shocks by only letting individuals belong to the treatment group if they have experienced more than 6 months of unemployment in the event year. In both panels standard errors are clustered at the child level.
Sources: Population and income register from Statistics Denmark.

Figure 18: Effect of child unemployment shock on propensity to hold low financial wealth: less than two months of disposable income in financial assets

(a) Child (T-group – C-group)



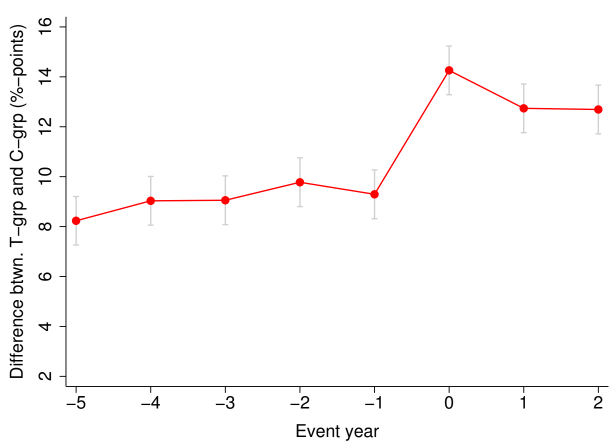
(b) Parent (T-group – C-group)



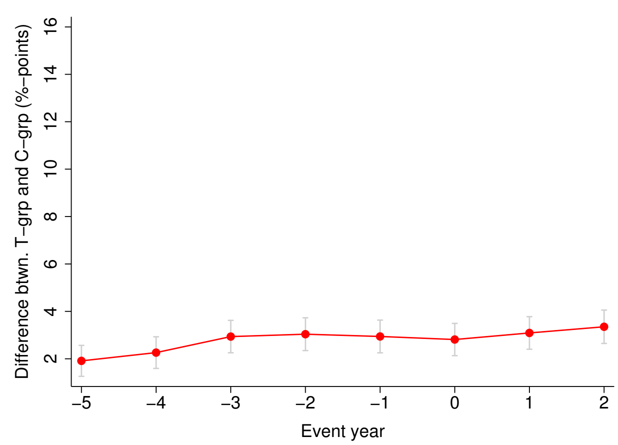
Notes: The figure is similar to Figure 9, but here we use a two month income threshold for the definition of low financial wealth. In both panels standard errors are clustered at the child level.
Sources: Population and income register from Statistics Denmark.

Figure 19: Effect of child unemployment shock on propensity to hold low financial wealth: parents never in default

(a) Child (T-group – C-group)

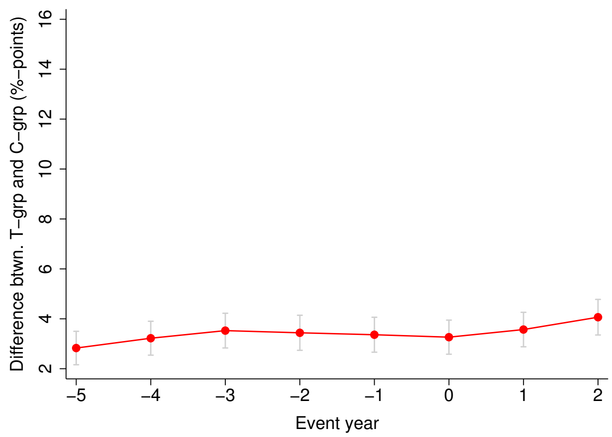


(b) Parent household (T-group – C-group)



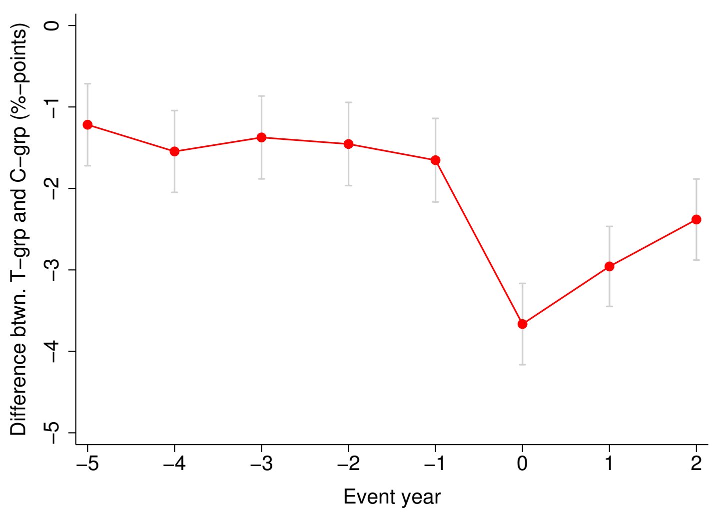
Notes: The figure is similar to Figure 9, but here we restrict the sample to child-parent pairs where parents are not in default at any time. In both panels standard errors are clustered at the child level.
Sources: Population and income register from Statistics Denmark.

Figure 20: Effect of child unemployment on parental propensity to hold low financial wealth: Pooled financial wealth of parents



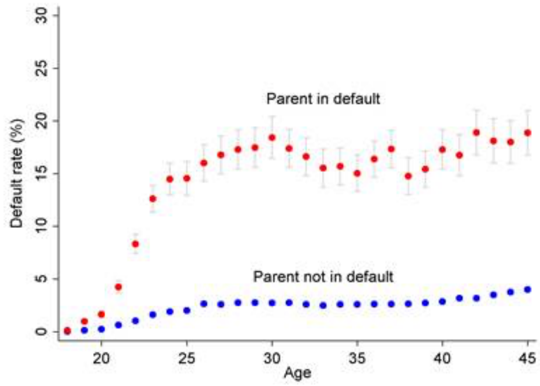
Notes: The figure is similar to Panel B in Figure 9, but here we consider the pooled resources of the parents instead of each parent separately.
Sources: Population and income register from Statistics Denmark.

Figure 21: Effect of unemployment on child's share of total child-parents financial wealth



Notes: This figure shows the impact of a child unemployment shock at t=0 on child financial wealth as a share of total child-parent financial wealth. In both panels standard errors are clustered at the child level.
Sources: Population and income register from Statistics Denmark.

Figure 22: Default propensity by age and by parental default status for individuals with a stable family pattern and experiencing no unemployment and health shocks.

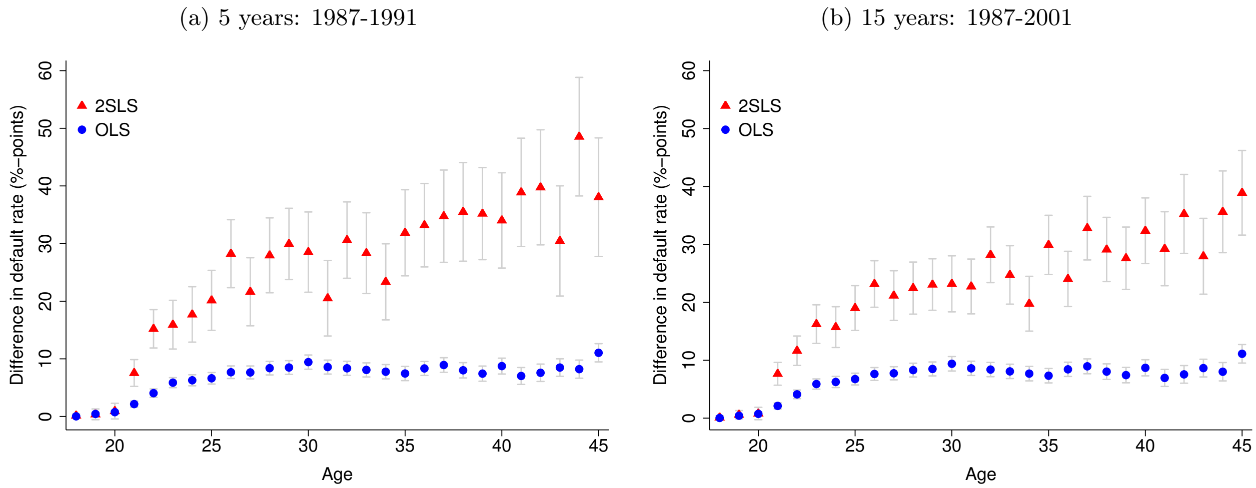


Notes: The figure shows the mean default rate surrounded by 95% CIs for each age group in 2011. Standard errors are clustered at the child level. Each age group is categorized into two groups according to parental default in 2011. An individual is defined as being in default if having at least one delinquent loan at the end of the year. Individuals with unstable family patterns or experiencing adverse health or unemplyment shocks during the period 2007-2011 have been omitted. A health shock occurs if the person is recorded as receiving sickness benefits. An unemployment shocks is defined to occur if the individual experiences unemployment amounting to more than 3 months during the year. Obs: 1.241.546.
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.

C Financial behavior: variations on the instrument

In this appendix we complement the analysis on parental financial behavior in Figure 10 with two variations on the instrument that we employ. Here we measure the historic financial assets of the parents both over a shorter period of time, 5 years, and over a longer period of time, 15 years. When measured over a longer period, the instrument will more precisely identify parents with persistently low liquid assets to income which provides a stronger signal on financial behavior. However the instrument can only eliminate shocks occurring after the end date of the period when the instrument is measured. In Panel A in Figure 23 the instrument is measured from 1987-1991 which potentially removes shocks occurring after 1991. In Panel B the instrument is measured over a period of 15 years from 1987 to 2001. Since this can only remove the attenuation bias from shocks occurring between 2002 and 2011 the IV-estimates in Panel B are slightly closer to the OLS-estimates than the corresponding IV-estimates in Panel A. In both cases however, the results are in line with the results in Figure 10.

Figure 23: Intergenerational relationship with parental default 2011 instrumented with parental financial wealth measured over two different periods



Notes: Panel A corresponds to Panel B in Figure 10 when the IV-instrument for the parent, decile of financial assets to income, is measured over the 5 year period 1987-1991. Panel B is the same graph but with the instrument measured over the 15 year period 1987-2001. In both panels standard errors are clustered at the child level.
Sources: Loan register from the Danish Tax Agency (SKAT) and population and income register from Statistics Denmark.

D Derivation of eq. (7)

The OLS estimate equals

$$\hat{\sigma}_1^{\text{OLS}} = \frac{\text{cov}(D^P, D^C)}{\text{var}(D^P)} = \frac{\text{cov}(\theta^P + \varepsilon^P, \sigma_0 + \sigma_1\theta^P + \omega + \varepsilon^C)}{\text{var}(\theta^P) + \text{var}(\varepsilon^P)} = \sigma_1 \frac{\text{var}(\theta^P)}{\text{var}(\theta^P) + \text{var}(\varepsilon^P)},$$

where we have used eqs (5) and (6). The IV estimate equals

$$\hat{\sigma}_1^{\text{IV}} = \frac{\text{cov}(Z^P, D^C)}{\text{cov}(Z^P, D^P)} = \frac{\text{cov}(Z^P, \sigma_0 + \sigma_1\theta^P + \omega + \varepsilon^C)}{\text{cov}(Z^P, \theta^P + \varepsilon^P)} = \sigma_1 \frac{\text{cov}(Z^P, \theta^P)}{\text{cov}(Z^P, \theta^P)} = \sigma_1,$$

where we have used eqs (5) and (6). Eq. (7) follows from the two expressions above.

E A simple theory of interest rate determination and externality in the credit market for personal loans

We extend the basic model in Section 5.1 with supply of credit, but simplify the model by assuming the shock ε and the risk parameter θ are each uniformly distributed on the unit interval. We consider a competitive bank sector that supplies credit but cannot observe the degree of risk taking of each individual, reflected by the choice of credit in proportion to permanent income α.[10] In the event of

[10] This is a strong assumption. In practice, the creditor knows the size of the loan given to the borrower and may have an idea of the permanent income. On the other hand, it seems realistic to assume that the information is not

default of the borrower, we assume the total costs of defaults are shared by the borrower and the bank with a share γ paid by the borrower and a share $1-\gamma$ paid by the bank. Thus, the costs of defaults faced by the banks cannot be passed on to the borrower in the default state. Instead, the banks charge a risk premium r on all loans (in addition to the risk free rate normalized to zero). With a consumption level equal to α in the first period, the second period consumption level of the borrower becomes

$$c_2 = 2 - \alpha(1+r) - \gamma \int_0^{\alpha} (\alpha - \varepsilon)\, d\varepsilon, \tag{8}$$

which is identical to eq. (2) in the special case where $r = 0$ and $\gamma = 1$. By inserting the consumption level in eq. (8) into the utility function (1) and optimizing with respect to α, we obtain

$$\alpha(\theta) = \begin{cases} \frac{\theta - r}{\gamma} & \theta \geq r \\ 0 & \theta < r \end{cases}, \tag{9}$$

where $\alpha(\theta)$ is the optimal loan, and also the expected default rate, of a type θ borrower. The default rate is decreasing in the risk premium charged by the banks, and individuals with $\theta < r$ do not borrow at all.

The expected profits of banks from giving credit to individuals of type θ equals

$$\pi(\theta) = r\alpha(\theta) - (1-\gamma) \int_0^{\alpha(\theta)} (\alpha(\theta) - \varepsilon)\, d\varepsilon, \tag{10}$$

where the first term is the revenue from charging the risk premium on all loans, while the last term is default costs. After solving the integral and using (9) to substitute for $\alpha(\theta)$, we obtain

$$\pi(\theta) = \frac{1+\gamma}{2\gamma^2}(\theta - r)\left(r - \frac{1-\gamma}{1+\gamma}\theta\right). \tag{11}$$

If the banks could identify the borrower type θ then in a perfectly competitive equilibrium, where $\pi(\theta) = 0$, banks would charge the risk premium[11]

$$r(\theta) = \frac{1-\gamma}{1+\gamma}\theta, \tag{12}$$

perfect. For example, a borrower may have loans in many financial institutions making it difficult to screen the borrowers perfectly.

[11]To see that this is the equilibrium and not $r = \theta$, note that profits are positive when $\frac{1-\gamma}{1+\gamma}\theta < r < \theta$, implying that a small reduction in r when $r = \theta$ raises both profits and utility of borrowers, implying that it cannot be a competitive equilibrium.

which is increasing in the risk type θ, and thereby also increasing in the probability of default, and increasing in the share of default costs paid by the banks $1-\gamma$. In this case, all individuals borrow and high-risk borrowers do not impose an interest rate externality on low-risk borrowers. [12]

When banks cannot observe θ, they have to charge the same risk premium r on each dollar of credit. In this case, the average profit per borrower equals

$$\pi = \frac{\int_r^1 \pi(\theta)\, d\theta}{\int_r^1 d\theta} = \frac{1+\gamma}{2\gamma^2 \int_r^1 d\theta} \int_r^1 (\theta - r)\left(r - \frac{1-\gamma}{1+\gamma}\theta\right) d\theta, \tag{13}$$

where we have used eq. (11). In a competitive equilibrium, profits π equal zero if $\tilde{\pi} = 0$ where

$$\begin{aligned}
\tilde{\pi} &\equiv \int_r^1 (\theta - r)\left(r - \frac{1-\gamma}{1+\gamma}\theta\right) d\theta \\
&= \int_r^1 \left(\frac{2}{1+\gamma}\theta r - r^2 - \frac{1-\gamma}{1+\gamma}\theta^2\right) d\theta \\
&= \left[\frac{1}{1+\gamma}\theta^2 r - r^2\theta - \frac{1-\gamma}{1+\gamma}\frac{1}{3}\theta^3\right]_r^1 \\
&= \frac{1}{1+\gamma} r - r^2 - \frac{1-\gamma}{1+\gamma}\frac{1}{3} + r^3\left(\frac{\gamma}{1+\gamma} + \frac{1-\gamma}{1+\gamma}\frac{1}{3}\right) \\
&= \frac{1+2\gamma}{3}\frac{(1-r)^2}{\gamma+1}\left(r - \frac{1-\gamma}{1+2\gamma}\right),
\end{aligned}$$

which is zero if the market value of the risk premium r^* is

$$r^* = \frac{1-\gamma}{1+2\gamma}, \tag{14}$$

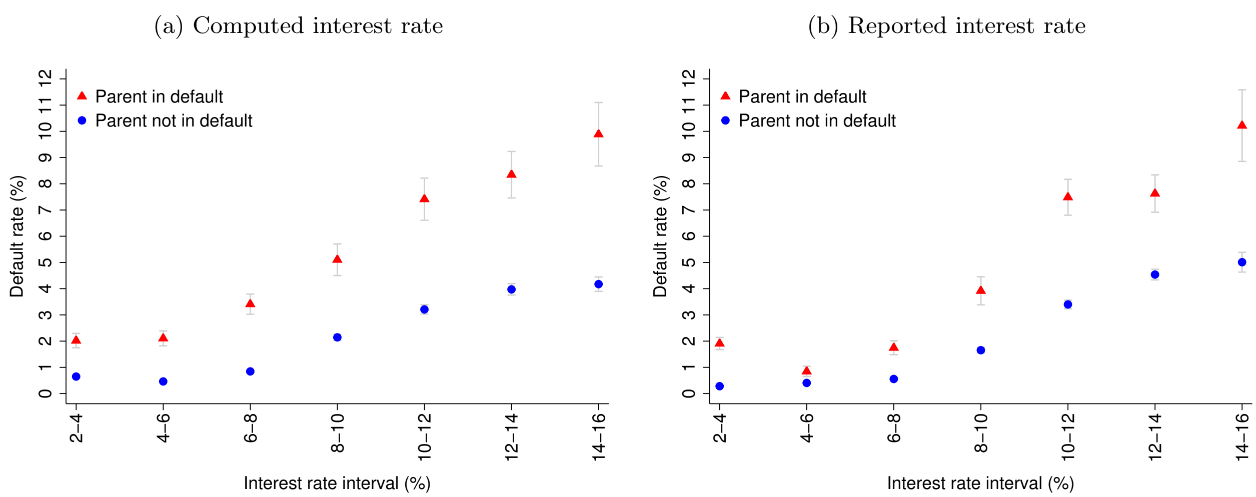
and positive (negative) if $r > r^*$ ($r < r^*$), showing that r^* is the competitive equilibrium. The risk premium r^* lies in the interval $(0,1)$. It then follows from the relationship (11) that the equilibrium is characterized by borrowers with high risk willingness θ paying a risk premium below the expected cost of default of the bank while borrowers with low values of θ pay a higher risk premium than the expected costs they inflict on the banks, and finally individuals with $\theta < r$ do not borrow at all. It also implies that policies that move some of the burden of default from borrowers to banks (reduction in γ) raise the equilibrium risk premium paid by all borrowers. This increases the interest rate externality and increases the number of low-risk individuals who choose not to borrow at all.

[12] The banks do not face an adverse selection problem in this case, but the competitive equilibrium is still characterized by moral hazard in the form of excessive borrowing compared to the social optimum because banks cannot charge borrowers the full costs of defaults, i.e. when $\gamma < 1$. From eqs (9) and (12), we have $\alpha(\theta) = 2\theta/(1+\gamma)$, which is larger than θ in (3), showing that borrowing is higher than the social optimum θ.

F Analysis of a subsample of loans where actual interest rates are known

This appendix repeats the analysis in Figure 12 for a subsample of the loans, where we have information on the actual interest rate charged on the loan. Financial institutions have to report the interest rate (rounded down to the nearest integer value) on the loan in special circumstances but in many cases the institutions report the interest rate anyway. This evidence may be subject to selection bias (e.g. interest rates on loans with a non-fixed interest rate are not reported), but should not be subject to measurement error. Panel A in Figure 24 corresponds to Figure 12 for the subsample. Panel B is the same graph but with the actual interest rate on the X-axis. The two graphs are very similar and mirror the original graph Figure 12, suggesting that measurement error in the computation of the interest rate is of minor importance.

Figure 24: Default probability on loan-specific interest rate: Subsample with information on actual interest rates



Notes: Panel A corresponds to Figure 12 for the subsample where actual interest rates are known. Panel B is the same graph but with the actual interest rate on the X-axis. In both panels standard errors are clustered at the child level.
Sources: Loan register from the Danish Tax Agency (SKAT) and population register from Statistics Denmark.