Essays in banking and household finance

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ESSAYS IN BANKING AND HOUSEHOLD FINANCE

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I am proud of the final product of this challenging journey and I would not have been able to complete it without the support of so many different people.

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Maaike Diepstraten

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Introduction

Deregulation, technological progress and financial innovation in the two decades prior to the global financial crisis led to larger and more diversified banks. This increase in bank size and scope was believed to be profit- and value-enhancing through economies of scale and scope, and (idiosyncratic bank) risk reducing due to portfolio diversification benefits (see e.g., DeLong, 2001; Laeven and Levine, 2007; Demsetz and Strahan, 1997; Stiroh and Rumble, 2006 or Baele et al., 2007).

However, the onset and unwinding of the global financial crisis of 2007–09 also illustrated a darker side of bank size and bank diversification. Banks' size and scope made banks systemically more important leading to too-big-to-fail and too-complex-to-unwind paradigms. This has caused policymakers and researchers to re-assess the optimal size and scope of banks and led to the introduction of regulatory reforms.

Surprisingly, the current literature usually focuses on the effect of bank size or diversification on systemic risk in isolation. The first chapter of this thesis, published in the Journal of Banking and Finance (2015), extends current work by examining the joint impact of bank size and scope on banks' exposure to systemic risk. We use a sample of listed banks across the globe over the period 1997–2011 and show that the strength of the bright side vis-à-vis the dark side of diversification depends on bank size. Whereas the dark side of diversification dominates for small banks, the bright side effects of diversification and innovation dominate for medium and large banks.

Small banks are more likely to lack the specific knowledge and tools to handle new business ventures or manage complex financial products (Milbourn et al., 1999). Besides,

larger banks are typically subject to a larger scrutiny by various disciplining stakeholders (Freixas et al., 2007), which may refrain large banks from taking excessive risk.

Importantly, however, stakeholders will only be able to properly discipline banks when the institutional settings and information environment allow them to do this. An environment with more information sharing, more private monitoring, stronger supervisory monitoring, less corruption or more competition, works as a disciplining device for large banks and induces them to differentiate and innovate for the better cause. For small banks, on the other hand, the effect remains negative and does not vary with these institutional features.

Hence, scaling down the size of the banks will lead to less systemic risk. Furthermore, from a systemic risk point of view, forcing banks to go back to the basic activities is unambiguously good for small banks, irrespective of the institutional setting. On the other hand, systemic risk exposures may increase if large banks are ring-fenced, depending on the institutional setting.

Not only is competition favorable to reduce systemic risk for large diversified banks, it is also believed to increase the efficiency of banking services (Worldbank, 2013; Murray et al., 2014; De Nederlandsche Bank, 2015a). As a result policymakers frequently call for more competition in the banking sector. One way to stimulate competition is to lower entry barriers to attract new players. An example of such barrier is consumer inertia, meaning that a small proportion of consumers switch banks (The Netherlands Authority for Consumers and Markets [ACM], 2014). To gain insight in this topic, survey data on Dutch consumers is used in Chapter 2 to study consumer bank switching behaviour. This paper is published in the Journal of Financial Services Research (2017).

Consumers' most important current account, savings account, mortgage loan and revolving credit are considered separately and it is shown that the propensity to switch depends on the banking product. The propensity to switch is highest for consumers' savings accounts. Besides, the main factors explaining the propensity to switch best depend on the banking product in question. Differences in the propensity to switch the main current and savings account are best explained by differences in the strength of the bank-customer relationship. In contrast, switching experiences play the most important role in explaining variation in the propensity to switch mortgage loans. One of this study's key

insights is therefore that it is important to examine banking products separately. This finding is meaningful for antitrust policy and provides an argument in favour of using a product market definition that is highly disaggregated.

In addition, it is documented that satisfaction with the current situation is the most important reason to stay at one's bank. The general perception that switching is a hassle, that there is nothing to gain, and the absence of account number portability are also reasons why a substantial proportion of bank customers do not switch.

Moreover, the reported propensity to switch main current accounts can be increased by introducing account number portability while improving knowledge of the switching service has no significant effect. Based on scenario-analyses it is shown that it is especially difficult for new foreign banks to attract savings in the Netherlands. Therefore, a policy aiming at attracting new domestic players seems to be more effective in enhancing mobility than a policy that increases the number of foreign players.

In Chapter 3 consumer bank switching behaviour after government interventions is investigated. A priori, the effect of these interventions is ambiguous. If consumers are rational and focus on bank risk, customers of bailed-out banks might be more inclined to stay at their bank, given that default risk is significantly reduced. On the other hand, increased awareness of bank risk and lack of trust in the government might trigger switches away from the intervened bank. In this study, it is shown how levels of trust in the government and risk aversion shape consumers' responses to government interventions.

Data from the DNB Household Survey is used to study how consumers respond to a nationalisation and a capital injection with their savings account and current account. The findings show that switching behaviour of consumers at intervened banks is similar before and after the intervention. This holds for both types of interventions and banking products.

Second, heterogeneity in consumer responses to government interventions is documented. Compared to consumers who trust the government, consumers with little or no trust are more likely to switch away after a nationalisation, relative to customers of the control bank. This holds for both banking products. Besides, risk-averse current account holders are more likely to switch away after a nationalisation relative to customers of the control bank. A possible explanation is that the intervention has made people more aware of the financial problems at the intervened bank.

Chapter 4 studies consumer savings behaviour. Recent developments in government policies increase households' responsibilities with respect to their own finances. Now that personal savings are becoming more important, it is important to understand differences in savings behaviour.

There is a large literature on savings that documents a role for socio-economic variables (e.g. Bucciol and Veronesi, 2014; Webley and Nyhus, 2013), parental teaching (Shim et al., 2010), household administration skills (Lusardi and Mitchell, 2007), personality factors (Fisher and Montalto, 2010) and social interactions (Brown et al., 2016). So far, these dimensions have been studied in isolation or a combination of only a few dimensions is studied. A broad study combining all these dimensions is lacking.

The literature offers various savings measures. Some use a binary dummy capturing whether one saved in the past year (Bucciol and Veronesi, 2014), where others focus on the level of bank saving (Webley and Nyhus, 2006), the total level of savings (Webley and Nyhus, 2013), the amount saved within a year (Bucciol and Veronesi, 2014) or the willingness to save (Brounen et al., 2016).

Chapter 4 extends current analyses on savings behaviour by exploring a wider set of explanatory dimensions and examining different measures of savings. It is shown that all five dimensions documented in the literature capture something distinct and as correlations between the dimensions are low, excluding a dimension from the analysis does not bias the results. The socio-economic dimension and the social circle are most important in explaining savings behaviour, irrespective of the way savings is measured (having saved in the past 12 months, amount saved in the past 12 months, net wealth or planning to save).[1]

[1] The views expressed in this PhD-thesis do not necessarily reflect the views of De Nederlandsche Bank or those of the Eurosystem.

Contents

Chapter 1

Banks' size, scope and systemic risk: What role for conflicts of interest? [2]

Co-authors: Olivier De Jonghe and Glenn Schepens

1.1 Introduction

Deregulation, technological progress and financial innovation in the two decades prior to the global financial crisis spurred banks to become larger and more diversified. This increase in bank size and scope was believed to be profit- and value-enhancing through economies of scale and scope, and (idiosyncratic bank) risk-reducing due to portfolio diversification benefits (see e.g. DeLong, 2001; Laeven and Levine, 2007; Demsetz and Strahan, 1997; Stiroh and Rumble, 2006 or Baele et al., 2007). However, the onset and unwinding of the global financial crisis of 2007-09 also illustrated a darker side of bank size and bank diversification.[3] Banks' size and scope made them systemically more important leading to too-big-to-fail or too-complex-to-unwind paradigms. This has caused policymakers and researchers to re-assess the optimal size and scope of banks. The general conclusion from recent studies is that larger banks have higher (conditional) tail risk and that diversification leads to higher systemic risk.[4] Surprisingly, the concepts of size and

[2] Published in the Journal of Banking & Finance (2015). DOI https://doi.org/10.1016/j.jbankfin.2014.12.024

[3] We follow the convention in this literature and use the word 'diversification' to refer to the extent of universal banking. That is, the extent to which banks have expanded their scope and combine traditional bank activities, which mainly generate interest income, with non-traditional, non-interest income generating activities.

[4] Barth and Schnabel (2013) present an overview of the direct and indirect channels through which large banks affect or are affected by systemic risk. Empirical evidence on the size-systemic risk relationship can be found in Demirguc-Kunt and Huizinga (2013), Fahlenbrach et al. (2012), Brunnermeier et al. (2012) and Adrian and Brunnermeier (2016). The impact of bank scope (or diversification) on systemic risk is investigated by e.g. Wagner (2010), Ibragimov et al. (2011), Boot and Ratnovski (2016), De Jonghe (2010), Brunnermeier et al. (2012).

scope and their effects on systemic risk (exposures) are usually analyzed in isolation. In most studies, the focus is either on one of the two or, when they are jointly analyzed, on additive effects.[5]

Yet, the use of acronyms such as SIFI or LCBG, which stand for Systemically Important Financial Institutions and Large and Complex Banking Groups, by regulators and supervisors do indicate that they perceive the mix of size and scope (complexity) to have multiplicative (or interaction) effects as well. Similarly, the public perception is also tilted towards the belief that the mix of bank size and scope results in hazardous effects. This paper fills this gap in the literature by exploring two issues. First, we examine the joint and interactive impact of both bank size and scope on banks' exposure to systemic risk. Second, by exploiting a cross-country sample, we assess whether these relationships are affected by a country's institutional setting, in particular by factors affecting the realization of conflicts of interests.

We make two important contributions to the academic literature. Unconditionally, the net impact of diversification on risk depends on the relative strength of a bright and dark side. The bright side of diversification stems from the scope for risk reduction within the financial institution (Dewatripont and Mitchell, 2005) and risk sharing with the financial system (van Oordt, 2014). The dark side of diversification originates in the complexity that comes along with combining various financial services. We are the first to show that the strength of the bright side vis-à-vis the dark side depends on bank size.[6] We find that the dark side of diversification dominates for small banks, whereas the bright side effects of diversification and innovation dominate for medium and large banks. More specifically, using a sample of listed banks across the globe over the period 1997-2011, we find that the initial positive impact of non-interest income (NII) on systemic risk exposure (measured by the Marginal Expected Shortfall (MES))[7] becomes smaller with size and turns negative when total assets equal 964 million US$. For almost half of the banks in the

[5] Fahlenbrach et al. (20120, Brunnermeier et al. (2012) and De Jonghe (20100 are examples of empirical papers that focus on the impact of bank size on systemic risk, while controlling for bank scope (or vice versa), without interacting them.
[6] Goddard et al. (2008) show for a sample of US credit unions that the impact of diversification on financial performance (measured as risk-adjusted accounting profits) is size-dependent.
[7] The Marginal Expected Shortfall corresponds with a bank's expected equity loss per dollar in a year conditional on the banking sector experiencing one of its 5% lowest returns in that given year. As in Acharya et al. (2017), we use the opposite of the returns, such that a higher MES implies more systemic risk.

sample, there is a significant negative impact of NII on MES. Hence, we are the first to document that combining size with scope leads to multiplicative effects on systemic risk. The explanation for this finding is multifaceted. Smaller banks are more opaque and less transparent (Flannery et al., 2004), and are therefore more inclined to engage in riskier and value-destroying activities, which encourages the impact of the dark side of diversification. Furthermore, larger banks have on average more sophisticated risk management techniques (Hughes and Mester, 1998), have more experienced management and employees and may therefore take more advantage of the bright side of diversification (Cerasi and Daltung, 2000). Put differently, small banks are more likely going to lack the specific knowledge and tools to handle new business ventures or manage complex financial products (Milbourn et al., 1999). Concerning the dark side, larger banks are typically subject to a larger scrutiny by various disciplining stakeholders (Freixas et al., 2007), which may refrain large banks from taking excessive risk. Importantly, however, stakeholders will only be able to properly discipline banks when the institutional setting and information environment allow them to do this. This brings us to our second contribution.

Our second contribution consists in showing that the bright side of diversification for large banks crucially depends on country characteristics that facilitate the creation of conflicts of interests. The potential for conflicts of interest is the main rationale why innovation by banks and expansion into non-traditional banking activities is seen as detrimental for banking system stability. For an excellent overview of the theoretical predictions and empirical results, we refer the reader to Mehran and Stulz (2007), Drucker and Puri (2007) and Saunders and Cornett (2014). We directly test the assertions of Saunders and Cornett (2014) that the likelihood with which potential conflicts of interest in universal banks turn into realized conflicts of interest depends on (1) imperfect information on banks, (2) the level of concentration in the banking sector, and (3) the value of reputation. These three features of the institutional setting facilitate the materialization of conflicts of interest (Mehran and Stulz, 2007; Saunders and Cornett, 2014). Hence, they will lead to negative effects of scope expansion for both small and large banks. However, an environment with more information sharing, more private monitoring, reputation concerns or more competition, works as a disciplining device for large banks and induces them to differentiate and innovate for the better cause.

These two contributions have important policy implications. First of all, the negative interaction effect implies that implementing one regulatory reform proposal, i.e. downsizing banks, may weaken another policy, ring-fencing or limiting activities. Second, ring-fencing small banks or forcing small banks to get back to the basics is always desirable to reduce systemic risk. Third, our results indicate that there might be a bright side to allowing large banks to expand into non-interest income conditional on the institutional setting. This creates a trade-off. It may be desirable to restrict activities of large banks if there is low information sharing, low private monitoring, high corruption and more concentration. On the other hand, improving transparency and the flow of information might be a desirable alternative to ring-fencing. Fourth, our results also indicate that downsizing is unconditionally desirable from a systemic risk point of view for two reasons. Not only is the effect of size on the systemic risk exposure always positive (for all levels of the non-interest income share), downsizing will also reduce concentration (and hence limits the scope for conflicts of interests).

The rest of the paper is structured as follows. In Section 1.2, we describe the sample construction as well as the main variables of interest. Subsequently, in Section 1.3, we provide empirical evidence in favour of an interaction effect between size and diversification. Our second contribution, i.e. analyzing which factors mitigate or reinforce this interaction effect is shown in Section 1.4. We subject this new and intriguing finding in the relationship between diversification, size and systemic risk to a battery of robustness checks, which are discussed in Section 1.5.

1.2 Descriptive statistics

To gauge the relationship between bank size, non-interest income and systemic risk, we combine data from several sources. We obtain information on banks' balance sheets and income statements from Bankscope, which is a database compiled by Fitch/Bureau Van Dijk that contains information on banks around the globe, based on publicly available data-sources. Bankscope contains information for listed, delisted as well as privately held banks. While Bankscope does not contain stock market information on a daily basis (which is what we need to compute a systemic risk indicator), it does contain information on the ticker as well as the ISIN number of (de)listed banks' equity, which enables matching Bankscope

with Datastream. From Datastream, we retrieve information on a bank's stock price as well as its market capitalization. This merged Bankscope-Datastream sample yields a panel of 16507 bank-year observations, distributed over 15 years and 76 countries.[8] We include commercial banks (44.5% of our sample), bank holding companies (51%), savings banks and cooperatives (4.5%). Our data span the period of 1997-2011.

The dependent variable is a bank's systemic risk exposure. A bank's exposure to systemic risk is measured by the Marginal Expected Shortfall (MES), as proposed by Acharya et al. (2017). Mathematically, the MES of bank i at time t is given by the following formula:

$$MES_{i,t}(Q) = E[R_{i,t}|R_{m,t} < VaR^{Q}_{m,t}] \quad (1.1)$$

In equation 1.1, $R_{i,t}$ denotes the daily stock return of bank i at time t, $R_{m,t}$ the return on a banking sector index at time t. $VaR^{Q}_{m,t}$ stands for Value-at-Risk, which is a threshold value such that the probability of a loss exceeding this value equals the probability Q. Q is an extreme percentile, such that we look at systemic events. Following common practice in the literature, we compute MES using the opposite of the returns such that a higher MES means a larger systemic risk exposure. Conceptually, MES measures the increase in the risk of the system induced by a marginal increase in the weight of bank i in the system.[9] The higher a bank's MES (in absolute value), the higher is the contribution of bank i to the risk of the banking system.

In this paper, we measure MES for each bank-year combination and follow common practice by setting Q at 5%. Doing so, $MES_{i,t}$ corresponds with bank i's expected equity loss per dollar in year t conditional on the market experiencing one of its 5% lowest returns in that given year. While Datastream provides return indices for the banking sector indices, it does not do so for all countries in our sample. For consistency across countries, we therefore construct the (value-weighted) indices ourselves. Moreover, the bank for which

[8] In terms of geographical spread, US banks constitute the largest part of our sample (1137 banks out of 2199). However, this US dominance does not impact our main findings, as our results also hold when using various subsamples (including a non-US sample) or when weighting observations such that each country-year combination gets equal weight. A list of countries and number of banks is available on request.

[9] The Expected Shortfall of the market portfolio is given by: $E[R_{m,t}|R_{m,t} < VaR^{Q}_{m,t}] = \sum_{i-1}^{N} w_{i,t} E[R_{i,t}|\ R_{m,t}<VaR^{Q}_{m,t}]$, and is hence equal to the weighted sum of the MES of all banks in the system. The first derivative of the Expected Shortfall of the market portfolio with respect to $w_{i,t}$ equals the MES of bank *i* at time *t*.

we compute the MES is excluded from the banking sector index for a given country. The independent variables of interest are bank size and non-interest income. The former is computed as the natural logarithm of total assets expressed in 2007 US dollars. We measure a bank's share of non-interest income to total operating income, by dividing other operating income (which comprises trading income, commissions and fees as well as all other non-interest income) by the sum of interest income and other operating income.[10] Summary statistics of all variables are reported in Table 1.1.

The other bank-specific variables capture various other dimensions of a bank's business model. In particular, we include proxies for leverage (capital-to-asset ratio), the funding structure (share of deposits in sum of deposits and money market funding), asset mix (loans to assets ratio), profitability (return-on-equity), annual growth in total assets as well as expected credit risk (loan loss provision to interest income). These variables are often used in other studies; and the values are comparable to e.g.: Laeven and Levine (2009) or Beck et al. (2013). We winsorize all variables at the 1 percent level to mitigate the impact of outliers.

1.3 The impact of bank size and non-interest income on systemic risk

Our first goal is to empirically show the impact of bank size, non-interest income, and their interaction on banks' Marginal Expected Shortfall. To that end, we estimate regressions corresponding with the following equation:

$$MES_{i,t+1} = \beta_1 Size_{i,t} + \beta_2 NII_{i,t} + \beta_3 Size_{i,t} NII_{i,t} + X_{i,t}\beta + u_i + v_{t+1} + \varepsilon_{i,t+1} \qquad (1.2)$$

Next to including a proxy for bank size and non-interest income (NII), we control for various bank- and country-specific characteristics that may affect the Marginal Expected Shortfall. These are represented by the vector $X_{i,t}$ and are described in Section 1.2. In

[10] In the robustness section, we decompose non-interest income in its constituents (i.e. commission and fee income, trading income and other operating income) and find similar results for each of the components. Moreover, we also resort to alternative data sources for US banks (regulatory filings of Bank Holding Companies, i.e. the FRY9C reports) that allow for an even finer decomposition. The results are robust to (i) using only US data and (ii) alternative non-interest income decompositions.

Table 1.1. Summary statistics

Variable	Mean	Standard Deviation	5th Percentile	Median	95th Percentile
Bank variables					
Marginal Expected Shortfall	1.924	2.354	−0.435	1.323	6.55
Ln(Total assets)	8.004	2.078	5.153	7.638	11.972
Non-interest income share	0.186	0.141	0.033	0.158	0.435
Capital-to-assets ratio	9.565	5.969	3.870	8.650	17.5
Share of deposit funding	0.924	0.128	0.709	0.969	1
Loans to total assets	0.623	0.159	0.325	0.647	0.842
Return-on-equity	8.274	15.389	−14.910	10.24	24.61
Annual growth in total assets	0.096	0.212	−0.142	0.059	0.441
Credit risk	0.192	0.321	0	0.098	0.69
Country variables					
GDP per capita	8.83	1.356	6.237	9	10.518
GDP growth – annual	3.531	3.666	−2.75	3.75	8.9
CPI inflation rate	4.637	7.951	0	2.64	13.59
Depth of information sharing	4.012	1.788	0	4	6
Private monitoring	8.232	1.382	6	8	10
Official supervisory power	10.981	2.41	6	11	14
Freedom from corruption	54.839	24.328	22	50	93
HHI concentration	0.208	0.159	0.048	0.159	0.555

This table shows the total sample summary statistics for the bank- and country-specific variables used throughout the paper. Bank specific data is retrieved from the Bureau Van Dijk Bankscope database. The full sample contains 16507 bank-year observations over the period 1996–2010 (as the accounting data are lagged one year with respect to the market-based risk measure). For each variable, we report five statistics, which are calculated at the bank-year level: the mean and standard deviation of the variables as well as the 5th, 50th and 95th percentile. All variables are winsorized at the one percent level. The summary statistics for the country-specific variables are calculated at the country-year level. The full sample contains 869 country-year observations over the period 1996–2010. The first three country-specific variables, GDP per Capita, Annual GDP Growth and the CPI Rate are used as macro-economic control variables throughout the paper. Data for these variables is retrieved from the WDI database at the World Bank. The other four country-specific variables are proxies for the information environment in a country. The Depth of Information Sharing indicator is retrieved from the World Bank Doing Business database. The Private Monitoring index and Official Supervisory Power Index are taken from the Bank Regulation and Supervision database (see Barth et al., 2013). The Freedom from Corruption index is taken from the Heritage foundation, whereas the Herfindahl–Hirschman concentration index (HHI) is calculated based on total asset data retrieved from the Fitch/Bureau Van Dijk Bankscope database.

addition, we include bank (u_i) and year (v_{t+1}) fixed effects and cluster the standard errors at the bank level. Let us stress once more that we compute MES using the opposite of the returns such that a higher MES means a larger systemic risk exposure. The results are reported in Table 1.2 and we will focus our discussion only on the impact of the variables of

interest, which corresponds with the coefficients β_1, β_2 and β_3.

In the first column, we report the results when imposing the constraint that there is no interaction effect between bank size and non-interest income, i.e. we impose that $\beta_3 = 0$. Hence, we impose additivity, which is the benchmark in the literature. We find that size has a positive effect on MES. Larger banks will experience a larger reduction in market value of their stock if there is a systemic event. The impact of NII on MES is negative and significant. Moreover, the correlation coefficient[11] of size and non-interest income (after the within transformation), is insignificant, reducing multicollinearity issues. The sign, significance and magnitude of this coefficient is in line with the results reported in Engle et al. (2012) in their specification including bank fixed effects. The economic magnitude of this estimated effect is small. A one standard deviation increase in the share of non-interest income in total income, holding all else equal, leads to an increase in MES of 0.1355 (i.e. the coefficient, -0.961, times the standard deviation of NII, 0.141). This is only a moderate impact on the MES, which has a mean of 1.9 and a standard deviation of 2.4. In column 2, we relax the restriction that $\beta_3 = 0$ and find that the interaction coefficient is negative and strongly significant. While the sign and magnitude of the size coefficient are unaffected, we now obtain that the coefficient on the non-interest income share is positive, large and significant. Hence, we find that expanding into non-interest income leads to higher systemic risk exposures for small banks. For example, based on the results in column 2 of Table 1.2, a one standard deviation increase in non-interest income for a bank at the 5th size percentile leads to a rise in the MES of 0.175, which corresponds with a 9.2% increase in MES for the average bank in our sample.[12] However, for larger banks the impact of non-interest income on MES becomes smaller and turns negative when ln(TA) equals 6.871, which corresponds with 963.7 million US$ (see bottom panel of Table 1.2). Figure 1.1 depicts the marginal effect of the non-interest income share on MES over the observed range of bank size in the sample.

[11] A full correlation table is reported in the online appendix. In particular, we report the correlation coefficients of the raw, untransformed data as well as those of the data after the within transformation. The latter implies that we first subtract, for each variable, the bank-specific mean. This setup corresponds with our regression which includes bank fixed effects.

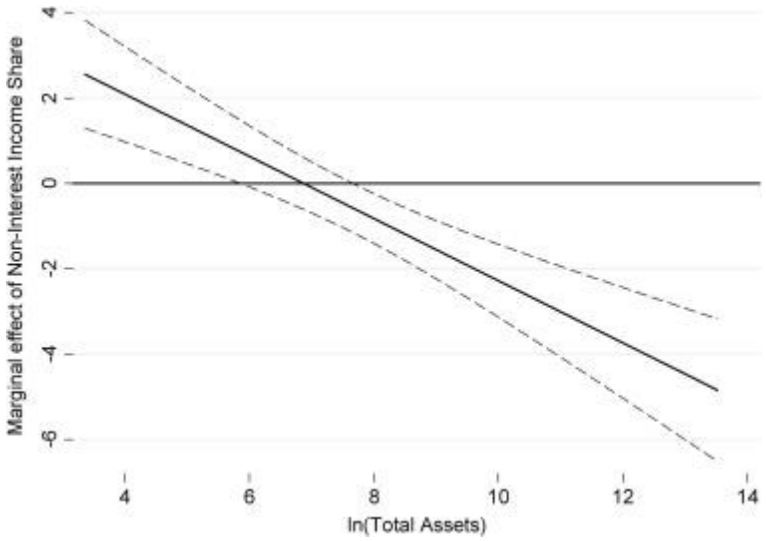
[12] The standard deviation of the non-interest income share is 0.14. The 5th percentile of ln(total assets) is 5.15 in our sample. Using the coefficients from column 2 of Table 1.2, we can then calculate the impact as follows: $0.14 * (5.001 - 0.728 * 5.15) = 0.175$.

Table 1.2. Baseline regressions: The interaction between size and non-interest income

					Alternative dependent variables		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	MES	MES	MES	MES	d(CoVaR)	TV	MES (incl)
Ln(Total assets)	0.839***	0.994***	0.702***	0.919***	15.791***	0.128**	1.002***
	(0.09)	(0.10)	(0.11)	(0.10)	(2.20)	(0.07)	(0.10)
Non-interest income share	−0.961***	5.001***	4.308***	5.611***	176.969***	2.772***	6.383***
	(0.29)	(1.07)	(0.75)	(1.95)	(31.09)	(0.68)	(1.14)
Ln(TA)∗ Non-interest income share		−0.728***	−0.470***	−0.880***	−23.001***	−0.359***	−0.910***
		(0.14)	(0.12)	(0.24)	(3.98)	(0.08)	(0.14)
Observations	16507	16507	16507	15522	13358	16506	16505
Adjusted R-squared	0.568	0.57	0.479	0.185	0.925	0.6	0.587
Bank fixed effects	YES	YES	NO	YES	YES	YES	YES
Year fixed effects	YES	YES	YES	YES	YES	YES	YES
Country fixed effects	NO	NO	YES	NO	NO	NO	NO
Bank-specific controls	YES	YES	YES	YES	YES	YES	YES
Macro-economic variables	YES	YES	YES	YES	YES	YES	YES
MFX(NII)=0 for lnTA		6.871	9.164	6.379	7.694	7.717	7.013
MFX(NII)=0 for TA		963.7	9549	589.2	2195	2246	1111
Kleibergen–Paap F-stat				67.5			
Hansen J p-value				0.137			

This table contains estimation results for the baseline specification and robustness tests on the baseline. The dependent variable is the Marginal Expected Shortfall, which corresponds with a bank's average equity loss per dollar in a given year conditional on the market experiencing one of its 5 percent lowest returns in that given year. We take the opposite of the returns such that a higher value for MES implies a higher systemic risk exposure. The MES is regressed on bank size, the non-interest income share, their interaction and control variables (capital-to-asset ratio, the share of deposits in sum of deposits and money market funding, the loans to assets ratio, return-on-equity, annual growth in total assets, loan loss provision to interest income, GDP per capita, GDP growth and CPI inflation). All independent variables are winsorized at the one percent level and are lagged one year to mitigate reverse causality. We include bank fixed effect as well as time dummies in all specifications (except column 3, where we include country rather than bank fixed effects). Standard errors are robust and clustered at the bank level. At the bottom of the table, we also report the value of bank size at which the relationship between the non-interest income share and MES switches sign. The different specifications are as follows. In column 1, we impose the interaction effect to be zero. Column 2 is the baseline regression in which we add an interaction effect between size and non-interest income. In column 3, we include country rather than bank fixed effects. Column 4 reports results of an instrumental variable setup, in which we instrument the non-interest income share and the interaction term. As instruments, we use the lagged values of these two variables as well as a cost ratio. In columns 5 to 7, we replace MES with alternative risk measures. We respectively use delta CoVaR, annual stock return volatility, or MES computed when including the bank itself in the banking sector index as alternative risk measures. Robust standard errors in parentheses, clustered at the bank level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Figure 1.1. Marginal effect of non-interest income on the Marginal Expected Shortfall



This graph plots the marginal effect (fitted coefficient) of the non-interest income share on Marginal Expected Shortfall over the observed size range. The graph is based on the estimation results of the baseline specification on the full sample as in column 2 of Table 1.2. The coefficient of the non-interest income share is 5.001 and the coefficient of the interaction with bank size is −0.728. The solid line represents this estimated linear relationship over the observed (in our sample) range of ln(Total Assets). The dotted lines correspond with the 95 percent confidence bounds. The solid line crosses the *X*-axis at 6.871, corresponding with a value of total assets of 963.7 million US dollars (expressed in 2007 values).

For small banks, the effect is economically large and positive and significantly different from zero. Subsequently, there is a range of values of ln(TA)=[5.86 − 7.66], around the "sign-switch point" of 6.871, at which the impact of NII is not significantly different from zero. The boundaries of this range correspond with the 14^{th} and 51^{th} percentile of bank size. Hence, for the 14% smallest banks in the sample, an increase in NII leads to an increase in MES. For the 49% largest banks in the sample, there is a significant impact of NII on MES as well, but it goes in the other direction. For larger banks, the impact is significantly sizeable and can become economically large (with point estimates exceeding −4). For example, a one standard deviation increase in non-interest income for a bank at the 95^{th} size percentile leads to a drop in the MES of 0.52, which corresponds with a 27.5% decrease in the MES for the average bank in our sample. Furthermore, the effect of a change in NII is twice as large for a bank with total assets of 207 billion US$ (=ln(TA) of 12.24) compared with a bank which has 14 billion US$ in total assets (=ln(TA) of 9.55). An equally

large but opposite effect is observed for a small bank with total assets worth 66 Million US$ (=ln(TA) of 4.10) compared with a bank which has 14 billion US$ in total assets (=ln(TA) of 9.55). Hence, not controlling for the interaction effect between size and non-interest income may lead to misguided conclusions. The interaction term also rationalizes why the effect of NII seems small in column 1. The effect in the first column averages out and obscures the large positive effect of NII for small banks and large negative impact of NII for large banks.

In sum, we find that larger banks have a larger MES than small banks and that the effect of NII depends on the size of the bank. Alternative revenues increase the exposure to systemic risk for small banks, but reduce it for larger banks. Put differently, the dark side of diversification and innovation dominates for small banks, while for large banks the bright side of diversification outweighs the potential negative consequences. Furthermore, additional robustness checks, which will be discussed in Section 1.5, indicate that both the statistical significance as well as the economic magnitudes (particularly regarding the value of bank size at which the sign switch for non-interest income occurs) are robust to endogeneity concerns, additional (market-based) control variables, alternative risk measures, decomposing non-interest income in its subcomponents as well as several sample splits.

1.4 Conflicts of interest: Exploiting cross-country heterogeneity

1.4.1 Theoretical motivation and empirical proxies

We find that the bright side of diversification dominates the dark side for large banks, but not so for small banks. One potential reason is that large banks are, compared to small banks, typically subject to a larger scrutiny by various disciplining stakeholders. However, these stakeholders will only be able to properly discipline these banks when the information environment or institutional setting allows them to do this. If not, large banks do have incentives to abuse conflicts of interest. Mehran and Stulz (2007) and Saunders and Cornett (2014) conjecture that the scope for exploiting conflicts of interest is larger when (1) there is more asymmetric or imperfect information, (2) reputation concerns and

fear of litigation are low, and (3) the banking sector is more concentrated (there is no alternative). We take advantage of our cross-country sample to exploit differences in institutional settings[13] across countries in each of these three dimensions. In particular, we measure imperfect or asymmetric information between a bank and other economic agents with three proxies. First, we employ a private monitoring index to analyze the strength of the information environment. The private monitoring index, taken from the Bank Regulation and Supervision database (Barth et al., 2013), ranges from 0 to 12, where larger values indicate greater regulatory empowerment of the monitoring of banks by private investors. Put differently, it captures how heavily regulators and policy makers try to incentivize private investors to monitor financial institutions. For example, it will be easier for private investors to monitor financial institutions when the latter have to provide more detailed information on their activities, are required to obtain certified audits and are rated by external agencies. More and better information on a banks' activities should then reduce information asymmetry problems between banks and the public/outside investors, which in turn reduces the probability that the dark side of diversification will be able to manifest itself. Second, a well-developed credit register will provide detailed information to supervisors and participating banks on other banks' credit quality by gathering data on the amount borrowed by each firm, default rates on loans, and so on. Hence, these registers should reduce the potential private information advantage and mitigate overall information asymmetries. To measure the information content of credit registries, we use the credit depth of information index. This is an indicator from the World Bank Doing Business database that takes into account the rules affecting the scope, accessibility, and quality of credit information available through public or private credit registries. The index ranges between 0 and 6, with a higher value indicating that more information is available. Thirdly, we also include a proxy for Official Supervisory Power, also constructed by Barth et al. (2013). The index measures the degree to which the country's bank supervisory agency has the authority to take specific actions. The official supervisory index has a

[13] Our cross-country sample offers the advantage that we can exploit variation in the institutional settings in which banks operate. We can therefore take a different approach compared to prior empirical research on conflicts of interest (for a survey of that literature, please see Drucker and Puri, 2007). Prior studies use detailed contract-level data (see e.g. Kroszner and Rajan, 1994 or Puri, 1996) and investigate the actual realization of conflicts of interest. Institutional features will make the exploitation of conflicts of interest more likely in some countries than in others. Hence, we do not look at the actual exploitation of conflicts of interest, but at the scope for the realization of such conflicts.

maximum value of 14 and a minimum value of 0, where larger numbers indicate greater power.

Reputation concerns will be low whenever fraudulent actions will remain undetected or are not penalized. We hypothesize that bank fraud is more likely and reputation concerns are lower in countries in which corruption levels are higher. We use the Heritage Freedom from Corruption Index to measure how corrupt a government is.[14] The index ranges between 0 and 100, where a higher index indicates less corruption.

Finally, in concentrated markets, banks should be less concerned with reputation concerns and market retaliation as there are no or fewer alternatives to go to. Bank market concentration is proxied by the Herfindahl-Hirschman concentration index (HHI). This index measures market concentration by summing the squares of the market shares (based on total assets) of all banks (listed and privately held) in a country. The higher the index, the more concentrated the banking market. Summary statistics of these variables are reported in the bottom panel of Table 1.1.

1.4.2 Setup and results

To measure the impact of the institutional setting on the interaction effect, we expand equation 1.2 by adding the country-specific factors of interest (one-by-one) and their interaction terms with bank size and diversification:

$$MES_{i,t+1} = \beta_1 Size_{i,t} + \beta_2 NII_{i,t} + \beta_3 Z_{i,t} + \beta_4 Interactions_{i,t} + X_{i,t}\beta + u_i + v_{t+1} + \varepsilon_{i,t+1} \quad (1.3)$$

$MES_{i,t+1}$, $Size_{i,t}$ and $NII_{i,t}$ are defined as in the previous section. $Z_{i,t}$ is one of the country-specific variables under investigation, $Interactions_{i,t}$ is a vector including all interaction terms between bank size, non-interest income and the country-specific characteristic, and $X_{i,t}$ is a group of bank specific and macro-economic control variables. Additionally, we also control for bank (u_i) and time (v_{t+1}) fixed effects. Estimating this equation allows us to

[14] Bank fraud data is available (see e.g. the proxy of corruption in bank lending used by Beck et al. (2006)), but unfortunately only for a single year (2000), whereas the freedom from (government) corruption indicator is time-varying and measured annually. We find that the correlation between corruption in bank lending in and the freedom from government corruption in the year 2000 is negative and significant (−68%). Similarly, Barth et al. (2009) show in a regression framework with control variables that measures of macro-corruption are significantly related to corruption in bank lending.

analyze the impact of country-specific characteristics on the relationship between non-interest income and systemic risk, while taking into account that the impact could differ for either small or large banks.[15] The impact of the five aforementioned country-specific proxies on the relationship between bank diversification and systemic risk is reported in Table 1.3. We report both the regression results (upper panel) and the marginal effect of NII on MES for different values of the country-specific variables (lower panel). The triple interaction term has the expected sign and is significant in three out of five cases. This provides support for the hypothesis that an institutional environment that facilitates the potential for conflicts of interest makes it more likely that an increase in non-interest income leads to a higher MES for larger banks as well. To facilitate the interpretation and provide insights in the economic magnitudes of the effects, we will mainly focus on the marginal effects that are reported in the lower right panel. We calculate the marginal effect of a change in diversification on systemic risk exposures for countries that have a low, median or a high level of the country-specific proxy of the scope for conflicts of interest. The low group is based on the country at the 10th percentile of the country-specific proxy, the median group is based on the country at the 50th percentile and the high group is based on the country at the 90th percentile. At the same time, we calculate the effect for each subgroup for three types of banks (small, median, large), based on the 10th, 50th and 90th percentile of bank size in our sample. For each bank size-country characteristic combination, the marginal effect is given in the first column, while the second column shows the corresponding p-value. Furthermore, the last column shows the difference (and the corresponding p-value) between the impact of diversification for banks in the low country group and banks in the high country group (for a given size). Similarly, the last row shows the differences for banks operating in the same country group but belonging to a different size group (large versus small).

The results in Table 1.3 reveal a couple of interesting patterns. First, all proxies

[15] Lee et al. (2014) provide evidence that the relationship between revenue diversification and bank performance/risk depends upon country characteristics. We differ from Lee et al. (2014) in at least three dimensions. That is, they only look at a sample of 29 Asia-Pacific countries, focus on the country-heterogeneity in the impact of diversification on bank performance (irrespective of bank size) and explain the cross-country variation in that relationship with differences in financial structures and reforms (bank- or market-based systems).

confirm that an environment more conducive to the realization of conflicts of interests leads to a larger impact of non-interest income on MES (irrespective of bank size), i.e. high-

Table 1.3. Country factors that facilitate exploiting conflicts of interest

Panel A

Variables	MES	MES	MES	MES	MES
Ln(Total assets)	0.716***	0.132	0.659***	0.974***	1.087***
	(0.17)	(0.23)	(0.18)	(0.19)	(0.10)
Non-interest income share	−1.922	−5.152	2.929	1.612	6.124***
	(3.55)	(4.75)	(3.25)	(3.341)	(1.48)
Ln(TA)∗Non-interest income share	0.785	1.098∗	−0.143	−0.126	−1.008***
	(0.49)	(0.63)	(0.44)	(0.44)	(0.19)
Country characteristic∗Ln(TA)	0.055**	0.105***	0.033**	0.000	−0.764***
	(0.03)	(0.02)	(0.01)	(0.00)	(0.27)
Country characteristic∗	1.206∗	1.269**	0.278	0.046	−9.540
Non-interest income share	(0.71)	(0.51)	(0.29)	(0.05)	(6.22)
Country characteristic*Ln(TA)*	−0.278***	−0.224***	−0.067	−0.009	2.406***
Non-interest income share	(0.10)	(0.07)	(0.04)	(0.01)	(0.91)
Depth of information sharing	−0.140				
	(0.22)				
Private monitoring		−0.675***			
		(0.17)			
Supervisory power			−0.256**		
			(0.10)		
Freedom from corruption				−0.00103	
				(0.02)	
HHI					4.049**
					(1.97)
Observations	15252	15646	14325	16507	16507
Adjusted R-squared	0.573	0.573	0.577	0.57	0.572
Bank fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes	Yes
Cluster	Bank	Bank	Bank	Bank	Bank
Nr Countries	76	72	70	76	76

This table documents the impact of country characteristics on the relationship between size, diversification and systemic risk. We exploit four different country characteristics that all affect the extent to which potential conflicts of interest are more likely to materialize. The measures are (1) the depth of information sharing, (2) the level of private monitoring, (3) supervisory power, (4) the freedom from corruption, and (5) concentration. The table consists of two panels. Panel A shows the results for regressions of our systemic risk indicator (MES) on bank size, non-interest income diversification, the country variable in question and all possible interactions between these three variables. Furthermore, we also include a range of bank-specific and macro-economic control variables (capital-to-asset ratio, the share of deposits in sum of deposits and money market funding, the loans to assets ratio, return-on-equity, annual growth in total assets, loan loss provision to interest income, GDP per capita, GDP growth and CPI inflation) and bank and time fixed effects in our regressions. All standard errors are clustered at the bank level. For each country characteristic, we create a separate subpanel, which are all constructed similarly. Robust standard errors in parentheses, clustered at the bank level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Panel B

Marginal effect of NII on MES if….

Depth of information sharing								
	Low		Median		High		High-low	
Small banks	2.061	0.031	1.108	0.012	0.472	0.375	−1.589	0.182
Median bank	3.107	0	0.432	0.201	−1.352	0	−4.458	0
Large banks	4.778	0.004	−0.648	0.334	−4.266	0	−9.043	0
Large–Small	2.717	0.202	−1.756	0.044	−4.738	0		
Private monitoring								
	Low		Median		High		High-low	
Small banks	1.103	0.135	1.184	0.017	1.265	0.006	0.162	0.823
Median bank	0.591	0.268	−0.253	0.471	−1.097	0.001	−1.689	0.003
Large banks	−0.226	0.818	−2.549	0	−4.871	0	−4.646	0
Large–Small	−1.329	0.317	−3.733	0	−6.136	0		
Supervisory power								
	Low		Median		High		High-low	
Small banks	1.448	0.004	1.186	0.004	0.923	0.066	−0.525	0.360
Median bank	0.051	0.893	−0.625	0.044	−1.301	0.001	−1.352	0.005
Large banks	−2.181	0.001	−3.517	0	−4.854	0	−2.673	0.012
Large–Small	−3.629	0	−4.703	0	−5.777	0		
Freedom from Corruption								
	Low		Median		High		High-low	
Small banks	0.909	0.245	0.896	0.071	0.876	0.097	−0.034	0.973
Median bank	0.208	0.684	−0.246	0.448	−0.974	0.019	−1.182	0.099
Large banks	−0.913	0.402	−2.073	0.001	−3.928	0	−3.016	0.078
Large–Small	−1.822	0.241	−2.969	0.001	−4.804	0		
HHI								
	Low		Median		High		High-low	
Small banks	0.832	0. 082	1.179	0.004	2.086	0	1.254	0.061
Median bank	−0.941	0. 004	−0.119	0.689	2.026	0.001	2.967	0
Large banks	−3.773	0	−2.193	0	1.930	0.119	5.703	0
Large–Small	−4.605	0	−3.372	0	−0.156	0.910		

In panel B, we report information on the marginal effect of a change in NII share on the Marginal Expected Shortfall for nine cases. We distinguish between small, median and large banks as well as countries with a low, median or a high level of the country-characteristic. The size classification (small, median, large) is based on the 10th, 50th and 90th percentile of bank size in our sample. The country classification (low, median and high) is based on the country at the 10th, 50th and 90th percentile of the country-specific proxy. We also report the difference between the marginal effect of NII on MES in the high and low group and large vs small banks. The (difference in the) marginal effect(s) is given in the first column, while the second column shows the corresponding *p*-value (italics). Calculations of these marginal effects are based on the regression results in panel A.

low (in the last column of the RHS panel) is negative for the first four proxies and positive for the last one (concentration). This implies that diversification into non-interest income activities will lead to higher systemic risk exposures in countries with non-transparent information environments, weaker supervisory power, more corruption or high concentration. Second, in line with our previous findings, the results in Table 1.3 confirm that the effect of non-interest income depends on the size of the bank. However, in addition to the results in the previous section, the results in Table 1.3 also illustrate that the average negative relation between non-interest income and MES for large banks, e.g. depicted to the right of the turning point in Figure 1.1, masks cross-country variation. The average negative effect is the result of a significant positive or non-significant negative relationship for banks operating in institutional settings conducive to conflicts of interest (e.g., low information, 4.778^{***}, high corruption, -0.913, or high concentration, 1.93) and a significant and large negative relationship for banks operating in institutional settings mitigating conflicts of interest (e.g. more information, -4.266^{***}, low corruption, -3.928^{***}, or low concentration, -3.773^{***}). Third, there is no statistically significant difference in the impact of the NII-share on MES for large versus small banks in countries with non-transparent information environments, more corruption or high concentration. The *p*-values of a differential response for large versus small banks is at least 0.20 when there is low information sharing, high corruption or high concentration.

In sum, we document that the sign switch disappears if the institutional setting facilitates the materialization of conflicts of interest.[16] Hence, it will lead to negative effects of scope expansion for both small and large banks. However, an environment with more information sharing, more private monitoring, stronger supervisory monitoring, less corruption or more competition, works as a disciplining device for large banks and induces them to differentiate and innovate for the better cause. For small banks, on the other hand, the effect remains negative and does not vary with these institutional features.

Overall, the results in this section confirm that the scope for conflicts of interests has a sizeable impact on the multiplicative effect of bank size and diversification on systemic

[16] Supervisory power is the exception to this general finding. The impact of NII on MES is negative for large banks irrespective of the strength of supervisory power. However, the gap between large and small banks' their impact of NII on MES is increasing in supervisory power strength, indicating that stronger supervisors are especially beneficial for disciplining the behaviour of large banks.

risk. If the institutional environment favors exploiting conflicts of interest, then diversification or innovation will lead to higher systemic risk exposures, both for large and small banks. On the other hand, diversification into non-interest income activities (innovation) could have a bright side for systemic stability in countries with transparent information environments, strong supervisors, less corruption or lower bank market concentration. Our results also indicate that the scope for conflicts of interest matters more for large banks. This is consistent with the idea that the larger scrutiny, by various disciplining stakeholders, to which large banks are typically subject, can only play its role in an environment that forces banks to be more transparent about their activities.

1.4.3 Economic magnitudes

What do the results reported in Table 1.3 and discussed above imply quantitatively and qualitatively? Using the depth of information sharing indicator as an information environment proxy, our results indicate that a one standard deviation in the non-interest income ratio leads a to jump in the MES ranging between 0.29 (for small banks) and 0.67 (for large banks)[17] when the potential scope for asymmetric information and conflicts of interest is high. For large banks, this increase in MES with 0.67 corresponds with a 35 percent increase of the average MES. On the other hand, when banks are operating in a highly transparent information environment, a one standard deviation increase in the non-interest income ratio would lead to a change in the MES ranging between 0.07 (for small banks) and -0.60 (for large banks), indicating that diversification can potentially contribute to a more stable banking system when the information environment is well developed. The impact of the information environment is also economically large. The differences between the impact of a change in diversification are reported in the high-low column and indicate that the impact of an increase in diversification is always significantly more positive (hence more risk) in countries with an underdeveloped information environment. Further focussing on the depth of information sharing, our results show that a one standard deviation increase in the non-interest income ratio for a median sized bank

[17] The standard deviation of the non-interest income ratio in our sample is 0.14. Based on the results in Table 1.3, the impact of a one standard deviation increase for a large bank operating in a low information environment thus equals $0.14 * 4.778 = 0.67$, which equals 35 percent of the average MES (1.92) or 28 percent of its standard deviation (2.35) in our sample. We make similar computations throughout this subsection.

operating in a low information environment raises the MES with 0.43. This corresponds with a 23 percentage increase in MES for the average bank in our sample, or, put differently, a 19 percent standard deviation increase in the MES. If that same bank would be operating in a highly transparent information environment, a standard deviation increase in the non-interest income ratio would lead to a reduction in the MES with 10 percent, which equals an 8 percent standard deviation decrease in MES. A similar and even stronger effect is found for large banks. The results for large banks indicate that a one standard deviation increase in the non-interest income ratio for a large bank operating in a low information environment raises the MES with 0.67 ($= 0.14 * 4.77$), which corresponds with a 35 percent increase in MES for the average bank in our sample. At the other extreme, if the same bank is operating in a country with a well-developed credit register, a one standard deviation increase in the non-interest income ratio leads to a drop in MES of 0.60 ($= 0.14 * -4.26$), which equals a reduction in average MES of 31 percent.

The results for the other information environment proxy (the private monitoring index), the freedom from corruption index and bank concentration are qualitatively similar. Banks operating in countries in which the potential scope for asymmetric information problems is lower will benefit more from an increase in diversification - in terms of systemic risk - compared to banks operating in a country with highly opaque information environments. For example, a standard deviation increase in the non-interest income ratio of a median sized bank operating in a country with a low private monitoring (freedom of corruption) index, leads to an increase in the MES with 7 (1.5) percent, while a similar raise in non-interest income would lead to a decrease in MES with 12 (8) percent if that bank would be operating in a highly transparent environment. For medium-sized and large banks, an improvement in the strength of supervisory power leads to a significant lower impact of NII on MES. The differential impact of a one standard deviation increase in NII on MES for a median-sized bank operating in a high versus low supervisory environment is -0.19 ($= 0.14 * -1.352$), whereas a similar computation for large banks yields an effect that is twice as large ($0.14 * -2.673 = -0.37$), indicating that supervisory power is more effective for disciplining large banks' behaviour. The difference in impact between high and low concentrated markets is reported in the last two columns in the HHI panel of Table 1.3. The difference is always positive and significant, and ranges between

1.25 for small banks and 5.70 for large banks. More specifically, a standard deviation increase in the non-interest income ratio for small (large) banks operating in a concentrated banking environment leads a to jump in the MES of 0.29 (0.27), which corresponds with an increase of around 16 (14) percent for the average bank in our sample. On the other hand, when a similar small (large) bank operates in an unconcentrated banking market, a standard deviation increase in the non-interest income ratio leads to a change in the MES of 0.11 (−0.53). This lends support to the idea that concentrated banking markets can suffer from too-important-to-fail problems, which will give banks an incentive to opt for more risky assets when they decide to (further) diversify their revenue stream.

1.5 Robustness tests[18]

In this section, we briefly discuss the results of a large number of additional tests and specifications, which indicate that the statistical significance as well as the economic magnitudes that we find in our analyses are robust. First of all, we subject the baseline regression (column 2 of Table 1.2) to a number of robustness tests to make sure that our results are not driven by omitted variables, endogeneity issues, the chosen systemic risk measure or (implicit or explicit) bail-out guarantees for large banks. In our baseline specification in column 2, we include bank-fixed effects to control for unobserved bank heterogeneity. To show that this is indeed important, we first relax this assumption in column 3 in which we include country fixed effects, but no bank fixed effects. We observe a substantial drop in the R-squared from 57% in column 2 to 48% in column 3, indicating a large scope for an omitted variable bias at the bank level. Admittedly, bank fixed effects only capture time-invariant bank-specific omitted variables, such as ownership or management which jointly decide on the risk profile as well as the business model. It can still be that there are time-varying omitted bank characteristics that drive both MES and the decision to diversify. In column 4, we report the results from an instrumental variable specification. We instrument NII and the interaction terms with their lag and a bank level operating cost ratio. The rationale behind this instrument is based on the theories of Rajan

[18] A more detailed discussion as well as additional tables are available on request.

et al. (2000) and Scharfstein and Stein (2000), which both imply that in more diversified firms weaker divisions will potentially get cross-subsidized by stronger ones, which will impact the cost level of diversified firms. The statistical tests validate the choice of our instrument set and indicate robustness. In subsequent tests, we analyze the robustness of the results when using alternative dependent variables. We find similar results when using respectively a systemic risk contribution measure ($\Delta CoVaR$, Adrian and Brunnermeier (2016)), total bank risk (total volatility of bank returns) or an alternative MES (that includes the bank itself in the banking index). The results in columns 5 to 7 indicate that the finding is not measure-specific, but also carries over to other risk measures that have been often used in the empirical literature relating non-interest income to bank risk (see e.g. Stiroh, 2006) or focusing on systemic risk (see, e.g. Brunnermeier et al., 2012). The largest banks (which are usually also more diversified) may benefit from implicit government guarantees (bailing out big banks) encouraging risk-taking, possibly affecting our baseline result. Unreported regressions show that our results are unaffected when including size squared or a dummy variable that is one for banks that are large with respect to the home country's GDP (as a proxy for being too-big-to-fail). Our results are also robust to (1) excluding the US banks from the sample, (2) employing weighted least squares such that each country-year combination gets equal weight, (3) splitting the sample in a pre-2007 crisis and a post-crisis period, (4) using commercial banks only, (5) using bank holding companies only, (6) dropping mergers and acquisitions (by excluding banks that shrink or grow substantially, and (7) bank exits.

We also analyze whether the results are robust to using alternative proxies for non-traditional banking activities. First of all, we examine whether the interaction effect is driven by a particular subcomponent of non-interest income. In columns 2 to 4 of Table 1.4, we focus on three non-interest income components which are available for our worldwide sample of banks. They are respectively fee income share, trading income share or other (non-interest) income share. For each component, the outcome is qualitatively similar to our baseline result. We always find a positive direct effect of the non-interest income component on MES, while the interaction term is negative. In an unreported regression, we include all three shares and their interactions with size simultaneously and find similar results. We also analyze US bank holding companies separately using Center for Research

in Security Prices (CRSP) and FR9YC data, which are more detailed and allow for alternative groupings of non-interest income components. Our initial result also holds when using these alternative data sources. Moreover, we also differentiate between a volatile and stable part of non-interest income as Calomiris and Nissim (2014) or a decomposition into traditional fee income, fee for services income and stakeholder income as in DeYoung and Torna (2013). These unreported tests also confirm the presence of a significant interaction effect of bank size and non-interest income on systemic risk exposures and this for each of the subcomponents.

Furthermore, we also construct two revenue diversification measures.

$$Div(HHI) = 1 - \left(\frac{interest\ income}{total\ income}\right)^2 - \left(\frac{non\ interest\ income}{total\ income}\right)^2$$

is a diversification measure based on the Herfindahl-Hirschman index (see e.g. Elsas et al., 2010). We also follow and define revenue diversification as follows:

$$Div(LL) = 1 - \left|\frac{interest\ income - non\ interest\ income}{total\ income}\right|$$

The results using these diversification measures rather than the non-interest income share are very similar as can be seen from the results reported in columns 5 and 6 of Table 1.4. Finally, in column 7, we use another proxy for the shift to non-traditional banking, which is the ratio of the total off-balance sheet position to total assets. Note that off-balance sheet items are also not necessarily only non-traditional banking activities as it may also contain the committed but unused component of credit lines or other credit-related commitments. As with the NII share, we find a positive and significant coefficient on the ratio of OBS to total assets and a negative and significant interaction effect with bank size. Moreover, we find that the value of bank size at which the relationship between MES and OBS-to-total assets switches from being positive to being negative is very similar to the one obtained in the baseline specification reported in column 1 of Table 1.4.

Next to analyzing the robustness of the result to using alternative proxies for diversification, we also investigate whether the results hold when we use a relative size measure (market share within a country) rather than absolute size. The results are reported in the last column of Table 1.4. We find a positive and significant effect on NII and

market share and a negative and significant interaction effect, which is further evidence of the robustness of our baseline specification. Using alternative setups in which we replace market share with a binary classification of banks whose assets are above or below the median (or mean) bank's assets (in a country year) yield similar results.

Our last set of (unreported) robustness checks deals with the analysis of the triple interaction effect. In the absence of an exogenous cross-country shock to the scope for conflicts of interest, we have to resort to another external validation technique. In particular, we design a placebo test by examining whether other country characteristics, which are not directly related to exploiting conflicts of interests, would also lead to a significantly different interaction effect. In particular, we examine whether we find similar patterns while including proxies of (1) the level of deposit insurance, (2) restrictions on the permissible range of activities, (3) herding of activities, (4) crisis times, (5) monetary policy conditions or (6) GDP per capita. In general, we do not find that the impact of NII-share on MES differs depending on the value of these country characteristics. The non-significant triple interaction results in these specifications make it less likely that the results in Section 1.4 are driven by other country-specific factors or that the obtained results are random and obtained by chance.

1.6 Conclusion

Bank supervisors across the globe pay special attention to financial institutions that are seen as both large and complex entities as they pose a challenge to financial stability. However, how size and scope interact in their impact on systemic risk is ignored in the academic literature. Our results indicate that scope expansion and innovation (venturing into non-traditional banking activities) is less detrimental for systemic risk the larger the bank is and even becomes beneficial (i.e. reduces systemic risk exposures) for medium sized and large banks. Furthermore, we show that country characteristics that affect the scope for and realization of conflicts of interest mitigate the impact of this interaction effect. The results in this paper can help in evaluating suggested policy reform proposals that followed the global financial crisis. This paper documents that an increase in size leads to larger systemic risk exposures. Hence, scaling down the size of the banks will lead to less systemic risk. Furthermore, from a systemic risk point of view, forcing banks to go back to

the basic activities is unambiguously good for small banks, irrespective of the institutional setting. On the other hand, systemic risk exposures may increase if large banks are ring-fenced, depending on the institutional setting. For large banks, ring fencing their activities may lower systemic risk, if they operate in an environment that facilitates the exploitation of conflicts of interest. Hence, improving information disclosure, both within and outside the financial system might be a substitute for restricting large banks' permissible range of activities. If large banks are forced to disclose more information, they will have less incentives to exploit the bad side of non-interest income generating activities. Put differently, information disclosure and less concentration might make it more likely that the bright side of innovation and diversification will prevail over the bad side.

This paper identifies a negative interaction effect between size and non-interest income in their relationship with systemic risk. We document that this pattern is also prevalent for the constituents of the non-interest income share, i.e. commission and fee income, trading income as well as other non-interest income. Moreover, the observed relationships (also those for the subcomponents) are similar in a sample of US banks only, even when using a finer split of the non-interest income generating activities. In future work, it may be worthwhile to focus exclusively on the US market and exploit the richness of the databases on US bank holding companies. For example, one may analyze how ownership structure and internal governance mechanisms, such as executive compensation or institutional ownership, may help in mitigating the relationship between conflicts of interest and risk-taking incentives in large banking groups. Data availability is the main limiting factor to analyze these issues in a large cross-country sample as ours. Alternatively, one may try to exploit plausibly exogenous regulatory changes at the state level (if any) to explore which specific source of revenue is most affected by the scope for conflicts of interest.

Table 1.4. Robustness checks

	Baseline	Revenue constituents (MES on LHS)			Diversification		Off-balance	Baseline	
	NII share	Fee Inc.	Trading Inc.	Other Inc.	Div(HHI)	Div(LL)	OBS	Market share	
Ln(Total assets)	0.994***	0.897***	0.871***	0.901***	1.064***	1.016***	0.999***	Market share	8.203***
	(0.10)	(0.10)	(0.09)	(0.10)	(0.10)	(0.10)	(0.10)		(1.40)
Proxy for non-traditional banking	5.001***	4.703***	9.532***	4.853***	5.646***	3.304***	1.215***	NII share	1.473***
	(1.07)	(1.76)	(2.85)	(1.38)	(1.12)	(0.63)	(0.42)		(0.25)
Ln(TA) *Proxy for non-traditional banking	−0.728***	−0.568***	−1.161***	−0.666***	−0.769***	−0.446***	−0.166***	Market share *NII share	−17.720***
	(0.14)	(0.20)	(0.33)	(0.18)	(0.14)	(0.08)	(0.05)		(5.35)
Observations	16507	15345	16507	15345	16490	16490	13552		16507
Adjusted R-squared	0.570	0.582	0.568	0.583	0.569	0.569	0.589		0.259
Bank fixed effects	YES	YES	YES	YES	YES	YES	YES		NO
Year fixed effects	YES	YES	YES	YES	YES	YES	YES		YES
Bank-specific controls	YES	YES	YES	YES	YES	YES	YES		YES
Macro-economic variables	YES	YES	YES	YES	YES	YES	YES		YES
MFX(NII)=0 for lnTA	6.871	8.285	8.212	7.286	7.346	7.402	7.308	MFX(NII)=0 for MS	8.30%

This table contains estimation results for robustness checks with respect to the proxy for non-traditional banking activities. The column title refers to which proxy of non-traditional banking activities is used in that specification. In column 1, we reproduce the baseline regression where the proxy for non-traditional banking activities is the non-interest income share. In columns 2 to 4, we investigate the impact of each of the components of the non-interest income share. We replace the non-interest income share variable with its 3 subcomponents, respectively being fee income share, trading income share and other non-interest income share. In columns 5 and 6, we replace the NII share with two measures of revenue diversification. The first one is (1- the Herfindahl–Hirschman index), labelled Div(HHI). The second one is a diversification measure in line with Laeven and Levine (2007), labelled Div(LL). Both measures are constructed such that higher values correspond with more diversification. In column 7, we replace the non-interest income share with the ratio of Off-balance sheet items to total assets. Finally in the last column, we repeat the baseline but replace bank size with market share. In all specifications, the dependent variable is the Marginal Expected Shortfall, which corresponds with a bank's average equity loss per dollar in a given year conditional on the market experiencing one of its 5 per cent lowest returns in that given year. We take the opposite of the returns such that a higher value for MES implies a higher systemic risk exposure. The MES is regressed on bank size, a proxy for non-traditional banking activities, their interaction and control variables (capital-to-asset ratio, the share of deposits in sum of deposits and money market funding, the loans to assets ratio, return-on-equity, annual growth in total assets, loan loss provision to interest income, GDP per capita, GDP growth and CPI inflation). All independent variables are winsorized at the one percent level and are lagged one year to mitigate reverse causality. We include bank fixed effect as well as time dummies in all specifications (except column 3, where we include country rather than bank fixed effects). Standard errors are robust and clustered at the bank level. At the bottom of the table, we also report the value of bank size at which the relationship between the proxy for the non-traditional banking activities and MES switches sign. Robust standard errors in parentheses, clustered at the bank level. $^{***}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.

Chapter 2

Banking products: You *can* take them with you, so why don't you?[19]

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2.1 Introduction

Policymakers frequently call for more competition in the banking sector to increase the efficiency of banking services, see for example the Global Financial Development Report 2013 (Worldbank, 2013), the Australian government response (2015) to the Financial System Inquiry (Murray et al., 2014) and the annual report of De Nederlandsche Bank (2015a).[20] One way to stimulate competition is to lower entry barriers to attract new players. Consumer inertia is one example of such a barrier (The Netherlands Authority for Consumers and Markets [ACM], 2014). Consumer inertia means that only a small proportion of consumers switch banks, which makes it hard for new entrants to gain market share. Inertia is not only a barrier for new entrants, it also reduces competition among existing players in the market.

Prior studies have concluded that most bank customers are immobile. The UK Competition and Markets Authority (2015a) reported in 2015 that almost 60% of account holders had not changed their main personal accounts provider in the past ten years. A report on Canada published by EY in 2013 states that 71% of Canadians have maintained

[19] Published in the Journal of Financial Services Research (2017). DOI https://doi.org/10.1007/s10693-017-0276-3

[20] There is no consensus in the literature regarding the effect of competition on stability. Two opposing views are described. The competition-fragility view perceives competition as detrimental for stability as it provides banks incentives to take more risks. The competition-stability hypothesis, in contrast, posits that competition enhances stability. We refer to Beck, De Jonghe and Schepens (2013) for an overview of the literature on bank competition and stability as well as conditional correlations between bank market power and stability for 79 countries.

their primary relationship for over a decade. In the case of the Netherlands, the ACM reports that in 2014, 73% of current account holders over 18 were still with the same bank where they opened their first account (ACM, 2014).[21] The European Commission (2013) concludes that mobility of consumers within Europe is low: around 10% of payment account users switched in 2011.

Even though consumers hold different banking products with distinct characteristics, prior studies use broad and general measurements of switching as they examine switching the main bank. There is little research on consumer bank switching behaviour (e.g. Kiser, 2002; Chakravarty et al., 2004; Brunetti et al., 2016a). Research has mostly focused on either the relationship between firms and banks (e.g. Ongena & Smith, 2001; Ioannidou & Ongena, 2010) or on consumers and non-banks (e.g. Giulietti et al., 2005; Yang, 2014).

At the same time, the product market considered by regulatory agencies for analysing competition in the US also consists of the cluster of commercial banking products and services (Federal Reserve, 2014). Similarly, the European Commission (2006) focuses on retail banking markets as a whole in merger decisions.[22] Although the clustering of banking products is convenient, identifying separate product markets may be better. Differences in mobility across banking products and the factors related to switching would provide an argument in favour of using a legal standard for analysing competition that is not based on clustering.

As a result, we research banking products separately. Our study focuses on current accounts, savings accounts, mortgage loans and revolving credit as these products are most commonly held by consumers. This approach allows us to differentiate between consumers' assets and liabilities. Our research questions are: 1) *Does the propensity to switch depend on the banking product?* 2) *What switching barriers do consumers perceive?* 3) *For each banking product, what are the most important factors explaining variation in switching propensities?* 4) *How effective are (potential) policies to lower switching barriers and/or increase (the*

[21] In April 2015, a resolution put forward by two Dutch politicians was adopted to investigate ways of easing and facilitating switching on the premise that competition will increase if switching is made easier. In July 2016 the National Forum on the Payment System published a statement on improving customer mobility urging parties in the payments market to improve efforts to enhance mobility and thereby foster competition (NFPS, 2016b).

[22] The European Commission (2006) reports that some EU countries define relevant product markets based on individual products.

threat of) switching?

We focus on consumers' *reported* propensities to switch, collected from survey data. In the remainder of the paper we simply call these "propensities to switch". To answer the third research question, we use insights from studies in different industries to identify a broad range of factors that may be related to consumers' propensity to switch banks in the coming year.[23] The factors we study are perceived benefits of switching, personal characteristics, switching experience, socio-psychological factors, the bank-customer relationship and knowledge related to banking products.

Better knowledge of factors related to switching propensities, switching barriers and the effectiveness of potential policies is important for policymakers who want to increase (the threat of) switching. One way to increase competition is to allow new foreign banks to enter the market. Consequently it is also key for policymakers to understand how consumers respond to new foreign players.

Although we research bank switching behaviour of consumers in the Netherlands, the questions apply broadly to other countries as well. In all countries there should be a threat of consumers leaving their bank to foster competition. Consequently insight in factors related to switching and ways to strengthen the threat of switching is of general interest. Besides, switching rates are comparable across the Netherlands, other European countries and the US.[24]

We find that the propensity to switch depends on the banking product. The propensity to switch is highest for consumers' main savings accounts. We also find that the main factors explaining the propensity to switch best depend on the banking product. Differences in the propensity to switch the main current account are best explained by differences in the strength of the bank-customer relationship and socio-psychological factors. The bank-customer relationship is also the most important factor for the propensity to switch main savings accounts. In contrast, switching experiences play the most

[23] E.g. the car insurance industry (Antón et al., 2007), landline telecom, home insurance, electricity industry (Gamble et al., 2009; Ek and Söderholm, 2008) and the banking sector (i.e. Kiser, 2002).

[24] Research by the European Commission (2012) shows that 10% of the current account holders switched the last five years in The Netherlands, while on average 8% of consumers switched in EU27 countries in the same period. 11% of the North Americans switched to a new financial service provider during March 2015 and March 2016 (Accenture, 2016). Note that this proportion does not only include switching with the current account. As a result, it is not surprising that the switching proportion is higher.

important role in explaining variation in the propensity to switch mortgage loans. One of our study's key insights is therefore that it is important to examine banking products separately. Our findings are meaningful for antitrust policy. Instead of using a legal standard for analysing competition that is based on clustering, our findings provide an argument in favour of using a product market definition that is highly disaggregated.

In addition, we report that satisfaction with the current situation is the most important reason to stay at one's bank. The general perception that switching is a hassle, that there is nothing to gain and the absence of account number portability are also reasons why a substantial proportion of bank customers do not switch.

Regarding the effectiveness of potential policies to increase (the threat of) switching, we find that the reported propensity to switch main current accounts can be increased by introducing account number portability. Improving knowledge of the switching service has no significant effect. To examine respondents' willingness to switch to a new domestic or foreign bank, we randomly divide respondents in four groups and present each group with a different scenario. Based on these scenarios we find that it is especially difficult for new foreign banks to attract savings in the Netherlands. Therefore, a policy aiming at attracting new domestic players seems to be more effective in enhancing mobility than a policy that increases the number of foreign players.

The remainder of the paper is organized as follows: Section 2.2 provides an overview of the literature. Section 2.3 describes the survey, switching propensities and barriers that withhold people from switching. Section 2.4 presents the methodology and shows our estimation results. Section 2.5 examines the effectiveness of hypothetical policies to increase (the threat of) switching and Section 2.6 presents our conclusions.

2.2 Literature

The literature on relationship banking explains that building a relationship with the bank can be beneficial for customers. During the relationship, the bank privately observes information about the customer which can foster flexibility in loan contracts (Boot and Thakor, 1994; Von Thadden, 1995) and favorable contract terms for the customers (e.g. lower interest rates or less collateral). However, at the same there are also costs associated

with relationship banking. Banks can extract rents as the inside bank has an informational advantage over competing banks (Ioannidou and Ongena, 2010). Consequently, the customer is locked-in. This effect will be more pronounced when consumers face switching costs. Switching costs may withhold customers from switching which blocks efficient buyer-selling matching (Farell and Klemperer, 2007).

Few studies empirically examine consumer bank switching behaviour and although consumers hold different banking products with distinct characteristics, these studies focus on the main bank. Kiser (2002) finds that geographic stability is an important factor for having a long-term relationship with the main bank, that switchers are more likely to be "shoppers" who compare prices and that there is a cohort effect rather than an age effect involved in switching in the US. Chakravarty et al. (2004) address consumers' propensity to switch and find that personal characteristics are important in explaining switching intentions. Responsiveness, empathy, reliability and relationship duration are significantly negatively related to the propensity to switch, while having experienced problems with the bank positively impacts the propensity to switch. A recent paper from Brunetti et al. (2016a) relates the bank-customer relationship to actual switching behaviour using Italian data from 2006-2012. The results show that having a relationship with only one bank and having more services with the main bank reduce the propensity to switch. Using Japanese data, Inakura and Shimizutani (2010) investigate the relationship between deposit insurance and bank switching. Respondents who had no knowledge of a change in the deposit insurance cap were less likely to actually switch and also more likely to not consider switching.

Research on switching in other markets also reveals potentially relevant factors. Antón et al. (2007) focus on switching intentions in the car-insurance industry. They find that the perception of unfair prices and experience of anger incidents have more capacity to explain switching intentions than quality and the organisation's commitment. Focusing on the electricity market, Ek and Söderholm (2008) show that income and education positively impact the intention to switch. Moreover, they find that perceptions about the behaviour of others, social descriptive norms, affect switching intentions. Gamble et al. (2009) study attitudes towards switching within three deregulated markets in Sweden characterised by a

homogenous product: electricity, landline telecom and home insurance. They find that loyalty has a negative effect on the attitude towards switching.

To summarize, the literature on switching emphasises the role of personal characteristics, the bank-customer relationship, knowledge and socio-psychological variables in explaining switching behaviour. This is why we investigate the role of these factors in explaining differences in switching propensities.

We expect to find differences in the propensity to switch across banking products. We predict the propensity to switch to be highest for savings accounts as new accounts are opened quickly, often without costs, and savings are easily transferred to the new account. Consumers who already have more than one savings account, may just transfer their savings to an existing account. We anticipate that the propensity to switch the main current account is lower as it is less easy to switch. Current accounts are often linked to other banking products and if customers switch banks they need to inform others about the new account number. Because of high evaluation and monetary costs we expect the propensity to switch mortgage loans to be lower. Besides, consumers are not always able to obtain a loan at another bank (supply effect). As a result we also expect a lower propensity to switch for revolving credit.

Our research questions not only contribute to the academic literature, they may also yield important implications for policymaking. Differences in switching propensities and the main related factors would provide an argument in favour of using a legal standard for the analysis of competition that is not based on clustering. Amel et al. (2008) explain that the current legal standard for analysing competition in the US views banking markets as geographically local and consider the cluster of financial products. The use of the cluster of banking services has generated less commentary than the use of local geographic banking markets. Both regulators and potential bank acquirers find the use of clusters convenient. The European Commission (2006) also reports that it focuses on retail banking markets as a whole in merger decisions. Without the clustering, antitrust analyses would become more time-consuming and costly. Our study contributes to the discussion on whether products should be considered as being in separate markets.

2.3 Survey

2.3.1 Data

We conducted a survey among the CentERpanel, a representative sample of the Dutch-speaking population in the Netherlands, in June 2015.[25] For each banking product we investigate the propensity that someone will switch to another bank in the upcoming 12 months. The survey also includes questions on past switching behaviour, the bank-customer relationship, barriers that withhold consumers from switching, requirements that a new bank should meet and socio-psychological statements and policies that try to alleviate switching barriers and/or increase
(the threat of) switching.[26]

The survey was sent out to 2,693 members of the CentERpanel and completed by 2,194 respondents, which represents an 81.5% response rate.[27,28] For some questions the response rate is higher (up to 83.1%) as 44 panellists partially completed in the questionnaire. We merge the survey data with data on personal characteristics from the annual DNB Household Survey (DHS). This survey is filled in by the same respondents, and exists for more than two decades.[29] CentERdata, a research institute affiliated to Tilburg University, manages the CentERpanel.[30]

2.3.2 Background information on banking products

The banking products we study are the main current account, savings account, mortgage loan and revolving credit. Around 70% of adults had exactly one current account in 2013, while the average number of accounts is 1.16 (Gfk, 2014). The current account acts a gateway for other products. As a result the majority of consumers have their current

[25] The Dutch banking sector is characterized by its size and level of concentration. In Europe, only Greece, Estonia, Lithuania and Finland have a more concentrated banking system (De Nederlandsche Bank, 2015b).
[26] A stumbling block withholding people from switching banks is the time and effort it takes to arrange the switch. To alleviate this burden, in 2004 the Netherlands was the first country to instigate a "switching service" to facilitate switching current accounts. Specifically, it ensures that payments are transferred automatically to the new account for a period of 13 months, and it verifies that direct debits are paid from the new bank account. It also provides an overview of all transferred transactions. Consumers still need to inform others about the new account numbers.
[27] The questionnaire is available on request.
[28] For more information on the CentERpanel, see Teppa and Vis (2012) and http://www.centerdata.nl/en/projects-by-centerdata/origins-of-the-centerpanel. URL last accessed on 12 January 2017.
[29] Information on the DHS is available at http://www.centerdata.nl/en/projects-by-centerdata/dnb-household-survey-dhs. URL last accessed on 12 January 2017.
[30] Previous researchers and policymakers have used the CentERpanel to investigate and ask questions on a broad range of topics. For example, Hurd et al. (2011) investigate stock market expectations, Von Gaudecker (2015) examines households' portfolio diversification, Georgarakos et al. (2014) research the impact of social interactions on debt and Van der Cruijsen et al. (2012) study the impact of crisis experiences on savings behaviour.

account and deposits at the same bank (Gfk, 2014). As in many other European countries, bank customers pay a fee for having a current account, ranging between EUR 14.40 and EUR 180 per year (Consumentenbond, 2016). However, more than half of consumer is not aware of the costs involved (Gfk, 2014).

The majority of savings are held at instant-access accounts rather than at term deposits (Competition & Markets Authority, 2015b). Interest rates on savings accounts are generally higher in the Netherlands than in surrounding countries, where small Dutch banks offer 50 basis points higher interest rates than large Dutch banks (ACM, 2014). Savings up to EUR 100,000 deposited at almost all banks active in the Netherlands are guaranteed by the European Deposit Guarantee Scheme.

Around 30% of total lending in the Netherlands is in the form of outstanding mortgage loans to households (Competition & Markets Authority, 2015b). It is common to have a high loan-to-value ratio due to incentives as the tax relief and the national mortgage guarantee. Between 2010 and 2015 the proportion of households choosing a period of long-term fixed interest rate has increased. In 2015, 68% of the households chose a fixed interest period of at least five years, which was likely to be driven by the low interest rates (De Nederlandsche Bank, 2016).

The average amount of revolving credit was approximately EUR 8,000 in 2013 (CEG, 2014). Interest rates for revolving credit are generally lower than for overdrafts. The number and total amount of revolving credit has decreased between 2010 and 2013 (CBS, 2017).

2.3.3 The propensity to switch by banking product

Depending on whether they hold the relevant product, we asked survey participants: *"What is the propensity that you will switch within the next twelve months with your main [current account/savings account/mortgage loan/revolving credit]? Fill in a propensity between 0 and 100 (0% = 'I will definitely not switch' and 100% = 'I will definitely switch')".*[31] We prefer to focus on switching propensities rather than yes/no intention questions as Juster (1966)

[31]An often expressed concern is whether respondents are able to answer questions about propensities. The CentERpanel is experienced in answering such questions and therefore we believe that the respondents understand the question and are able to answer it. CentERdata has checked the clarity of our survey.

shows in his seminal paper that elicited purchase probabilities are better predictors of subsequent behaviour.[32] Note that we measure switching between banks. Our interest in switching from one bank to another bank is clarified in the introduction of our questionnaire. Second, we use the Dutch word '*overstappen'*, which is used for switching from one company to another. A bank-related example of the use of this word is that the service that helps consumers switch banks is called the '*overstapservice'*.

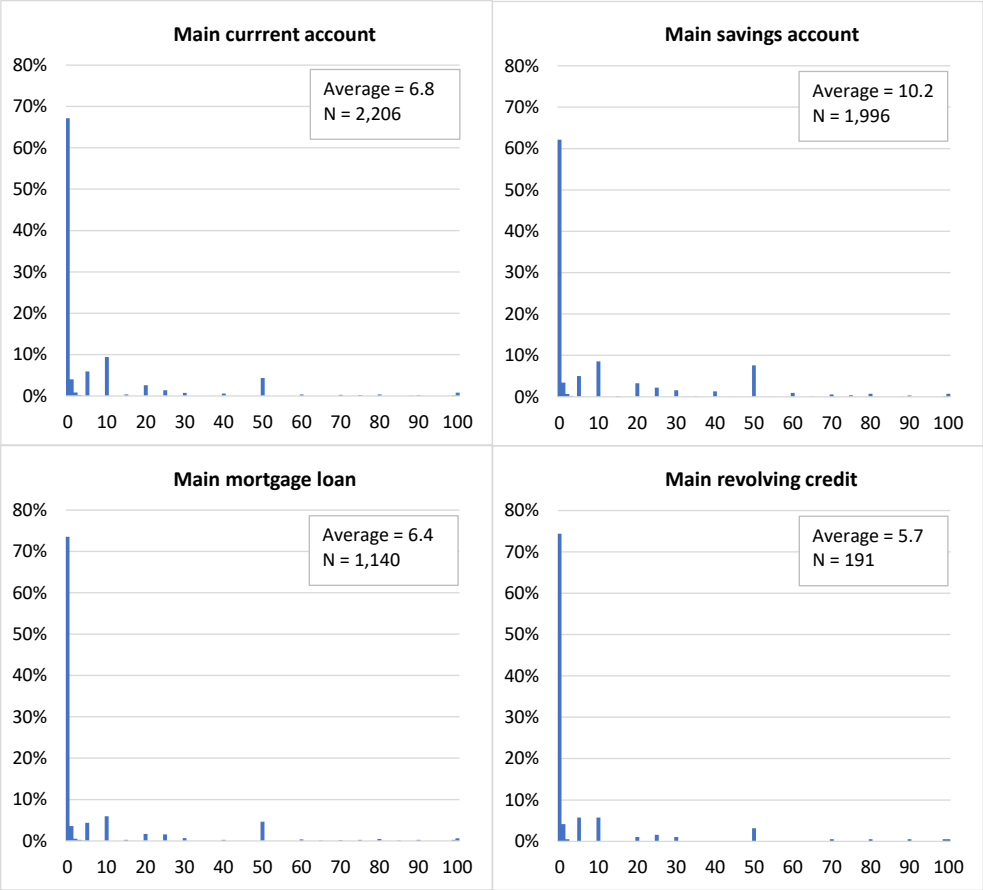
We find that the propensity to switch in the coming year indeed depends on the product in question. Figure 1 shows that the average propensity to switch is the lowest for main revolving credits (5.7%) and mortgage loans (6.4%), slightly higher for main current accounts (6.8%) and the highest for main savings accounts (10.2%). This indicates differences between consumers' assets and liabilities.[33] The share of respondents who will definitely not switch is high; it ranges from 62.1% for savings accounts to 74.3% for revolving credits. For each banking product, the proportion of consumers who definitely intend to switch is below 1%.[34]

The data supports our first hypothesis which states that the propensity to switch depends on the banking product. Based on t-tests, we find that the propensity to switch savings accounts is significantly higher than the propensity to switch current accounts, mortgage loans and revolving credits (all p=0.00). Focusing on individuals, paired t-tests show that respondents report a significantly higher propensity to switch their main savings accounts than their main current accounts (p=0.00) and main mortgage loans (p=0.00).[35] Table A.2.1 in Appendix A.2 reports the results of the paired t-tests.

We find positive and significant correlations between switching propensities (in all

[32] We refer to Manski (2004) for an overview of the evolution of the literature on probabilistic expectations.
[33] Fischhoff and Bruine de Bruin (1999) indicate that a recorded value of 50% might mean that respondents have no idea (epistemic uncertainty) rather than that they record a quantitative probability. We think this is not a major issue in our case. First, as mentioned before, members of the CentERpanel are used to answering propensity questions. Second, our question clearly indicates what 0% and 100% answers mean. Third, for all banking products, only a small proportion of respondents express a propensity to switch of exactly 50% (ranging from 4.4% for current accounts to 7.6% for savings accounts).
[34] Based on survey data collected in February 2014 Gfk concludes that 3% of respondents actually switched banks with their main current account in the last 12 months (Gfk, 2014). There is no research on bank switching behaviour that examines the gap between intentions and actual behaviour. However, in other fields it is shown that intentions matter for actual behaviour. Other factors are important too. A meta-analysis by Webb and Sheeran (2006) shows that a medium-to-large change in intention results in a small-to-medium change in behaviour.
[35] Paired t-tests compare for the same individual the propensity to switch across products. Consequently the sample is restricted to respondents who have multiple banking products.

Figure 2.1. Propensity to switch in the next twelve months



This figure shows the propensities to switch in the next 12 months. It also includes the switching propensities of respondents who did not complete the whole survey. 44 respondents started the survey but did not finish it.

cases p=0.00). The correlation is the strongest between the propensity to switch the main current account and the propensity to switch the main revolving credit (0.68). The propensity to switch the main savings account and the propensity to switch the main mortgage loan are the least correlated (0.25).

2.3.4 Discussion of barriers

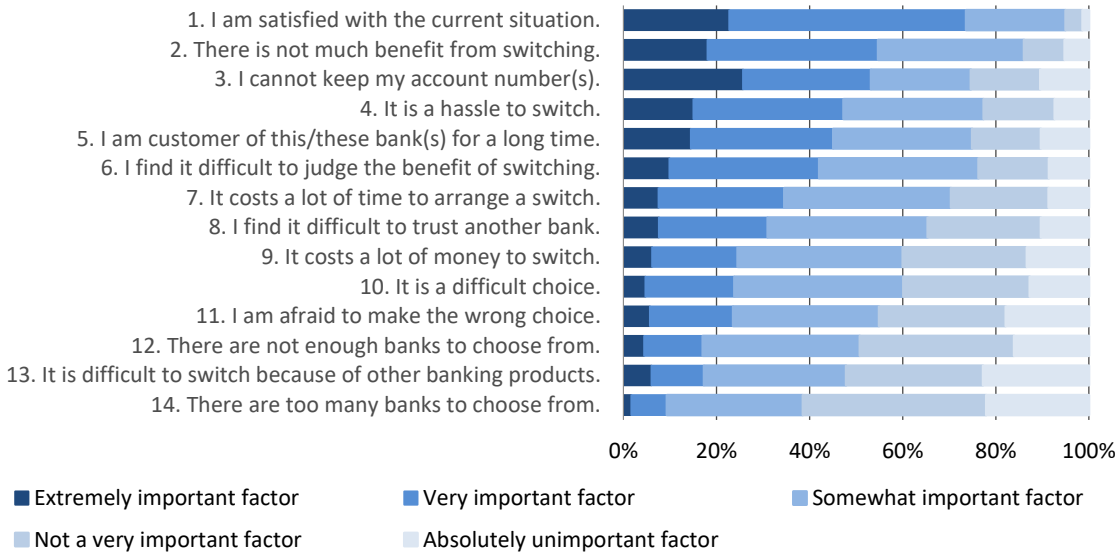
Figure 2.2 gives an overview of potential switching barriers. The figure shows the answers to the question "*There can be different factors withholding you from switching. How important are the factors below?*" The statements are unconditional and therefore we

measure the importance of each barrier at this moment, rather than the importance *if* it would be a barrier.

We find that for three out of four respondents, satisfaction with the current situation is a very or extremely important factor why people stay at their bank. Other relationship characteristics, like having a long-standing bank-customer relationship and finding it difficult to trust another bank also withhold a substantial group of respondents from switching. A large number of respondents mention that there is not much to gain from switching.

The outcomes also indicate important practical barriers. About half of the respondents state that the absence of account number portability withholds them from switching. A significant proportion of respondents also find switching a hassle and believes that it costs a lot of time and money. A substantial share of respondents find it a difficult choice and are afraid of making the wrong decision.

Figure 2.2. Barriers to switching



The figure shows the response shares to the question *"There can be different factors that withhold you from switching. How important are the factors below?"* Factors are ranked based on the average answer.

Table B.2.1 in Appendix B.2 looks at differences in the importance of barriers between respondents who will definitely not switch (*switching propensity*$_p$ = 0) and

respondents who are considering switching in the coming year (*switching propensity*$_p$ > 0). Regarding all products, we find that for respondents who are considering switching, the relationship with their bank is a less important barrier than it is for respondents who will definitely stay with their current bank. Respondents considering switching their current account find the absence of account number portability, lack of time and insufficient banks to choose from more important barriers than respondents who will definitely not switch their current accounts. The same holds for savings accounts. We clearly find that respondents who report a positive propensity to switch their main mortgage loans (*switching propensity mortgage loan* > 0) perceive the long bank-customer relationship less a barrier than other respondents (*switching propensity mortgage loan* = 0) do.

2.4 Propensity to switch: Regressions

2.4.1 Methodology

We research the decision to switch banks for each product separately to test whether the variables related to the propensity to switch depend on the banking product. We also examine which factors are most important in explaining variation in switching propensities of the individual banking products. Table 2.1 shows the estimated coefficients of Tobit regressions, where each column represents the switching propensity of a specific banking product: *current account* (column 1), *savings account* (column 2), *mortgage loan* (column 3) and *revolving credit* (column 4). The dependent variables are the reported propensities to switch banks within the next twelve months (expressed as a percentage). Scores for these dependent variables range between 0 and 100. A large proportion of the observations are at the 0 boundary. Therefore these are corner solution variables and we use the Tobit model.[36]

We relate the propensity to switch to potentially relevant factors and postulate that:

[36] Wooldridge (2002) argues that it makes sense to call the model that fits this type of data well a *corner solution model*. However, in practice the term *censored regression model* is used more often. Wooldridge (2002) argues that a suited method to use for a corner solution dependent variable is the Tobit model (Papalia & Di Iorio, 2001). In general, most of our findings are robust with respect to the chosen method.

$$Switching\ propensity = \begin{cases} switching\ propensity_{ip}^{*} & if\ 0 < switching\ propensity_{ip}^{*} < 100 \\ 0 & if\ switching\ propensity_{ip}^{*} \leq 0 \\ 100 & if\ switching\ propensity_{ip}^{*} \geq 100 \end{cases} \quad (2.1)$$

where $switching\ propensity_{ip}^{*}$ is the latent variable:

$$switching\ propensity_{ip}^{*} = \beta_1 X_i + \beta_2 B_{ip} + \beta_3 E_{ip} + \beta_4 R_{ip} + \beta_5 K_{ip} + \beta_6 S_{ip} + e_{ip} \quad (2.2)$$

In these equations, *i* denotes the individual and *p* the banking product. We estimate the equations together and allow individual-level errors to be correlated. The vector X captures personal characteristics. We include a binary dummy *male* that is 1 for males and 0 for females. Four binary age dummies capture the age: *between 35 and 44*, *between 45 and 54*, *between 55 and 64* and *65 and over*. The reference category consists of people aged 34 or below. The level of education is measured by including the binary dummy variable *education: bachelor degree or higher*. We furthermore include *income category* which captures the gross monthly personal income. Switching propensities may also depend on respondents' place of residence. We therefore include *degree of urbanisation*, which ranges between 1 (rural) and 5 (very urbanised). The last variable included in X is *responsible for household finances*, which is a binary dummy that is 1 for respondents who take care of household finances.

As shown in Figure 2.1 a large proportion of respondents report a switching propensity of 0%. A potential concern is that these zeros are generated by two distinct data generation processes. Either one foresees no incentive to switch and reports a propensity of 0%, or one foresees an incentive to switch but nevertheless does not intend to do so (for example because one finds it a hassle). To distinguish between the two cases, we control for perceived benefits of switching by including *not much benefit of switching* (vector B). This variable ranges between 1 (strongly disagree) and 5 (strongly agree).

Third, the vector E includes both recent and non-recent switching experience with the banking product in question, as well as switching experience with other banking products. For each banking product, we construct three binary dummy variables: *recent*

switching experience, older switching experience and *other switching experience*. *Recent switching experience* is 1 for respondents who switched less than a year ago with the banking product in question, whereas *older switching experience* is 1 for respondents who switched at least a year ago with this product. For respondents who have at any point switched with other banking products, *other switching experience* is set at 1. For all banking products, we find that the vast majority of respondents have never switched banks, a substantial proportion switched longer than a year ago and only a small proportion report recent switching activities. For revolving credit, we find the highest proportion of respondents without switching experience (73%), whereas the highest proportion of respondents reporting switching experience is for mortgage loans (44%).

Fourth, the vector R captures the strength of the bank-customer relationship. The first variable *customer loyalty* measures the perceived strength of the relationship. This variable ranges between 1 (no bond at all) and 5 (very strong bond) and is measured separately for each banking product. Many respondents report having a strong bank-customer relationship. We include *number of banks*, which is a measure of the number of banks. We find that 43% of respondents bank with one bank only. Lastly, we construct the binary dummy *filed a complaint* that is 1 for consumers who filed a complaint in the three years prior to the survey.

Fifth, we include a vector K with product specific knowledge variables. For the current account we include a binary dummy that is 1 for respondents who report to know how much they pay for their main current account including debit cards. We also include *knowledge of switching service*, a variable that measures the extent to which one is familiar with the switching service. For the other three banking products we include binary dummies that capture self-reported knowledge of the interest rate. For the savings account we also construct *knowledge of Deposit Guarantee Scheme*, a binary dummy that is 1 for respondents who state that they know the DGS. In each regression, we also include a variable that captures the knowledge of other banking products. We find that a substantial proportion of bank customers are not fully aware of the costs and benefits of banking products, the switching service and the DGS.[37]

[37] This finding is related to the results of Van der Cruijsen et al. (2011), who show that consumers gather little information on the bank and product before choosing a savings product.

Sixth, the vector S includes a range of socio-psychological variables that measure the degree of perceived control over switching, joint ownership of the product, social norms (*injunctive social norms* and *perceived switching behaviour of others*) and the extent to which consumers perceive switching as unpleasant. Almost one in five respondents believes that they would not be able to switch if they would want to. We find that joint ownership is the lowest for main current accounts (52% of respondents) and the highest for the main mortgage loans (77% of respondents). Only a small proportion of consumers believe that others whom they want to resemble switch every now and then, and that people who are important to them think they should switch. 50% of the respondents perceive switching as unpleasant. Appendix C.2 includes a detailed description of the variables that we constructed and the summary statistics.

2.4.2 Results

We find that the model provides a better fit than an intercept-only model for the main current account, savings account and mortgage loan (F-test, p=0.00).[38] The regression model of revolving credit is not significant (F-test, p=0.40) so we will not discuss these results.

A wide range of variables from all six factors significantly explains variation in switching propensities, and both the sign and significance level of these variables depend on the banking product in question. Although we do not necessarily identify causal effects, our regressions reveal interesting correlations.

First of all, we find that the propensity to switch is significantly related to various socio-economic variables. There is a negative age effect for all three products. For example, the predicted propensity to switch the current accounts is 9.1% for people aged 34 or below and 4.8% for people in the highest age bracket.[39] This negative age effect is in line

[38] Note that multicollinearity is not a problem in our regressions. The mean Variance Inflation Factor (VIF) ranges between 1.48 and 1.99. The minimum VIF found is 1.05 and the maximum is 5.08. As a rule of thumb a VIF smaller than 10 is fine.

[39] To obtain the predicted propensity to switch the current account, we make a prediction for every respondent while setting the variable *65 and over* at 1 and the other age dummies at 0. The average of these predictions is the predicted propensity to switch for respondent aged 65 or above. All predictions below zero are set to 0 and all predictions above 100 are set to 100.

with studies on switching in banking and health insurance (Chakravarty et al., 2004; Inakura and Shimizutani, 2008; Frank and Lamiraud, 2009).

In addition, people with a high degree of education are more likely to switch their main current account and savings account than people without a bachelor degree or higher. The opposite holds for the propensity to switch mortgage loans. Income is positively related to the reported propensity to switch the main mortgage loan provider.We also find that consumers living in urbanised regions are more likely to switch their current account than consumers in rural areas. A plausible explanation is that some consumers find it important to have a physical bank branch nearby. However, in the Netherlands there are fewer banks in rural areas than in urbanised regions and the distance to the closest bank branch is further (National Forum on the Payment System, 2016a). To the extent that this is causing the lower switching propensity in rural areas, it provides an argument in favour of preserving local bank branches in rural areas or improving online banking if one wants to strengthen (the threat of) switching. This finding is in line with Brunetti et al. (2016a) who report a negative effect of bank market concentration on switching.

As in Chakravarty et al. (2004), Ek and Soderholm (2008) and Brunetti et al. (2016a) we do not find a gender effect. There is also no difference between people who are responsible for household finances and those who are not.

Second, switching propensities are related to the perceived benefits of switching. This relationship is significant for the current account. The predicted propensity of switching is 9.9% for people who disagree with the statement that there is not much benefit from switching, and 6.6% for people who agree with this statement.

Third, we confirm the positive relationship between switching experience and the propensity to switch documented in Chakravarty et al. (2004). The predicted propensity of switching main savings accounts in the coming year is 20.8% for consumers with recent experience, whereas it is 9.9% for consumers who did not switch these accounts in the past year. Regarding main current accounts, we also find that consumers who switched less than a year ago report a higher propensity to switch in the coming year. This effect is stronger for people unfamiliar with the switching service. For mortgage loans it is not the recent experience that counts, but the experience of having switched more than a year ago. This is

intuitive given the long maturity of mortgage loans and the switching penalty. Experience in switching other banking products also matters for current accounts and mortgage loans.[40]

Fourth, switching propensities are related to the strength of the bank-customer relationship. In the case of all banking products, consumers who feel a strong bond with their bank report a significantly lower propensity to switch than respondents who feel a weak bond or no bond at all. To illustrate the strength of the effect, the predicted propensity to switch their main current account is 9.3% for consumers who feel a poor bond with the bank where they hold their main current account, whereas it is only 5.2% for consumers who feel a strong bond. We furthermore find a positive relationship between the number of bank-customer relationships and the reported propensity to switch main savings accounts. This is in line with Brunetti et al. (2016a) who report a positive relationship between having multiple bank relationships and switching the main bank in general. In addition, we find that consumers who contacted their bank in the past three years to file a complaint report a significantly higher propensity to switch main current and savings accounts than consumers without complaints.

Fifth, switching propensities are also related to knowledge of banking products. The propensity to switch savings accounts is higher for consumers who know by heart the interest rate they currently receive than for other consumers. The predicted propensity to switch is 11.5% for the first group and 8.3% for the second group. This finding is in line with Van der Cruijsen et al. (2012) who show that consumers who consider themselves knowledgeable about financial matters are more likely to have savings accounts at multiple banks. Knowledge of the DGS is positively related to the propensity to switch main savings accounts. Compared to the effects of other variables in the model, this effect is rather small. The difference in the predicted switching probability is 1.9 percentage points. Knowledge of other banking products has a mixed effect on the propensity to switch. The effect is positive for the main current account but negative for the main savings account and mortgage loan.

[40] We cannot rule out the possibility that an omitted variable explains both switching experience and switching propensities. Furthermore, in case of knowledge there may be reverse causality or an omitted factor driving both knowledge and switching propensities. We ran additional regressions excluding experience and knowledge. Our findings are robust. We find the same variables to be related to switching propensities as in the baseline analysis, with two exceptions: (1) *perceived switching behaviour of others* is significantly positive related to the propensity to switch savings, and (2) *between 35 and 44* is no longer significantly related to the propensity to switch mortgages. The results are available upon request.

Table 2.1. Propensity to switch by banking product: Baseline regressions

	Current account	Savings account	Mortgage loan	Revolving credit
Male	0.10	-1.27	1.83	-1.23
	(2.10)	(2.39)	(4.13)	(9.56)
Between 35 and 44	-0.10	1.49	-12.79*	18.81
	(3.43)	(3.93)	(6.64)	(18.05)
Between 45 and 54	1.59	1.08	-9.83	24.92
	(3.42)	(3.92)	(6.89)	(19.17)
Between 55 and 64	-4.05	-8.02**	-25.85***	-7.21
	(3.47)	(3.97)	(7.01)	(16.38)
65 and over	-15.10***	-17.86***	-27.08***	7.44
	(3.33)	(3.79)	(7.15)	(16.87)
Education: bachelor degree or higher	4.76**	4.50*	-6.84*	-2.18
	(2.08)	(2.34)	(3.76)	(8.14)
Income category	-0.17	0.40	2.23***	-1.94
	(0.40)	(0.44)	(0.79)	(1.69)
Degree of urbanisation	1.40*	0.92	1.03	6.65**
	(0.74)	(0.81)	(1.36)	(3.32)
Responsible for household finances	1.81	0.85	0.74	25.36**
	(2.11)	(2.44)	(4.02)	(9.97)
Not much benefit of switching	-5.02***	-1.21	-2.27	-7.24*
	(0.95)	(1.03)	(1.74)	(3.94)
Recent switching experience$_p$	47.52**	23.58***	-11.90	6.98
	(18.58)	(5.84)	(13.19)	(13.88)
Older switching experience$_p$	1.97	9.60***	16.07***	12.43
	(2.42)	(2.64)	(3.84)	(8.82)
Other switching experience$_p$	3.96*	-1.48	8.25**	-3.96
	(2.35)	(2.63)	(3.54)	(8.11)
Customer loyalty$_p$	-6.79***	-7.87***	-4.33***	0.06
	(0.97)	(1.04)	(1.52)	(3.67)
Number of banks	0.57	3.83***	1.94	6.69
	(1.01)	(1.15)	(1.78)	(5.26)
Filed a complaint	14.49***	17.19***	-0.49	7.14
	(3.40)	(3.85)	(5.60)	(12.35)
Knowledge of banking product$_p$	-1.41	9.25***	1.75	3.59
	(2.00)	(2.49)	(4.65)	(8.81)
Knowledge of other banking products$_p$	8.94**	-9.76**	-21.14***	4.25
	(4.25)	(4.60)	(7.79)	(14.18)
Knowledge of switching service	-0.31			
	(1.23)			
Knowledge of switching service * Recent switching experience current account	-23.30***			
	(7.88)			
Knowledge of Deposit Guarantee Scheme		5.36*		
		(2.76)		
Perceived control over switching	5.87***	4.33***	2.20	5.64
	(1.23)	(1.32)	(2.25)	(4.50)
Degree to which switching is unpleasant	0.25	0.08	-2.95	8.53*
	(1.11)	(1.22)	(1.96)	(4.45)
Injunctive social norms	5.54***	2.23	0.67	0.81
	(1.41)	(1.55)	(2.25)	(5.59)
Perceived switching behaviour of others	1.52	2.15	-0.66	0.43
	(1.23)	(1.37)	(2.07)	(4.32)
Jointly owned banking product$_p$	2.18	1.52	-3.65	20.22**
	(1.96)	(2.24)	(4.19)	(9.79)
Constant	-27.45***	-32.07***	-6.81	-123.32***
	(9.42)	(10.13)	(16.08)	(41.05)
Observations	2086	1889	1087	181

This table reports parameter estimates for Tobit regressions. Robust standard errors in parentheses. The equations are estimated together to allow individual-level errors to be correlated. Variables with subscript *p* vary per regression. Subscript *p* indicates the banking product. *** p<0.01, ** p<0.05, * p<0.1.

Lastly, the propensity to switch is also related to socio-psychological factors. Consumers who agree with the statement *"If I want, I can switch to another bank"* are more likely to switch their main current account and savings account than consumers who disagree with this statement. For example, with respect to current account we find that people who strongly agree with this statement have a predicted propensity to switch of 9.2%, while the predicted propensity to switch for people who neither agree nor disagree with this statement is 5.6%. We also find that consumers who agree with the statement that switching is unpleasant are less likely to switch their main mortgage provider than consumers who disagree with this statement. In addition, injunctive social norms significantly relate to the propensity to switch current accounts. The predicted propensity is 7.5% for consumers who disagree with the statement *"I believe that most people who are important to me think that I should switch to another bank"* and 11.5% for consumers who agree with this statement. Perceptions of the behaviour of people who one wants to resemble do not significantly matter. This is in contrast to findings of Ek and Solderholm (2008) who report that behaviour of others positively affects switching electricity suppliers in Sweden. Lastly, we find that the propensity to switch is the same for people with joint banking products and single users.

In short, we conclude that for all banking products a wide range of factors are related to the reported propensities to switch the current account, savings account and mortgage loan and that the strength of the relationship depends on the banking product. For all three banking products, we find that personal characteristics, the strength of the bank-customer relationship, switching experience and knowledge of banking products are related to the propensity to switch. In addition, perceived benefits are related to the propensity to switch the current account and socio-psychological factors matter for both the propensity to switch current accounts and savings account.

To examine the importance of each of the six factors of our model, we regress switching propensities on the variables belonging to each of the six factors of our model separately and measure the relative quality of the models by assessing Akaike's Information Criterion (AIC, Akaike, 1974). The results are presented in Appendix D.2.

The most important factors related to switching propensities depend on the banking product. The bank-customer relationship is most important in explaining variation in the

propensity to switch current accounts, followed by socio-psychological factors. The bank-customer relationship is also the main factor explaining the propensity to switch savings accounts. This finding is in line with studies that show that the bank-customer relationship is important in financial decision making (Brunetti et al., 2016a; Brown et al., 2016). Switching experience is the second most important factor for the savings account and the most important factor for mortgage accounts. The factor that ranks second in explaining variation in mortgage loan switching propensities is personal characteristics.[41]

2.4.3 Robustness

As a first robustness test, we present the outcomes of regressions which excludes all respondents who state that "*satisfaction with the current situation"* is an extremely important factor that withholds them from switching. Although unforeseen circumstances may trigger a switch, the incentive to switch and the reported propensities to switch are lower for this group of respondents than for other respondents. Table 2.2 presents the regression results. Overall, we find that most of our results are robust to the exclusion of respondents with the weakest incentive to switch. There are only a few coefficients that have become insignificant: *education: bachelor degree or higher* in case of the savings account regression, and *between 35 and 44* and *income category* in the mortgage loan regression.

Second, as responses are skewed we make bin switching probabilities (0-20 20-40, 40-60, 60-80 and 80-100) and estimate ordered logits and find that most of our baseline results are robust.[42] There are a few exceptions. For the current account switching propensities are no longer related to *education: bachelor or higher, other switching experience* and *knowledge of other banking products*. Regarding the savings account we now find insignificant coefficients for *between 55 and 64, education: bachelor degree or higher, knowledge of other banking products* and *knowledge of DGS.* We do find a significant coefficient for *injunctive social norms* now. With respect to switching propensities for mortgage loans we find significant coefficients for *not much benefit of switching* and *degree*

[41] We do not discuss the outcomes for the propensity to switch for the main revolving credit as all models are insignificant. The results are available upon request.
[42] The results of all robustness analyses are available upon request.

to which switching is unpleasant, and an insignificant coefficient for *other switching experience*. Moreover, this robustness exercise tells us that the size of the effects we found in our baseline analysis are plausible and it confirms that the strength of the relationships can be substantial.[43,44]

Third, we add background variables distilled from DNB's annual Household Survey. The number of observations is substantially lower in these cases because these background characteristics are not available for all participants in our survey. As a first exercise, we include risk aversion and find a negative relationship between the level of risk aversion and the propensity to switch for all banking products. Most other relationships still hold.[45] Additional robustness analyses show no significant relationship between self-assessed financial knowledge or change in relative trust in the bank and the propensity to switch. For revolving credit the model becomes significant if we add the variables risk aversion, self-assessed knowledge or change in relative trust. Consumers who believe that their financial knowledge is adequate are less likely to switch their main revolving credit than consumers who perceive their knowledge to be poor.

The balance on the main savings account is positively related to the propensity to switch this account. A variable that measures to what extent people save with the goal to generate interest income is not significantly related to the propensity to switch the savings account. The value of the mortgage loan has a positive but insignificant sign if included in the regression with the mortgage switching propensity. We do not find a significant effect on the propensity to switch of a year-on-year change in the trust in one's own bank compared to other banks.

Fourth, we take into account whether customers have different type of banking products at the same bank. Brown et al. (2016) report that customers are less likely to withdraw from a distressed bank when they have a loan linkage with this bank. In the

[43] For example, the strong effect of switching experience is confirmed. Compared to people without recent switching experience, people with recent switching experience are 16 percentage points less likely to report a switching propensity between 0% and 20%, 4 percentage points more likely to report a switching propensity between 20% and 40%, 8 percentage points more likely to report a switching propensity between 40% and 60%, and 2 percentage points more likely to report a switching propensity between 60% and 80% or between 80% and 100%.

[44] As additional robustness tests we have also estimated (1) Tobit regressions with log-transformed dependent variables, and (2) fractional response logit models. The results of the robustness analyses are available on request.

[45] *Education: bachelor degree or higher* is no longer significant for current and savings account. *Between 45 and 54* and *knowledge DGS lose significance* in the specification of the main savings account. *Between 45 and 54* is now significant in the specification of mortgage loans.

Table 2.2. Propensity to switch by banking product: Excluding extremely satisfied customers

	Current account	Savings account	Mortgage loan	Revolving credit
Male	-1.25	-3.25	5.55	3.84
	(2.29)	(2.60)	(4.36)	(11.53)
Between 35 and 44	-0.48	1.55	-9.98	13.61
	(3.70)	(4.34)	(6.86)	(26.07)
Between 45 and 54	0.72	0.67	-9.13	23.88
	(3.61)	(4.18)	(7.15)	(26.95)
Between 55 and 64	-5.49	-8.01*	-23.74***	-12.10
	(3.73)	(4.35)	(7.15)	(24.41)
65 and over	-15.52***	-18.14***	-25.74***	-1.36
	(3.58)	(4.15)	(7.39)	(25.23)
Education: bachelor degree or higher	4.38*	3.77	-7.66*	-8.76
	(2.27)	(2.56)	(4.08)	(10.36)
Income category	-0.11	0.42	1.33	-2.11
	(0.43)	(0.48)	(0.85)	(1.92)
Degree of urbanisation	1.78**	1.04	0.79	6.76*
	(0.81)	(0.88)	(1.47)	(3.82)
Responsible for household finances	1.27	1.54	1.11	23.74**
	(2.29)	(2.65)	(4.28)	(10.97)
Not much benefit of switching	-4.94***	-0.36	-0.68	-6.59
	(1.11)	(1.22)	(2.06)	(4.57)
Recent switching experience$_p$	41.27*	24.23***	-13.24	7.55
	(21.51)	(6.28)	(16.00)	(14.13)
Older switching experience$_p$	2.20	6.81**	17.63***	7.45
	(2.60)	(2.85)	(4.06)	(11.71)
Other switching experience$_p$	3.98	0.70	7.56**	1.59
	(2.47)	(2.80)	(3.75)	(10.25)
Customer loyalty$_p$	-5.06***	-6.49***	-2.98*	2.28
	(1.07)	(1.16)	(1.67)	(4.41)
Number of banks	0.10	2.11*	2.82	5.28
	(1.10)	(1.28)	(1.97)	(5.53)
Filed a complaint	14.59***	16.77***	2.07	-14.03
	(3.54)	(4.03)	(5.81)	(18.89)
Knowledge of banking product$_p$	-1.68	10.58***	3.33	13.77
	(2.14)	(2.68)	(4.80)	(11.34)
Knowledge of other banking products$_p$	10.71**	-9.51*	-18.92**	0.65
	(4.53)	(5.03)	(8.06)	(18.33)
Knowledge of switching service	-0.77			
	(1.33)			
Knowledge of switching service * Recent switching experience current account	-21.49**			
	(9.49)			
Knowledge of Deposit Guarantee Scheme		5.99**		
		(3.05)		
Perceived control over switching	7.02***	5.47***	2.22	3.39
	(1.42)	(1.57)	(2.59)	(5.43)
Degree to which switching is unpleasant	0.37	0.13	-1.44	8.55
	(1.26)	(1.40)	(2.22)	(5.57)
Injunctive social norms	5.28***	1.66	1.78	6.47
	(1.60)	(1.77)	(2.51)	(6.51)
Perceived switching behaviour of others	0.67	1.66	-2.10	-4.19
	(1.40)	(1.57)	(2.23)	(5.55)
Jointly owned banking product$_p$	3.46	1.82	-0.01	31.78***
	(2.14)	(2.46)	(4.54)	(11.37)
Constant	-31.50***	-36.11***	-23.38	-125.64**
	(10.61)	(11.44)	(18.08)	(51.44)
Observations	1609	1447	846	139

This table reports parameter estimates for Tobit regressions. The sample excludes respondents who indicate that satisfaction with the current situation is an extremely important factor that withholds them from switching and respondents who do not report the degree of satisfaction. Robust standard errors in parentheses. The equations are estimated together to allow individual-level errors to be correlated. Variables with subscript *p* vary per regression. Subscript *p* indicates the banking product. *** p<0.01, ** p<0.05, * p<0.1.

specification of current accounts we include two dummy variables representing whether one has a mortgage loan has and/or a savings account. We do not find a significant difference in the propensity to switch between consumers with a mortgage and/or a savings account and consumers without these accounts. To guarantee that the savings account and mortgage loan are held at the same bank as the current account, we restrict the sample to respondents who bank with only one bank in a next specification. Again we do not find significant effects for having a savings account or a mortgage loan.

2.5 Effectiveness of policies to increase (the threat of) switching

In this section, we address the last research question by discussing the effectiveness of three different hypothetical policies to increase (the threat of) switching: attracting new foreign banks, increasing knowledge of the switching service and introducing account number portability.

2.5.1 Attracting new banks

A first potential way to increase (the threat of) switching is to enhance the benefits of switching by allowing new banks to enter the market. For this policy to be effective, customers should be willing to switch to new banks, which can either be domestic or foreign. Six out of ten of our respondents indicate they are not willing to switch to a foreign bank.[46] To examine this issue in more detail, we perform a scenario analysis for the savings account.

This scenario analysis confirms that it will be more difficult for new foreign banks than new domestic banks to attract new customers. A policy of allowing new foreign banks to enter the savings market is less promising for enhancing mobility than a policy that increases the number of domestic players. Table 2.3 shows the outcomes of the four cases. Respondents were randomly assigned to one of these. The question was: "*Suppose you have a savings account with a balance of EUR 25,000 at a Dutch bank. You receive 1% interest on your savings (EUR 250 per year). A new [Dutch/foreign] bank, Bank B, enters the market and offers 2% interest (EUR 500 per year). [If the bank goes bankrupt, you will get your money*

[46] Previous studies have shown that consumers prefer domestic products. For more information on this topic, see Siamagka & Balabanis (2015).

back.] Would you switch?" Respondents indicated the propensity to switch to a new entrant that offers a higher interest rate for savings. Depending on the scenario, the new entrant was either a Dutch or a foreign bank and the accompanying text included the line "*If the bank goes bankrupt, you will get your money back.*" or not.

Table 2.3 shows that consumers are significantly less likely to switch to a foreign bank than to a Dutch bank. Respondents who received the scenario with the text "*If the bank goes bankrupt, you will get your money back.*" report a significantly higher propensity to switch than respondents who received the question without this text ($p<0.01$). However, there remains a significant difference in the propensity to switch to domestic and foreign banks.[47]

Table 2.3. Home bias in bank switching behaviour

	Deposit insurance text	Certainly not	Probably not	Neutral	Probably yes	Certainly yes	Mean score	N
Dutch bank	no	8%	25%	33%	28%	7%	3	564
Foreign bank	no	26%	39%	21%	13%	1%	2.2	577
Difference		-18%	-15%	12%	15%	6%	0.8***	
Dutch bank	yes	7%	21%	27%	35%	10%	3.2	536
Foreign bank	yes	22%	31%	23%	19%	5%	2.5	522
Difference		-15%	-11%	5%	16%	5%	0.7***	

The question was: "*Suppose you have a savings account with a balance of EUR 25,000 at a Dutch bank. You receive 1% interest on your savings (EUR 250 per year). A new [Dutch/foreign] bank, Bank B, enters the market and offers 2% interest (EUR 500 per year). [If the bank goes bankrupt, you will get your money back.] Would you switch?*" N = number of respondents. *** $p<0.01$.
Source: CentERpanel, June 2015.

2.5.2 Increasing knowledge of the switching service

A second route to enhance (the threat of) switching is by better informing customers of the "switching service". This service was introduced in the Netherlands in 2004 to make current account switching easier. The service ensures that payments are automatically transferred to the new account for 13 months after the switch and that direct debits are paid from the new bank account. It also provides an overview of all transferred

[47] Note that in these scenarios consumers know the ultimate owner of the bank, while in practice not all consumers may know whether their bank is foreign or domestically owned.

transactions.[48] However, not all consumers are aware of the switching service. To test the impact of better knowledge of the switching service on the reported switching propensities, we informed respondents about this service. After this explanation respondents who reported that they did not know of this service, or did not know exactly know what it entails, were again asked to report their switching propensity. We find that on average the reported switching propensity is not significantly higher after the explanation, see Table 2.4.[49]

2.5.3 Reducing the hassle: Account number portability

The last potential policy to increase (the threat of) switching that we examine is introducing account number portability. Although the switching service makes switching easier, customers still have to inform third parties of their new account number. Account number portability does not currently exist but would enable account holders to retain their current account numbers when switching to a new bank. Although account number portability would not eliminate all aspects of switching costs, Table 2.4 reveals that the average reported propensity to switch significantly increases in the hypothetical case of number portability. The effect is the strongest for respondents who are aware of what the switching service provides.[50] More research is needed to evaluate whether the benefits of account number portability outweigh the costs involved due to technical complexity and to learn to what extent consumers' attitudes change if they have to pay for account number portability.

[48] Although the switching service provides a framework to facilitate switching, customers need to inform third parties about their new account numbers.

[49] The question was: *"The switching service entails that the first thirteen months after switching to another bank, payments are automatically redirected to your new current account. Payments based on direct debit will be directly withdrawn from your new account. In addition, your statement of account includes an overview of all redirected transactions. You also have to arrange some things yourself, for example applying for a debit card, credit card and online banking at the new bank and informing people and companies that pay money into your account about your new account number. You indicated a likelihood of switching within 12 months with your* ***main*** *current account of x%. What is the likelihood that you will switch within 12 months with your* ***main*** *current account now that you know (more) about the switching service? Fill in a percentage between 0 and 100 (0% = "I will certainly not switch" and 100% = "I will certainly switch")."*

[50] The question was formulated as follows: "*Currently, if you want to switch your current account you can't keep your current account number. Account number portability means that bank customers can keep their current account number when they switch banks. You indicated a likelihood of switching within 12 months your* ***main*** *current account of x%. What is the likelihood that you will switch within 12 months your* ***main*** *current account if you were able to keep the account number? Fill in a percentage between 0 and 100 (0% = "I will certainly not switch" and 100% = "I will certainly switch")*."

Table 2.4. Effectiveness of improving knowledge and reducing hassle

	Average switching propensity (in %)	Percentage of respondents who report a switching propensity of…			
		…0%.	…100%.	…≥50%.	N
All respondents					
Current situation	6.8	67.1	0.8	6.7	2206
In case of account number portability after explanation switching service	13.3***	58.1	2.3	13.7	2205
People unaware of the switching service					
Current situation	5.8	70.4	0.6	5.6	895
After explanation of switching service	7.0	66.4	0.6	6.1	895
After explanation and account number portability	10.7***	62.9	1.3	10.8	895
People unaware of the content of the switching service					
Current situation	8.0	60.9	0.6	8.3	654
After explanation of switching service	8.9	56.9	0.5	8.4	654
After explanation and account number portability	15.8***	48.9	1.8	15.0	654
People aware of the content of the switching service					
Current situation	7.0	68.9	1.4	6.7	657
In case of account number portability after explanation switching service	14.4***	60.7	4.1	16.2	656

This table shows the reported propensity that someone will switch within twelve months with their main current account before and after the switching service was explained to them. It also shows the effect of the hypothetical case of account number portability on the reported propensity to switch. N = the number of respondents. We have tested whether the difference in reported switching probablities is significant. *** p<0.01.
Source: CentERpanel, June 2015.

2.6 Conclusion

Policymakers argue for more competition in the banking sector to improve efficiency of banking services. However, consumer inertia can impose a barrier for new entrants and can lower competition among current players (ACM, 2014). Despite its relevance, little is known about consumers' switching behaviour.

This paper provides detailed insight into consumers' bank switching behaviour. Although our research focuses on the Netherlands, the questions we raise apply broadly to other countries as well. By conducting a survey among a representative panel of consumers, we retrieve a unique dataset that enables us to study switching intentions, barriers to switching, factors related to switching intentions and the effectiveness of hypothetical policy initiatives to ease switching.

We contribute to the existing literature in several ways. First, we show that the propensity to switch differs across banking products, with the propensity to switch the main savings account to be highest. Second, we provide insight in barriers that withhold consumers from switching. Satisfaction with the current situation is the most often mentioned reason for staying at one's bank. The perceptions that switching is a hassle, that there is nothing to gain and the absence of account number portability are also withholding a substantial proportion of respondents from actually switching.

Third, we reveal that a wide range of variables is related to switching propensities, and that both the sign and significance level of these variables depend on the banking product in question. Consumers' differences in the propensity to switch their main current accounts are best explained by differences in the strength of the bank-customer relationship and socio-psychological factors. The bank-customer relationship is also the most important factor for the propensity to switch their main savings accounts. In contrast, switching experiences play the most important role explaining variations in the propensity to switch mortgage loans.

One of the key policy implications of our research is that it is important to view banking products separately. This finding gives guidance for designing antitrust policy. It provides an argument against using a legal standard for the analysis of competition that is based on clustering, as is done by the Federal Reserve (2014) and European Commission (2006), and in favour of using a product market definition that is highly disaggregated.

Another finding with potential policy implications is that local banking competition matters for the current account. Consumers living in urbanised regions are more likely to switch their current account than consumers in rural areas. A plausible explanation is that some consumers find it important to have a physical bank branch nearby and there are fewer banks in rural areas (National Forum on the Payment System, 2016a). To the extent that this is causing the lower switching propensity in rural areas, it provides an argument in favour of preserving local bank branches in rural areas or improving online banking if one wants to strengthen (the threat of) switching.

Lastly, we show the effectiveness of potential policies to increase (the threat of) switching, thereby providing policymakers with initial guidelines. We find that consumers are less willing to switch their savings account to a new foreign bank than to a new

domestic bank. This suggests that a policy of allowing new foreign banks to enter the savings market is less promising in enhancing mobility than a policy that increases the number of domestic players. Regarding the main current account, our research indicates that reported switching propensities do not significantly change as a result of better knowledge of the switching service. We also test the hypothetical effect of account number portability. This seems to be a more promising policy avenue.

We will leave it to future research to provide insight into time patterns and to what extent various events and technological developments, such as the increase in electronic banking, have affected switching behaviour. We also welcome studies that include non-banks in the analysis, given the rise of non-banks executing banking activities, e.g. credit unions providing loans and technology companies providing payment services. It would also be interesting to analyse the gap between switching propensities and actual switching behaviour.

Appendix

Appendix A.2 Comparison of switching propensities

Table A.2.1 Paired t-tests to compare reported switching propensities across banking products

	Average switching propensity (in %)	Difference	t-value	P-value	N
Main current account	6.7	-3.51	-10.20	0.00	1,988
Main savings account	10.3				
Main current account	7.3	0.90	1.52	0.13	1,138
Main mortgage loan	6.4				
Main current account	6.4	0.65	0.65	0.51	189
Main revolving credit	5.8				
Main savings account	11.4	4.97	6.89	0.00	1,074
Main mortgage loan	6.4				
Main savings account	8.0	1.74	1.26	0.21	164
Main revolving credit	6.3				
Main mortgage loan	5.4	-1.37	-0.79	0.43	128
Main revolving credit	6.8				

This table shows the results of paired t-tests. The column "difference" shows the difference in average switching propensity for the products in question. The column "t-value" shows the t-value of testing whether the difference is equal to zero, while the column "p-value" reports the according p-value of this test. N denotes the number of observations.

Appendix B.2 Barriers to switching

Table B.2.1 Barriers to switching: results for different groups of respondents

	Current account					Savings account					Mortgage loan					Revolving credit				
	Switching propensity current account=0		*Switching propensity current account*>0			*Switching propensity savings account*=0		*Switching propensity savings account*>0			*Switching propensity mortgage loan*=0		*Switching propensity mortgage loan*>0			*Switching propensity revolving credit*=0		*Switching propensity revolving credit*>0		
	Mean	N	Mean		N	Mean	N	Mean		N	Mean	N	Mean		N	Mean	N	Mean		N
Satisfaction	4.0	1461	3.6	***	718	4.0	1226	3.7	***	744	3.9	828	3.8	*	299	3.9	140	3.688		48
Difficult	2.7	1461	2.8		718	2.7	1226	2.8		744	2.7	828	2.7		299	2.6	140	2.813		48
Time	3.0	1461	3.2	***	718	3.0	1226	3.2	***	744	3.1	828	3.1		299	2.8	140	3.083		48
Costs	2.8	1461	2.8		718	2.8	1226	2.8		744	2.8	828	2.8		299	2.7	140	2.646		48
Not enough banks	2.5	1461	2.6	***	718	2.5	1226	2.7	***	744	2.6	828	2.5		299	2.6	140	2.417		48
Too many banks	2.3	1461	2.2	**	718	2.3	1226	2.2		744	2.2	828	2.2		299	2.2	140	2.167		48
Hassle	3.2	1461	3.5	***	718	3.2	1226	3.5	***	744	3.4	828	3.4		299	3.1	140	3.458	**	48
Regret aversion	2.7	1461	2.6		718	2.7	1226	2.7		744	2.6	828	2.6		299	2.5	140	2.563		48
Low benefit	3.6	1461	3.4	***	718	3.6	1226	3.5		744	3.6	828	3.5		299	3.3	140	3.250		48
Long relationship	3.4	1460	2.8	***	717	3.5	1225	2.9	***	744	3.3	827	2.8	***	299	3.4	140	3.042	**	48
Benefit unclear	3.2	1460	3.2		717	3.2	1225	3.2		744	3.2	827	3.1		299	3.1	140	3.292		48
Trust difficult	3.0	1460	2.9		717	2.9	1225	2.9		744	2.9	827	2.8		299	2.9	140	2.979		48
Number portability	3.4	1460	3.6	***	717	3.4	1225	3.6	***	744	3.5	827	3.3		299	3.2	140	3.708	**	48
Other products	2.5	1460	2.5		717	2.5	1225	2.5		744	2.6	827	2.6		299	2.7	140	2.750		48

We refer to Figure 2.2 for a complete description of the barriers. N = the number of respondents. We tested whether differences in mean reported switching propensities are signficant. *** p<0.01, ** p<0.05, * p<0.1.
Source: CentERpanel, June 2015.

Appendix C.2 Description of variables

Table C.2.1 Description of variables

Variable	Description	Mean	Sd	Min	Max	N
Dependent variables						
Switching propensity current account	Propensity to switch within the next twelve months with main current account (%).	6.68	16.54	0	100	2086
Switching propensity savings account	Propensity to switch within the next twelve months with main savings account (%).	9.98	19.79	0	100	1889
Switching propensity mortgage loan	Propensity to switch within the next twelve months with main mortgage loan (%).	6.34	17.03	0	100	1087
Switching propensity revolving credit	Propensity to switch within the next twelve months with main revolving credit (%).	5.85	17.15	0	100	181
Personal characteristics (X)						
Male	Binary dummy (1 = male, 0 = female).	0.53	0.50	0	1	2093
34 and below	Binary dummy (1 = 34 or below, 0 = else).	0.11	0.31	0	1	2093
Between 35 and 44	Binary dummy (1 = between 35 and 44, 0 = else).	0.17	0.38	0	1	2093
Between 45 and 54	Binary dummy (1 = between 45 and 54, 0 = else).	0.16	0.37	0	1	2093
Between 55 and 64	Binary dummy (1 = between 55 and 64, 0 = else).	0.22	0.41	0	1	2093
65 and over	Binary dummy (1 = 65 or older, 0 = else).	0.34	0.47	0	1	2093
Education: bachelor degree or higher	Successful completion of higher vocational education and/or university education. Binary dummy (1 = graduate level diploma, 0 = else).	0.37	0.48	0	1	2093
Income category	Classification of gross monthly personal income in euros (1 = 500 or less, 2 = 501-1000, 3 = 1001-1500, 4 = 1501-2000, 5 = 2001-2500, 6 = 2501-3000, 7 = 3001-3500, 8 = 3501-4000, 9 = 4001-4500, 10 = 4501-5000, 11 = 5001-7500, 12 = 7500 or more).	4.96	2.80	1	12	2093
Degree of urbanisation	Degree of urbanisation of respondent's residence based on the address density per km^2 (1 = 500 or less, 2 = 500-1000, 3 = 1000-1500, 4 = 1500-2500, 5 = more than 2500).	2.94	1.31	1	5	2093
Responsible for household finances	Whether or not respondent is responsible for the household's financial affairs. Binary dummy (1 = responsible for financial affairs, 0 = else).	0.67	0.47	0	1	2093
Benefits (B)						
Not much benefit of switching	Perceived benefit from switching. Derived from the question: "*There can be different factors that withhold you from switching. How important are the factors below? There is not much benefit from switching."* (1 "absolutely unimportant factor" 2 "somewhat important factor" 3 "not a very important factor" 4 "very improtant factor" 5 "extremely important factor").	3.55	1.05	1	5	2093

Variable	Description	Mean	Sd	Min	Max	N
Switching experience (E)						
Recent switching experience current account	Binary dummy (1 = switched main current account less than one year ago, 0 = else).	0.02	0.15	0	1	2086
Older switching experience current account	Binary dummy (1 = switched main current account at least one year ago, 0 = else).	0.28	0.45	0	1	2086
Other switching experience current account	Binary dummy (1 = switching experience with main savings account, mortgage loan or revolving credit, 0 = else).	0.45	0.50	0	1	2086
Recent switching experience savings account	Binary dummy (1 = switched main savings account less than one year ago, 0 = else).	0.04	0.19	0	1	1889
Older switching experience savings account	Binary dummy (1 = switched main savings account at least one year ago, 0 = else).	0.36	0.48	0	1	1889
Other switching experience savings account	Binary dummy (1 = switch experience with main current account, mortgage loan or revolving credit, 0 = else).	0.41	0.49	0	1	1889
Recent switching experience mortgage loan	Binary dummy (1 = switched main mortgage less than one year ago, 0 = else).	0.02	0.14	0	1	1087
Older switching experience mortgage loan	Binary dummy (1 = switched main mortgage at least one year ago, 0 = else).	0.42	0.49	0	1	1087
Other switching experience mortgage loan	Binary dummy (1 = switching experience with main current account, savings account or revolving credit, 0 = else).	0.35	0.48	0	1	1087
Recent switching experience revolving credit	Binary dummy (1 = switched main revolving credit less than one year ago, 0 = else).	0.03	0.16	0	1	181
Older switching experience revolving credit	Binary dummy (1 = switched main revolving credit at least one year ago, 0 = else).	0.24	0.43	0	1	181
Other switching experience revolving credit	Binary dummy (1 = switching experience with main current account, savings account or mortgage loan, 0 = else).	0.49	0.50	0	1	181
Bank-customer relationship (R)						
Customer loyalty current account	Extent to which one feels a bond with the bank of one's main current account (1= no bond at all, 2 = poor bond, 3 = some bond, 4 = strong bond, 5 = very strong bond).	2.98	1.05	1	5	2086
Customer loyalty savings account	Extent to which one feels a bond with the bank of one's main savings account (1= no bond at all, 2 = poor bond, 3 = some bond, 4 = strong bond, 5 = very strong bond).	2.94	1.05	1	5	1889
Customer loyalty mortgage loan	Extent to which one feels a bond with the bank of one's main mortgage loan (1= no bond at all, 2 = poor bond, 3 = some bond, 4 = strong bond, 5 = very strong bond).	2.83	1.15	1	5	1087
Customer loyalty revolving credit	Extent to which one feels a bond with the bank of one's main revolving credit (1= no bond at all, 2 = poor bond, 3 = some bond, 4 = strong bond, 5 = very strong bond).	2.78	1.15	1	5	181
Number of banks	Number of banks of which one is customer (1 = 1, 2 = 2, 3 = 3, 4 = 4, 5 = 5 or more).	1.86	0.94	1	5	2093
Filed a complaint	Binary dummy (1=contacted the bank to file a complaint during the last three years, 0=else)	0.08	0.28	0	1	2093

Variable	Description	Mean	Sd	Min	Max	N
Knowledge (K)						
Knowledge of current account	Binary dummy (1 = knows the costs of main current account, 0 = else).	0.52	0.50	0	1	2086
Knowledge of savings account	Binary dummy (1 = knows the interest rate on main savings account, 0 = else).	0.65	0.48	0	1	1889
Knowledge mortgage loan	Binary dummy (1 = knows the interest rate on main mortgage loan, 0 = else).	0.79	0.41	0	1	1087
Knowledge revolving credit	Binary dummy (1 = knows the interest rate on main revolving credit, 0 = else).	0.49	0.50	0	1	188
Knowledge of other banking products:						
current account	Average score on other knowledge questions than the current account questions.	0.43	0.27	0	1	2086
savings account	Average score on other knowledge questions than the savings account questions.	0.32	0.25	0	1	1889
mortgage loan	Average score on other knowledge questions than the mortgage loan question.	0.45	0.25	0	1	1087
revolving credit	Average score on other knowledge questions than the revolving credit question.	0.49	0.30	0	1	181
Knowledge of switching service	Extent to which one is familiar with the switching service (1 = not heard of it, 2 = heard of it but no knowledge of content, 3 = heard of it and knowledge of content).	1.90	0.83	1	3	2086
Knowledge of Deposit Guarantee Scheme	Binary dummy (1 = knows the DGS, 0 = else).	0.71	0.45	0	1	1889
Socio-psychological factors (*S*)						
Perceived control over switching	"If I want, I can switch to another bank" (1=completely disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = completely agree).	4.04	0.91	1	5	2093
Degree to which switching is unpleasant	"Switching to another bank is unpleasant" (1=completely disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = completely agree).	3.49	0.93	1	5	2093
Injunctive social norms	"I believe that most people who are important to me think that I should switch to another bank" (1=completely disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = completely agree).	1.89	0.89	1	5	2093
Perceived switching behaviour of others	"People who I would like to resemble switch banks every now and then" (1=completely disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = completely agree). This measures descriptive social norms.	2.00	0.96	1	5	2093
Jointly owned current account	Binary dummy (1 = shares current account, 0 = else).	0.52	0.50	0	1	2086
Jointly owned savings account	Binary dummy (1 = shares savings account, 0 = else).	0.56	0.50	0	1	1889
Jointly owned mortgage loan	Binary dummy (1 = shares mortgage with, 0 = else).	0.77	0.42	0	1	1087
Jointly owned revolving credit	Binary dummy (1 = shares revolving credit, 0 = else).	0.58	0.49	0	1	181

This table describes the variables used in the regressions reported in Table 2.1 for the respondents included in these regressions. The mean, standard deviation (sd), minimum (min), maximum (max) and number of observations (N) for DHS variables are based on the data available for the respondents of our additional June 2015 survey.

Appendix D.2 The importance of model elements

Table D.2.1 Propensity to switch main current account

	1	2	3	4	5	6
Male	2.45					
	(2.26)					
Between 35 and 44	1.16					
	(3.60)					
Between 45 and 54	4.46					
	(3.59)					
Between 55 and 64	-1.38					
	(3.58)					
65 and over	-13.63***					
	(3.37)					
Education: bachelor degree or higher	7.58***					
	(2.21)					
Income category	0.19					
	(0.41)					
Degree of urbanisation	1.46*					
	(0.78)					
Responsible for household finances	1.58					
	(2.25)					
Not much benefit of switching		-6.19***				
		(1.01)				
Recent switching experience current account			-1.67			
			(6.64)			
Older switch experience current account			4.06			
			(2.59)			
Other switching experience current account			9.09***			
			(2.43)			
Customer loyalty current account				-8.29***		
				(1.02)		
Number of banks				3.38***		
				(0.96)		
Filed a complaint				17.49***		
				(3.56)		
Knowledge of current account					-2.51	
					(2.15)	
Knowledge other banking products					10.01**	
					(4.10)	
Knowledge of switching service					1.35	
					(1.32)	
Knowledge of switching service * Recent switching experience current account					-1.56	
					(2.56)	
Perceived control over switching						7.55***
						(1.26)
Degree to which switching is unpleasant						-1.35
						(1.18)
Injunctive social norms						6.58***
						(1.47)
Perceived switching behaviour of others						1.98
						(1.29)
Jointly owned current account						0.37
						(1.95)
Constant	-25.48***	3.55	-23.88***	-1.64	-24.19***	-60.87***
	(4.02)	(3.56)	(1.85)	(3.64)	(3.06)	(7.89)
Observations	2086	2086	2086	2086	2086	2086
Akaike's Information Criterion	8143.67	8159.60	8173.49	8071.60	8199.74	8126.41
Ranking	3	4	5	1	6	2

Table reports parameter estimates for Tobit regressions. Robust standard errors in parentheses. The propensity to switch equations of the four different type of banking products are estimated together to allow individual-level errors to be correlated. *** p<0.01, ** p<0.05, * p<0.1. All models are significant at 1%.

Table D.2.2 Propensity to switch main savings account

	1	2	3	4	5	6
Male	1.79					
	(2.56)					
Between 35 and 44	1.65					
	(4.02)					
Between 45 and 54	5.30					
	(4.02)					
Between 55 and 64	-4.15					
	(4.03)					
65 and over	-14.71***					
	(3.77)					
Education: bachelor degree or higher	10.24***					
	(2.49)					
Income category	0.93*					
	(0.47)					
Degree of urbanisation	1.26					
	(0.86)					
Responsible for household finances	1.40					
	(2.55)					
Not much benefit of switching		-2.91***				
		(1.11)				
Recent switching experience savings			39.79***			
			(6.10)			
Older switching experience savings			15.76***			
			(2.79)			
Other switching experience savings			0.03			
			(2.78)			
Customer loyalty savings account				-9.12***		
				(1.08)		
Number of banks				7.35***		
				(1.07)		
Filed a complaint				20.09***		
				(3.81)		
Knowledge of savings account					5.48**	
					(2.71)	
Knowledge of other banking products					1.59	
					(4.92)	
Knowledge of Deposit Guarantee Scheme					9.25***	
					(2.85)	
Perceived control over switching						7.60***
						(1.39)
Degree to which switching is unpleasant						-0.91
						(1.29)
Injunctive social norms						2.60
						(1.69)
Perceived switching behaviour of others						3.62**
						(1.49)
Jointly owned savings account						-0.53
						(2.25)
Constant	-24.18***	-3.99	-21.22***	-2.75	-25.18***	-53.94***
	(4.29)	(4.14)	(1.78)	(4.21)	(2.73)	(8.48)
Observations	1889	1889	1889	1889	1889	1889
Akaike's Information Criterion	8456.67	8525.68	8451.19	8344.35	8511.46	8492.53
Ranking	3	6	2	1	5	4

Table reports parameter estimates for Tobit regressions. Robust standard errors in parentheses. The propensity to switch equations of the four different type of banking products are estimated together to allow individual-level errors to be correlated. *** p<0.01, ** p<0.05, * p<0.1. All models are significant at 1%.

Table D.2.3 Propensity to switch main mortgage loan

	1	2	3	4	5	6
Male	0.74					
	(4.19)					
Between 35 and 44	-5.32					
	(6.58)					
Between 45 and 54	-1.89					
	(6.89)					
Between 55 and 64	-18.55***					
	(6.88)					
65 and over	-22.10***					
	(6.93)					
Education: bachelor degree or higher	-4.77					
	(3.86)					
Income category	2.51***					
	(0.81)					
Degree of urbanisation	1.57					
	(1.39)					
Responsible for household finances	-2.24					
	(3.98)					
Not much benefit of switching		-3.70**				
		(1.74)				
Recent switching experience mortgage loan			-14.39			
			(14.42)			
Older switching experience mortgage loan			14.79***			
			(3.87)			
Other switching experience mortgage loan			10.63***			
			(3.62)			
Customer loyalty bank mortgage loan				-6.65***		
				(1.57)		
Number of banks				2.50		
				(1.75)		
Filed a complaint				-0.97		
				(5.81)		
Knowledge of mortgage loan					1.72	
					(4.88)	
Knowledge of other banking products					-13.77*	
					(7.54)	
Perceived control over switching						3.18
						(2.23)
Degree to which switching is unpleasant						-4.19**
						(2.03)
Injunctive social norms						-0.04
						(2.37)
Perceived switching behaviour of others						0.83
						(2.17)
Jointly owned mortgage loan						-1.84
						(4.24)
Constant	-33.63***	-16.49**	-39.35***	-16.17**	-24.91***	-28.28**
	(7.84)	(6.56)	(3.61)	(6.78)	(4.49)	(12.89)
Observations	1087	1087	1087	1087	1087	1087
Akaike's Information Criterion	3639.49	3660.56	3631.64	3645.49	3663.99	3665.59
Ranking	2	4	1	3	5	6

Table reports parameter estimates for Tobit regressions. Robust standard errors in parentheses. The propensity to switch equations of the four different type of banking products are estimated together to allow individual-level errors to be correlated. *** p<0.01, ** p<0.05, * p<0.1. The last two specifications are not statistically significant. The other specifications are significant.

Chapter 3

To stay or go?
Consumer bank switching behaviour after government interventions

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3.1 Introduction

Many countries have been confronted with instability in the banking sector since the outbreak of the financial crisis. To prevent banks defaulting, bail-out operations have been conducted all over the world. Although the goal of such operations is clear, the consequences are unclear and intensively debated. One potential implication of bailing out distressed financial institutions is that it encourages risky behaviour by these institutions and their investors if they anticipate bail-outs. As a result, recent studies examine bank responses to government interventions. These studies focus on the effect of bail-outs on bank risk-taking (Duchin and Sosyura, 2014; Black and Hazelwood, 2013; Ianotta et al., 2013; Dam and Koetter, 2012; Gropp et al., 2011; Cordella and Yeyati, 2003), liquidity creation (Berger et al., 2016) or bank competition (Calderon and Schaeck, 2016).

To date, less is known about bank customers' (household) responses to government interventions. Berger and Turk-Ariss (2015) and Hasan et al. (2013) argue that bail-outs might reduce market discipline as default risk is reduced and therefore also the need to monitor and discipline banks. They reason that, at the same time, the negative press coverage accompanying government interventions may damage the bank's reputation. This increase in the public's awareness of bank risk and (mis)management might trigger a

customer response. There is some empirical evidence that bail-outs indeed affect customer behaviour. Van der Cruijsen et al. (2012) show that Dutch customers of troubled banking institutions are more likely to move funds across banks and spread their savings than customers of other banks. Brown et al. (2017) find that households are more likely to withdraw from distressed banks that received a capital injection, although this effect is mitigated by switching costs. According to Iyer and Puri (2012) consumers who panic do not return to the bank.

We add to existing literature by examining how trust in the government and risk aversion are related to bank switching behaviour after government interventions.[51] We hypothesize that consumers with no or little trust in the government are more likely to switch away from a bank after a nationalisation than consumers who trust the government, given that the government becomes the owner of the bank after such intervention. As the government does not become the owner of the bank after a capital injection, we expect no effect in this case. Second, we expect that risk averse customers are more likely to stay at the intervened bank as interventions reduce default risk of a bank.

This study is close to Brown et al. (2017) who research deposit withdrawals in Switzerland. Our paper differs in important ways. First of all, we have a panel dataset rather than a cross-sectional dataset. Therefore we are able to conduct a difference-in-difference analysis, which allows us to take systematic differences in the behaviour of customers of different banks into account. We show that this is important as pre-intervention switching proportions differ across the bailed-out and control bank. Furthermore, we find that part of their results are overturned when using a difference-in-difference setup.

Furthermore, we differ from current studies (Brown et al., 2017; Van der Cruijsen et al., 2012) by taking the scope of government interventions into account. We are the first to differentiate between a nationalisation and a capital injection to gain insight in whether the scope of the bail-out matters for subsequent consumer behaviour.

Besides, we distinguish between savings accounts and current accounts as Van der Cruijsen and Diepstraten (2017) show that both switching propensities and the main factors related to switching depend on the banking product.

[51] In the household finance literature, a household often refers to the head of household. In our analysis we also include other members of the household.

To gather information on switching behaviour, we would ideally use data from a deposit register. However, such register does not exist and therefore we collect survey data. The advantage of survey data is that it allows us to make cross-bank comparisons, which is not possible using administrative data from a single bank. We use data on the Netherlands from the DNB Household Survey (DHS), which is the household survey of De Nederlandsche Bank (DNB). Given its stable history, but turbulent crisis years, the Netherlands provides a natural setting to study the effect of government interventions.

We first study the aggregate effect of each intervention on switching away from a bank by customers at the intervened bank, compared to customers' switching behaviour at the control bank. We find that switching behaviour of consumers at intervened banks is similar before and after the troubles and intervention. This holds for both type of interventions and banking products.

We then examine heterogeneity across bank customers. Compared to consumers who trust the government, consumers with little or no trust are more likely to switch away after a nationalisation, relative to customers of the control bank. This holds for both the savings account and the current account. Second, compared to non-risk averse current account holders, risk averse current account holders are more likely to switch away after a nationalisation, relative to current account holders of the control bank. This latter finding is in contrast to our expectation and might indicate that the intervention has raised awareness of financial problems at the intervened bank.

For both the intervener and bank manager, it is essential to understand if and how interventions shape customer behaviour to highlight potential unintended consequences. Therefore our study provides important input for the debate about the design of government interventions. Since the bank's customer base impacts the required liquidity within the Basel III framework (Basel Committee on Banking Supervision, 2013), understanding how customers respond to bail-out operations is key.

Our research contributes to different strands of the literature. First, we add to studies on consumer responses to government interventions (e.g. Brown et al., 2017; Hasan et al., 2013; Van der Cruijsen et al., 2012). Second, we relate to work on consumer switching behaviour and bank runs (e.g. Iyer et al., 2016; Iyer and Puri, 2012; Van der Cruijsen and

Diepstraten, 2017; Kiser, 2002). Third, we link to studies on the effects of risk aversion and trust (e.g. Van Rooij et al., 2011; Guiso, 2010; Chanley et al., 2000).

The remainder of this paper is structured as follows: Section 3.2 provides an overview of the related literature. Section 3.3 delivers background information on the Dutch banking sector. Section 3.4 presents our data. Section 3.5 includes our analyses of aggregate switching behaviour, whereas Section 3.6 shows the analyses of heterogeneity in consumers' responses to interventions. Section 3.7 presents additional tests and Section 3.8 contains the conclusion.

3.2 Literature

3.2.1 Consumer responses to government interventions

Our paper is closest to Brown et al. (2017) and Van der Cruijsen et al. (2012), who both use a cross-sectional dataset. The former study examines interventions at two large Swiss banks and shows that consumers' deposit accounts at distressed banks are more likely to decline or even to be closed than their non-distressed counterparts. The authors find that the scope of the intervention matters. The propensity to withdraw funds and to close an account is higher for a bank which is both recapitalized and bailed out by the government than for a bank that only received a capital injection from private investors. This effect is mitigated by switching costs arising from a tight relationship with the bank; customers with an exclusive or broad relationship with the distressed bank are less likely to withdraw. The results are qualitatively robust across respondents with different levels of deposit insurance coverage, knowledge of the scheme and financial literacy. However, households who are less likely to be covered, with more knowledge of the scheme and who are more financially literate are more likely to switch than others. Van der Cruijsen et al. (2012) show that negative experiences with the banking sector led Dutch households to more actively manage their savings accounts. Customers of troubled banks are more likely to spread their savings and to move funds across banks than others. Again, the size of the shock is important. Consumers who experienced both a bail-out and a bankruptcy of their bank are

most active.[52]

Others focus on market discipline when researching customer responses to government interventions. Berger and Turk-Ariss (2015) find that market discipline decreased during the crisis for large US banks and both small and large banks in the EU. They argue that this is the result of government interventions. In contrast, for Central European countries Hasan et al. (2013) find that subsidiaries of parent companies that received government aid faced more deposit outflows than other banks. This implies that depositors view government support as a sign of difficulties at the parent, and hence the potential stabilising effect of government aid is overshadowed by reputational damage.

3.2.2 Bank switching behaviour and bank runs

Prior studies on switching behaviour focus on individual characteristics that explain differences in switching (propensities). Kiser (2002) finds that married persons, persons with a four-year college degree and persons with higher income are less likely to remain with their first- ever bank than their counterparts. Chakravarty et al. (2004) show that customers who feel that the bank is reliable, empathetic and responsible are less likely to switch banks than customers who do not have these feelings. In addition, multiple studies provide evidence that the relationship between the bank and the customer is important. Individuals who bank with a single bank (Brunetti et al., 2016a), individuals who have more services at the main bank (Brunetti et al., 2016a) and individuals with a longer relationship with the bank are less likely to switch than others (Chakravarty et al., 2004). In contrast, customers who filed a complaint in the past and customers who switched before are more likely to switch (Chakravarty et al., 2004). Van der Cruijsen and Diepstraten (2017) research the most important factors explaining differences in switching propensities for individual banking products. The bank-customer relationship and socio-psychological factors are the most important factors in explaining variation in the propensity to switch the current account. The bank-customer relationship and switching experience are the most

[52] There is also research on the effect of other events on switching behaviour. For example, Brunetti et al. (2016b) examine how a legal reform that reduced mortgage refinancing costs affects switching mortgage loans. They show that both shopping for a mortgage and switching to refinance an existing loan increased after the reform.

important drivers of savings accounts' switching propensities, while switching experience and personal characteristics are key for mortgage loans.

A different but related measure is the withdrawal of funds. Several studies focus on bank runs and on which depositors are more likely to withdraw all their deposits. Iyer and Puri (2012) find that deposit insurance matters, but is only partially effective in preventing bank runs. Even though customers with balances above the insurance limit are more likely to withdraw their deposits, depositors with balances below the insurance limit also do this. This is in line with findings of Davenport and McDill (2006) who analyse depositor behaviour at a failed institution and also document that insured depositors withdraw funds.

The bank-customer relationship can help reduce bank fragility as depositors who currently have a loan or had one in the past, as well as depositors who have a longer relationship with the bank are less likely to withdraw all their deposits than other customers (Iyer and Puri, 2012). Besides, customers are more likely to withdraw all their funds if other depositors in their social network also do this.

Iyer et al. (2016) show that certain depositors are more likely to run than others and therefore the fragility of the bank is affected by the depositor base. By studying a low and high solvency risk shock to the same bank, the authors conclude that the nature of the shock shapes customer responses. Depositors with loan linkages are for example more likely than others to withdraw all their funds in case of a high-solvency-risk shock, while they are less likely to do so in a low-solvency-risk-shock. Customers with longer relationships are less likely to withdraw all their deposits than customers with a short relationship in both circumstances.

3.2.3 Trust

Our study also relates to the literature on trust as we examine whether switching behaviour depends on the level of trust in the government. Prior studies provide evidence that trust impacts households' financial decision-making. Guiso et al. (2008) find that households with more trust in other people (generalised trust) and households with more trust in their financial advisor (personalised trust) are more likely to directly invest in the stock market and to own risky assets. Moreover, people with higher levels of trust in others are more likely to become entrepreneurs (Guiso et al., 2006).

Guiso (2010) documents a dramatic drop in trust in banks and the financial market after the outbreak of the financial crisis in the US. Similar patterns are found in European countries, confirming that the drop in trust was universal (e.g. Guiso, 2010; Knell and Stix, 2015). Uslaner (2014) finds that the financial crisis of 2008 has had a stronger impact on trust in institutions than on generalised trust in the US. Van der Cruijsen et al. (2016) focus on personal crisis experiences and provide evidence that such experiences reduce trust in banks as well as generalised trust, while trust in the supervisor does not depend on personal crisis experiences. Lastly, Ananyev and Guriev (2015) report that the Russian economic crisis in 2009 reduced generalised trust.

Not only did trust in financial markets drop; trust in the government also decreased (Kong, 2013). Empirical work on determinants of trust in the government shows that negative perceptions of the economy, increasing public concern about crime and political scandals trigger a decline in citizens' trust in the government (Chanley et al., 2000).

3.2.4 Risk aversion

Lastly, our study is connected to research that relates households' risk aversion to financial decision-making as we research whether the effect of government interventions depends on consumers' degree of risk aversion. Barsky et al. (1997) document that households who are more risk tolerant are more likely to have stocks. Less risk-tolerant households are more likely to have Treasury bills and savings accounts. This is in line with findings of Van Rooij et al. (2011) who show that households who are not willing to take risks are less likely to have stocks. Guiso and Paiella (2006) find that risk averse consumers are not only less likely to own risky assets but are also less likely to be self-employed and to hold insurance.

3.3 The Dutch banking sector

The current structure of the Dutch banking sector is rooted in the mergers and acquisitions wave of the 1980s. This culminated in fewer but larger banks, and nowadays the sector is one of the most concentrated in Europe (DNB, 2015). The Netherlands Authority for Consumers and Markets (2013) finds that 72.3% of the newly-granted mortgages between January 2012 and October 2012 were granted by the four largest banks. For savings

accounts, these four banks had a total market share of 84% in 2011 (Dijsselbloem, 2013) and Gfk (2014) concludes that the total market share of savings accounts of the three largest banks equalled 96% in 2014. Not only is the sector concentrated compared to other European banking systems, it also belongs to the largest European banking sectors with a value of more than four times Dutch GDP in 2014 (DNB, 2015).[53]

Although the Dutch banking sector has a relative stable history, the sector has experienced turbulent years during the recent crisis. Therefore, the Netherlands provides a natural setting to study the effect of government intervention. Only few banks failed between 1945 and 2007 (Scheltema et al., 2010). From then on, the situation changed considerably. In 2008 and 2009 three banks failed (Scheltema et al., 2010), while at the same time two of the largest banks (ING and SNS REAAL) received a government capital injection. In addition, the Dutch parts of Fortis Bank and ABN Amro were nationalised in 2008, and in 2013 SNS REAAL was nationalised as well. We focus on the nationalisation of Fortis/ABN Amro and the capital injection of ING.[54] Appendix A.3 provides a description of the problems of both banks that resulted in the need for government support.

3.4 Data and methodology

We use the annual DHS to collect data on consumers' banking affairs and personal characteristics. The DHS is a continuous Internet-based survey among a representative sample of the Dutch-speaking population in the Netherlands (the CentERpanel), starting in 1993. The CentERpanel consists of approximately 2,000 households, in which all family members of age 16 and above are invited to complete the survey. The survey covers a wide array of topics like income, housing, health, personal characteristics and psychological concepts.[55] We complement this dataset with bank-level data from DNB, and additional surveys held among the CentERpanel to measure trust.

[53] The average size of banking sectors in the Euro area equaled 3 times GDP in 2014. Only Ireland and Great Britain had a larger banking sector relative to GDP (DNB, 2015).
[54] In case of SNS REAAL, the pre-intervention switching trend is not similar to the control bank and hence a difference-in-difference comparison is problematic. Consequently, we exclude it from our analysis.
[55] See http://www.centerdata.nl/en/projects-by-centerdata/dnb-household-survey-dhs for more information on the DHS. URL last accessed on 2 August 2017. See also Teppa and Vis (2012). The CentERpanel has been used to investigate a broad range of topics, e.g. household portfolio diversification (Von Gaudecker, 2015), social interactions (Georgarakos et al., 2014) and stock market participation (Hurd et al., 2011).

Each year participants provide the names of the banks where they held their savings and current accounts at the end of the previous year, as well as the balance of each account. If someone has multiple accounts of the same product, we focus on the most important account.[56] This is the account with the highest balance for the savings account, and the self-reported most important account for the current account. For all respondents, we compare their banks in consecutive years to find out whether they changed banks.

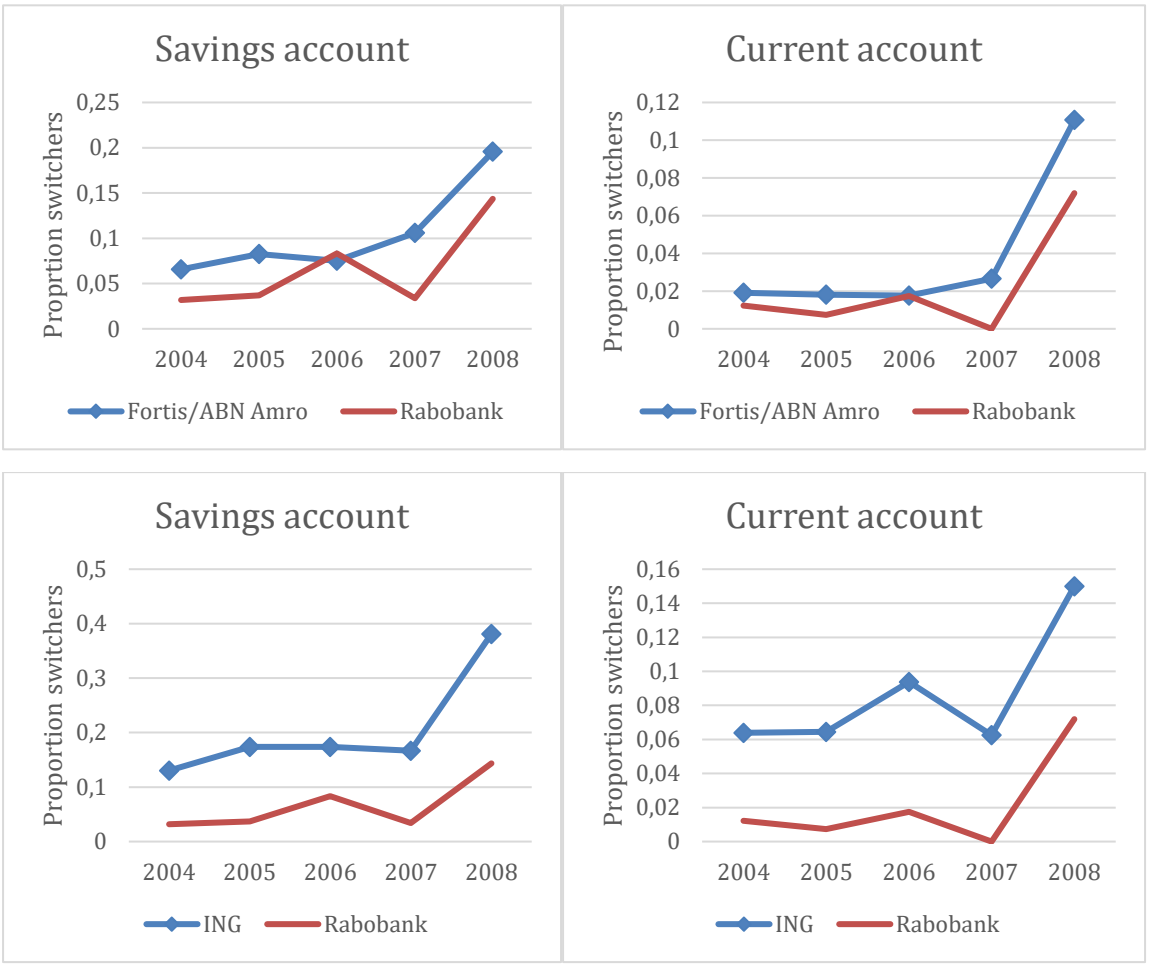
Our research covers the period from 2004 to 2008, which enables us to compare behaviour before and after the troubles and interventions. We limit the sample period to 2008 as we are interested in immediate responses to bail-outs. We find that 83% of savings accounts are held at one of the six largest banks.[57] We use this detailed dataset to construct all variables included in the regression analyses before making any restrictions.[58]

In the analyses we restrict the sample to customers of the bailed-out bank in question and a control bank: Rabobank. This is a large bank that did not receive any government support. At the time the nationalisation took place, the Dutch part of ABN Amro was acquired by Fortis and the aggregate was nationalised. For this reason we include both Fortis' and ABN Amro's customers in the analyses.[59]

Figure 1 shows the evolution of switching for the bailed-out banks and the control bank. The graphs show the proportions of customers that switched to another bank in a given year. The top graphs plot switching proportions of Fortis/ABN Amro and Rabobank.[60] The left graph presents switching with the savings account, and the right graph shows switching with the current account. For both banking products, we document a peak in switching in 2008, the year of the intervention. In this year, we observe that customers of the nationalised bank switched more than customers of the control bank. However, the

[56] The majority of respondents has only one account of a product.
[57] The six largest banks are: ABN Amro, Fortis, Postbank, ING, Rabobank and SNS REAAL. The brands Postbank and ING merged in 2009, even though they were already part of the same holding. Fortis took over the Dutch parts of ABN Amro in 2007. In 2010, ABN Amro and the Dutch part of Fortis merged.
[58] We compute all variables using the detailed dataset. Later we use different samples in different specifications.
[59] As ING received capital support on the concern level, its subsidiaries received support as well. A critical assumption here is that consumers are informed about this. When a bank receives support but customers are not aware of this, they will not respond to it. Hence it is key to understand consumers' awareness of interventions. To gain insight in consumers' perceptions, we analyse newspaper articles. These articles mention that ING received a capital injection, but the name of its subsidiary is not mentioned. As a result most consumers were probably not aware that Postbank received support as well. Besides, the problems creating the need for support were at ING and not at Postbank. Consequently, we do not include customers of Postbank in the analyses.
[60] To be consistent with the regression analysis, we plot Fortis and ABN Amro together.

Figure 3.1. Switching proportions over time by bank



This figure shows the proportion of customers that switched to another bank in a given year. The upper graphs include customers of Fortis/ABN Amro and Rabobank and the lower graphs include customers of ING and Rabobank. The left graphs represent switching with the savings account, the right graphs report switching with the current account.

years before reveal that this has been the case for most other years. Therefore, this graph shows the relevance of using a panel dataset rather than a cross-sectional dataset. Only focusing on the year of the intervention might lead to the incorrect conclusion that the intervention led to more switching at the bailed-out bank than at the control bank. The lower graphs plot switching proportions of customers of ING and Rabobank. Again, we note a peak in switching in 2008 and the figure shows that customers of the bailed-out bank switched more than customers of the control bank in all years.

To test whether the switching trends of customers of the control bank and the bailed-out bank are similar before the intervention, we restrict the sample to the pre-intervention period (2004-2007) and run the following regression per banking product:

$$Switch_{i,t} = \alpha_b + \alpha_t + \beta_1 Bailed\ out_{i,t} * D06_t + \beta_2 Bailedout_{i,t} * D07_t + \varepsilon_{i,p,t} \quad (3.1)$$

In this specification, *i* denotes the customer, *b* the bank and *t* time in years. Our dependent variable captures whether the customer switched banks in a given year. It is a dummy variable with value 1 if a switch took place and zero otherwise. We focus on switching away from a bank. We regress our switching indicator on bank dummies (α_b), time dummies (α_t), as well as interaction terms of a dummy capturing whether the customer is with the bailed-out bank at the beginning of the year (*Bailed-out*) and dummies for 2006 and 2007 (*D06* and *D07*, respectively) and cluster the standard errors at the customer level.

β_1 (β_2) shows whether customers of the bailed-out bank switched more or less in 2006 (2007) than in 2004 and 2005. If the trends are parallel, we should find insignificant effects. Table B.3.1 of Appendix B.3 reports the results and shows insignificant interaction terms for both bailouts and both banking products. Therefore we conclude that the pre-intervention trends are similar.

3.5 The aggregate effect of interventions on switching away from the intervened bank

3.5.1 Methodology

The panel structure of our dataset allows us to compare the behaviour of customers of an intervened bank with the behaviour of customers of the control bank, after versus prior to the intervention. That is, we use a difference-in-difference analyses to identify the effect of government interventions on switching behaviour. The advantage of this methodology is that we take systematic differences in the behaviour of customers (consumers) of different banks into account. Figure 1 shows that this is important as the proportion of customers switching banks differs across banks.

We run separate regressions for each banking product and intervention. For all regressions, the sample is restricted to customers of the intervened bank under investigation and Rabobank, the control bank. Rabobank serves as a benchmark to proxy switching behaviour at the treated bank in absence of problems and an intervention.
We estimate the following fixed effects model:[61,62]

$$Switch_{i,t} = \beta_1 D05_t + \beta_2 D06_t + \beta_3 D07_t + \beta_4 D08_t + \beta_5 Bailed\ out_{i,t} + \beta_6 Bailed\ out_{i,t} D08_t + \beta_7 B_{i,t-1} + \alpha_i + \alpha_b + \varepsilon_{i,t} \quad (3.2)$$

Again, *i* denotes the customer, *b* the bank and *t* time in years. Our dependent variable captures whether the customer switched banks in a given year.

To capture aggregate time trends we include dummies for each year (*D05-D08*), with 2004 being the reference year. *Bailed-out* captures whether the customer is from the intervened bank. This variable is 1 if the customer is with the mentioned bank at the beginning of year *t* and zero if this is otherwise. Consequently, we focus on switching behaviour of the bank's current customers in a given year.

The coefficient of interest is β_6. It measures the effect of the bail-out on switching. We rely on the identification assumption that customers of bailed-out banks would have behaved like customers of the non-bailed-out bank in the absence of problems and the bail-out. β_6 identifies whether switching behaviour of customers of an intervened bank, in comparison to customers of the control bank, significantly changed after the intervention.

A concern is that the analysis may suffer from an omitted variable bias, as the customer base could drive both the intervention and switching behaviour. The Dutch government offered liquidity to all healthy and viable banks that were in trouble because of the crisis. Hence, each bank decided whether to make use of this offer. Bank managers are

[61] We prefer a linear model as nonlinear models produce biased estimates in panel datasets with a short time period and many fixed effects (see Duchin and Sosyura (2014) for a detailed explanation). In addition, nonlinear fixed effects models generate biased estimates for interaction terms (Ai and Norton, 2003). Consequently, we follow Wooldridge's (2002) recommendation and recent studies by estimating a linear model (Duchin and Sosyura, 2014; Puri et al., 2011).
[62] Focusing on persons who have a savings or current account at both the nationalised bank and the control bank, would improve identification. Unfortunately, more than 50% of respondents have only 1 savings account or current account. Of those respondent with multiple account almost 50% has all accounts at the same bank. As a consequence, we do not have enough observations that have the same banking product at both the bailed-out and control bank. For example, only 28 observations had a savings account at both Fortis/ABN Amro and Rabobank in 2008.

likely to take expected customer responses into account when deciding on this, resulting in a potential omitted variable bias.

We provide summary statistics of savings account holders of each bank at January 1, 2008 to investigate observable differences in customers across banks. We check for each bailed-out bank whether its customers are significantly different from Rabobank's customers in terms of gender, age, education, whether they are responsible for household finances, the degree of urbanisation of their residence and the value of the savings account (Table 3.1). The average age of the customer is slightly higher for Fortis/ABN Amro than for Rabobank, and Rabobank's customers are less likely to live in urbanised cities. This is not surprising, given the origin of the Rabobank; a cooperative of small agricultural banks. The average value of the savings account is lower at ING than at Rabobank. We find no differences for all other variables. As most of the variables do not change much over time, we include customer fixed effects (α_i) rather than these control variables. The advantage of this methodology is that it is also captures all time-invariant unobservable characteristics.

Table 3.1. Comparison of customers of different banks

	Rabobank	Fortis/ABN Amro	ING
Male	0.583	0.567	0.640
Age	51.123	55.000**	52.480
Education: bachelor degree or higher	0.415	0.371	0.360
Responsible for household finances	0.783	0.825	0.720
Degree of urbanisation	2.493	3.398***	3.280***
Value savings account	19191	19495	10733**

This table compares savings account holders on January 1, 2008 of different banks. The table shows mean values of customer characteristics. *Male* is a binary dummy with value 1 if male and 0 otherwise, *Age* measures the age of the respondent in years, *Education: bachelor degree or higher* is a binary dummy with value 1 if having successfully completed higher vocational education and/or university education and zero otherwise. *Responsible for household finances* equals 1 if responsible for the household's financial affairs and zero otherwise. *Degree of urbanisation* measures the degree of urbanisation of a respondent's residence based on the address density and ranges from 1 (not urbanised) to 5 (very strongly urbanised). The *Value of the savings account* is denoted in euros. The stars indicate whether the mean is significantly different from the mean value of Rabobank. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Vector *B* includes bank characteristics of the bank where the customers hold an account at the beginning of the year. We control for the bank's size (logarithm of total assets) and profitability (return on assets) (see also Soledad Martinez Peria and Schmukler, 2001; Demirgüç-Kunt and Huizinga, 2004; Hasan et al., 2013). After the interventions, the

bailed-out banks were not allowed to be price leaders. Hence, we control for interest rates on household savings as well, as customers of bailed-out banks might be inclined to switch to banks offering higher interest rates.[63] To control for time- invariant bank characteristics we include bank fixed effects (α_b). This captures, for example, the customer orientation of a bank.

We use bank level data from DNB to construct the variables. The upper panel of Table 3.2 shows total assets in millions. ABN Amro and ING are the largest banks. The second panel of Table 3.2 highlights the impact of the financial crisis as we observe negative values for profitability in 2008. The lower panel of Table 3.2 shows the interest rates on household savings. Rabobank and ABN Amro offer the highest interest rates on savings.

We cluster the standard errors at the respondent level. Appendix C.3 provides summary statistics of the variables included in this study.

Table 3.2. Bank level variables

	2004	2005	2006	2007	2008
	Total assets in millions				
ABN Amro	615	881	987	1030	664
Fortis	144	170	209	272	184
ING	617	834	895	996	1030
Rabobank	462	507	559	571	614
	Return on assets (%)				
ABN Amro	0.185	0.147	0.119	0.666	-1.249
Fortis	0.066	0.082	0.061	0.064	-10.435
ING	0.064	0.120	0.103	0.087	-0.097
Rabobank	0.064	0.097	0.087	0.070	0.136
	Interest rates on household savings (%)				
ABN Amro	2.861	2.637	2.607	3.029	3.558
Fortis	2.699	2.267	2.103	2.259	2.630
ING	2.562	2.364	2.294	2.387	2.737
Rabobank	2.782	2.635	2.628	3.040	3.566

This table shows the evolution of bank size, profitability and interest rates on household loans per bank. Bank size is measured as the value of total assets in millions. The value of return on asset denotes the profitability. The lower panel shows the average interest rate on household savings. All variables are measured on 31 December of the expressed year.

3.5.2 Results

[63] Gerritsen et al. (2017) find that deposit rates play an important rates in reallocation funds during non-crisis times.

Table 3.3 reports the results of the fixed effects regressions to measure the net effect of each intervention on switching. Note that the bailed-out dummy is included in the bank fixed effect. The first two columns report the results of the nationalisation of Fortis/ABN Amro while the last two columns show the results of the capital injection of ING.

We find a positive and significant coefficient for the year 2008 in the current account specification of the nationalisation of Fortis/ABN Amro. Hence, the proportion of switchers was higher in 2008 than in 2004, indicating a crisis effect. However, the insignificant interaction terms for both the savings account and current account imply that customers of the nationalised bank did not switch away more after the troubles and intervention than they did in prior years, compared to customers of the control bank. Focusing on the capital injection of ING, the coefficient of the 2008 dummy is insignificant in both specifications and, again, we find insignificant interaction terms. Hence the outflow of consumers at the intervened banks remained unchanged after the government intervention, relative to the control bank.

This is in contrast to findings of Brown et al. (2017) who show that customers of a bailed-out bank are more likely to withdraw from and terminate the account. There are two possible explanations. Either the difference in results stems from differences in the methodology as they use a cross-sectional dataset rather than a panel dataset, or Swiss consumers respond differently to a capital injection than Dutch consumers. To formally test which explanation holds, we run a cross-sectional regression that is similar to the one used by Brown et al. (2017). We do this for each intervention and banking product separately:

$$Switch_{i,} = \alpha + \beta_1 Bailed\ out_i + \gamma C_{i+} + \varepsilon_i \quad (3.3)$$

Vector C includes observable consumer characteristics: gender, education, age dummies, income dummies, responsible for household finances, degree of urbanisation, risk aversion and the value of the most important savings account as a proxy for wealth (see Appendix C.3 for definitions and summary statistics).

β_1 shows whether customers of the bailed-out bank are more likely to switch away in 2008 than customers of the control bank. Appendix D.3 presents the results. Without taking systematic differences across customers of different banks into account, we find that

Table 3.3. Regression results: Aggregate effect on switching away from the intervened bank

	Fortis/ABN Amro		ING	
	Savings account	Current account	Savings account	Current account
D05	-0.004	-0.026*	-0.091	-0.056
	(0.03)	(0.02)	(0.25)	(0.19)
D06	0.002	-0.038	0.163	-0.176
	(0.06)	(0.03)	(0.26)	(0.49)
D07	0.012	-0.039	0.022	-0.139
	(0.06)	(0.03)	(0.34)	(0.39)
D08	0.103	0.091*	0.011	0.277
	(0.07)	(0.06)	(0.21)	(0.60)
Bailed-out*D08	-0.048	0.041	0.169	-0.103
	(0.09)	(0.05)	(0.35)	(0.48)
Return on assets	0.146	0.027	-8.148	1.208
	(0.18)	(0.11)	(8.04)	(2.24)
ln(total assets)	0.030	-0.054	0.469	-0.584
	(0.14)	(0.11)	(0.68)	(1.53)
Interest rate	-0.038	-0.162	-0.117	-0.913
	(0.13)	(0.10)	(0.92)	(2.44)
Observations	1,781	3,328	1,226	2,309
Within R-squared	0.044	0.092	0.093	0.051
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

This table shows fixed effects regression results. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. The specifications include bank and customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

customers of bailed-out bank are 7 percentage points more likely to switch away with their current account after a nationalisation than customers of the control bank. In addition, savings account holders are also more likely to switch away after a capital injection. Hence, using a cross-sectional setup, half of our findings are in line with those of Brown et al. (2017). We do not find an effect of the bail-out for savings account holders after the nationalisation, nor for current account holders after a capital injection. As a result we

conclude that the differences between our main results and those of Brown et al. (2017) partially stem from differences in methodology and partly from differences in behaviour of Swiss and Dutch customers.

One potential explanation for differences in behaviour lies in the banking market structure of both countries. Where the Netherlands has a concentrated market with a limited number of players (DNB, 2015), the Swiss market is served by many banks: two globally systemically important banks, 25 state-owned banks and 332 regional savings banks (Brown et al., 2017). Since consumers are less likely to switch in concentrated banking markets (Brunetti et al., 2016a) this may explain why we do not find significant results in all specifications.

3.6 Exploring heterogeneity across bank customers

Even though we do not find an aggregate change in switching behaviour after the bail-outs, some customers might be more inclined to respond to interventions than others. We investigate whether responses depend on consumers' level of trust in the government and risk aversion. We expect that customers with little or no trust in the government are more likely to leave a nationalised bank than customers who trust the government. We only expect trust in the government to affect switching after a nationalisation as the government does not become the new owner of the bank after a capital injection. Concerning the second type of heterogeneity, if customers are well-informed about risks an intervention should especially prevent the outflow of risk averse customers because of the lower default risk.

3.6.1 Methodology

To measure trust in the government, we use data of trust surveys held among the same panel. Respondents indicate their trust in national politics and civil service, ranging from 1 (a lot of trust) to 4 (no trust at all). We first compute the average trust in national politics and civil service. Based on this, we construct a dummy variable, *Lack of trust*, which has value 1 if the average level of trust is equal to or greater than 3 and zero otherwise. A potential concern is that our trust variable picks up generalised trust rather than trust in the government specifically. To address this concern, we include a dummy variable

Generalised trust, which has value 1 if one believes that other people are trustworthy and zero otherwise (see e.g. Guiso et al., 2008). As the data is available from 2006 onwards, we limit the sample period to 2006-2008.[64] Since we now only use three years of observations, we have fewer observations per customer. Consequently we first run a simple OLS regression without customer fixed effects per banking product:

$$Switch_{i,t} = \beta_1 D07_t + \beta_2 D08_t + \beta_3 Bailed\text{-}out_{i,t} + \beta_4 Lack\ of\ trust_{i,t} + \beta_5 Bailed\text{-}out_{i,t}*D08_t + \beta_6 Lack\ of\ trust_{i,t}*D08_t + \beta_7 Lack\ of\ trust_{i,t}*Bailed\text{-}out_{i,t} + \beta_8\ Bailed\text{-}out_{i,t}*Lack\ of\ trust_{i,t}\ *D08_t + \beta_9\ Generalised\ trust_{i,t} + \beta_{10} B_{i,t-1} + \alpha_b + \varepsilon_{i,t} \quad (3.4)$$

Hereafter we run a specification including customer fixed effects to control for unobserved time invariant customer characteristics:

$$Switch_{i,t} = \beta_1 D07_t + \beta_2 D08_t + \beta_3 Bailed\text{-}out_{i,t} + \beta_4 Lack\ of\ trust_{i,t} + \beta_5 Bailed\text{-}out_{i,t}*D08_t + \beta_6 Lack\ of\ trust_{i,t}*D08_t + \beta_7 Lack\ of\ trust_{i,t}*Bailed\text{-}out_{i,t} + \beta_8\ Bailed\text{-}out_{i,t}*Lack\ of\ trust_{i,t}\ *D08_t + \beta_9\ Generalised\ trust_{i,t} + \beta_{10} B_{i,t-1} + \alpha_i + \alpha_b + \varepsilon_{i,t} \quad (3.5)$$

The notation is similar as before and in both cases interest goes to the triple interaction term, β_8. It shows whether customer with and without trust in the government respond differently to the bail-out relative to customers of the control bank. We cluster the standard errors on the customer level.

To measure a consumer's level of risk aversion we focus on direct statements on investment strategies. Respondents indicate to what extent they agree with the following statements ranging from 1(complete disagreement) to 7 (complete agreement): 1) *'I think it is more important to have safe investments and guaranteed returns, than to take a risk to have a chance to get the highest possible returns.'*, 2) *'I do not invest in shares, because I find this too risky.'*, 3) *'If I think an investment will be profitable, I am prepared to borrow money to make this investment.'*, 4) *'I want to be certain that my investments are safe.'*, 5) *'If I want to*

[64] Appendix E.3 shows the estimation results for the aggregate effect using this shorter sample period. Again, we find insignificant effects for switching after a nationalisation with both banking products, and switching after a capital injection with the current account. In contrast, we now report a positive effect of switching after a capital injection with the current account.

improve my financial position, I should take financial risks.', and 6) *'I am prepared to take the risk to lose money, when there is also a chance to gain money.'*. We recode the statements such that a higher value implies a higher value of risk aversion. As in Kapteyn and Teppa (2011) we apply a factor analysis to determine the factor. Based on this we construct the dummy variable *Risk aversion* which is equal to one if one is above the median and zero otherwise. This variable is available for the entire sample period, 2004-2008.

We run the following regression per banking product to examine the role of risk aversion:

$$Switch_{i,t} = \beta_1 D05_t + \beta_2 D06_t + \beta_3 D07_t + \beta_4 D08_t + \beta_5 Bailed\text{-}out_{i,t} + \beta_6 Risk\ aversion_{i,t} + \beta_7 Bailed\text{-}out_{i,t} * D08_t + \beta_8 Risk\ aversion_{i,t} * D08_t + \beta_9 Risk\ aversion_{i,t} * Bailed\text{-}out_{i,t} + \beta_{10} Bailed\text{-}out_{i,t} * Risk\ aversion_{i,t} * D08_t + \beta_{11} B_{i,t-1} + \alpha_i + \alpha_b + \varepsilon_{i,t} \quad (3.6)$$

We include the same bank control variables as in the previous specifications and the standard errors are clustered at the customer level.[65]

We are especially interested in the coefficient of the triple interaction term, β_{10}. It shows whether risk averse and non-risk averse customers respond differently to the bail-out relative to customers of the control bank.

3.6.2 Results

We find that, compared to customers who trust the government, customers with lower levels of trust in the government are more likely to switch away after a nationalisation, relative to customers of the control bank (Table 3.4, column 1-4). Both in the specifications of the savings account and the specifications of the current account, we find a positive and significant triple interaction term. These findings are robust to including customer fixed effects. As the coefficients range between 0.13 and 0.24 these effects are also economically relevant. Since we use a linear probability model these numbers indicate that customers with lower levels of trust in the government are 13-24 percentage point more likely to

[65] One might be concerned that wealth correlates with both risk aversion and switching and hence excluding it from the analysis would lead to an omitted variable bias. We find a small and insignificant correlation between the value of the largest savings account and risk aversion and hence we are confident that there is no omitted variable bias.

switch after the bail-out than customers who trust the government, relative to customers at the control bank. These findings have important implications for designing government interventions. Although the goal of an intervention is to secure trust and stability in the sector, the opposite will occur when a large proportion of consumers do not trust the government. Furthermore, the savings account results show that customers who trust other people are less likely to switch away than others.

Continuing with the capital injection of ING, we do not find differences in switching behaviour between customers with high and low levels of trust in the government, irrespective of the banking product. This is line with our expectations, as the government does not become the owner of the bank after a capital injection.

Table 3.5 column 2 shows that, compared to others, risk averse customers are 19 percentage points more likely to switch away after a nationalisation with their current account than non-risk averse customers, relative to the behaviour of customers of the control bank. This finding is in contrast with our expectation and might be driven by increased awareness of financial troubles at the bank due to media attention. In all other specifications, we do not find differences in responses for risk averse versus non-risk averse consumers.

These findings not only show the roles of lack of trust in the government and the level of risk aversion, they also indicate that consumers respond differently to a nationalisation and a capital injection. Namely, while there is heterogeneity in customer responses after a nationalisation, this is not the case for a capital injection. Besides, our findings show that consumer responses depend on the banking product in question.

3.7 Additional tests

3.7.1 Timing

So far we focused on customer responses to the troubles and interventions after the bail-outs took place. As the financial crisis started in 2007, some customers might have responded to the troubles before the government stepped in. To test this, we add

Table 3.4. Exploring heterogeneity: The role of lack of trust in the government

	Fortis/ABN Amro				ING			
	1	2	3	4	5	6	7	8
	Savings account	Savings account	Current account	Current account	Savings account	Savings account	Current account	Current account
D07	4.404	1.148	5.468	5.213	-0.035	-0.127	-0.010	0.011
	(3.52)	(3.21)	(4.15)	(3.67)	(0.03)	(0.14)	(0.01)	(0.01)
D08	19.465	5.264	22.764	21.803	0.316	-0.317	-0.104	0.158***
	(15.17)	(13.78)	(17.08)	(15.21)	(0.78)	(0.41)	(0.45)	(0.05)
Lack of trust	0.001	0.003	-0.006	0.032**	0.006	0.016	-0.008	0.030*
	(0.02)	(0.03)	(0.01)	(0.02)	(0.02)	(0.03)	(0.01)	(0.02)
Bailed-out*D08	2.895	0.447	3.462	3.227	-0.274	0.094	0.253	-0.001
	(2.55)	(2.34)	(2.71)	(2.36)	(0.66)	(0.15)	(0.38)	(0.16)
Lack of trust*D08	-0.023	0.011	-0.049*	-0.073**	-0.024	0.006	-0.048	-0.073**
	(0.06)	(0.06)	(0.03)	(0.04)	(0.06)	(0.07)	(0.03)	(0.04)
Lack of trust*Bailed-out	-0.078*	-0.125	0.020	-0.068**	0.067	0.059	-0.015	-0.093
	(0.04)	(0.08)	(0.01)	(0.03)	(0.13)	(0.14)	(0.07)	(0.10)
Lack of trust*Bailed-out*D08	0.173*	0.182*	0.131**	0.241***	0.185	-0.014	-0.207	-0.148
	(0.10)	(0.11)	(0.05)	(0.07)	(0.26)	(0.28)	(0.13)	(0.12)
Generalized trust	-0.049**	-0.062*	0.006	-0.004	-0.029	-0.037	0.001	-0.009
	(0.02)	(0.03)	(0.01)	(0.02)	(0.03)	(0.04)	(0.01)	(0.02)
Observations	914	914	1,666	1,666	631	631	1,174	1,174
(Within) R-squared	0.042	0.112	0.055	0.150	0.048	0.088	0.068	0.107
Customer FE	NO	YES	NO	YES	NO	YES	NO	YES
Bank FE	YES	YES	YES	YES	YES	YES	YES	NO
Bank controls	YES	YES	YES	YES	YES	NO	YES	NO

This table shows regression results of equation 3.4 and 3.5. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2008. *D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Lack of trust* is a binary dummy capturing whether the customer has low trust in the government. *Generalised trust* is a dummy with value 1 if one believes that other people are trustworthy in general. The first four columns show the results for the nationalisation and the last four columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. The specifications include bank controls except column 6 and 8 to avoid multicollinearity. Return on assets and ln(total assets) are dropped in column 5 and 7. Bank dummies are included to capture bank fixed effects (FE). One additional bank dummy is dropped in column 4 to avoid multicollinearity. The even columns include also customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.5. Exploring heterogeneity: The role of risk aversion

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	0.005	-0.020	-0.130	0.040
	(0.03)	(0.01)	(0.30)	(0.18)
D06	0.021	-0.035	0.054	-0.007
	(0.06)	(0.03)	(0.30)	(0.48)
D07	0.026	-0.040	-0.063	0.028
	(0.07)	(0.03)	(0.41)	(0.37)
D08	0.100	0.109	0.061	0.252
	(0.08)	(0.07)	(0.22)	(0.63)
Risk aversion	-0.002	0.020**	0.010	0.021**
	(0.02)	(0.01)	(0.02)	(0.01)
Bailed-out*D08	-0.137	-0.052	0.117	0.057
	(0.15)	(0.07)	(0.47)	(0.48)
Risk aversion*D08	-0.052	-0.050*	0.000	-0.047*
	(0.06)	(0.03)	(0.06)	(0.03)
Risk aversion*Bailed-out	0.041	-0.021	0.088	0.070
	(0.04)	(0.02)	(0.16)	(0.07)
Risk aversion*Bailed-out*D08	0.169	0.194***	-0.165	0.046
	(0.11)	(0.06)	(0.29)	(0.13)
Observations	1,595	2,800	1,106	1,935
Within R-squared	0.059	0.128	0.087	0.068
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES
Bank controls	YES	YES	YES	YES

This table shows regression results of equation 3.6. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Risk aversion* is a dummy variable with value 1 if one is risk averse and zero otherwise. The first two columns show the results for the nationalisation and the last two columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. The specifications include bank fixed effects (FE), customer fixed effects (FE) and bank controls. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

interaction terms with 2007 to equation 3.2, 3.5 and 3.6. Table 3.6, 3.7 and 3.8 present the results.

Starting with the aggregate effect, we find that customers of Fortis/ABN Amro were

more likely to switch away with their savings account than customers of Rabobank in 2007. This suggests that some customers left the bank before the bail-out took place. We do not find evidence that current account holders at Fortis/ABN Amro, nor customers at ING switched more than customers of the control bank before the bail-outs took place.

Examining trust in the government, we document that customers with low levels of trust were more likely to switch away with their current account from ING than customers from Rabobank. We do not find evidence that trust in the government affected switching behaviour of customers of the nationalised bank before the intervention took place. Again we find that trust in the government does play an important role for switching with the current account after the nationalisation.

Table 3.8 shows that risk aversion did not play a role in 2007 as all triple interaction terms are not significant. Besides, it is confirmed that risk averse current account holders are more likely to switch away after a nationalisation.

Currently we examine switching immediately after the intervention. If consumers panic, they will respond rapidly. But they may also change behaviour more slowly. In an additional test, we prolong the sample period with one year. We extend the net effect specifications with a year dummy for 2009 and an interaction term of the bailed-out dummy and the 2009 dummy. We exclude respondents who switched to the bank in question after the intervention: customers who had an account on 1 January 2009 at the bailed-out bank or control bank, but not on 1 January 2008. Studying the responses to the nationalisation, we again find an insignificant interaction term for 2008 for the savings account (see Table 3.9). The interaction term with the 2009 dummy is positive and significant at the 10% level. Regarding the current account, we now find a positive and significant interaction term for 2008 (significant at the 10% level). Based on this, we conclude that if anything, consumers are more likely to switch away after a nationalisation. We do not find a net effect for 2008 nor 2009 on switching after the capital injection of ING.

Table 3.10 presents the findings of the roles of lack of trust in the government and risk aversion for the extended sample period. The triple interaction of lack of trust in the government, the bail-out indicator and the 2008 dummy remain significant for the current account specification of the nationalisation. This indicates again that customers with less trust in the government are more likely to switch away after a nationalisation relative to

Table 3.6. Aggregate effect on switching away from the intervened bank – early responses

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	0.032	-0.023	-0.050	0.022
	(0.03)	(0.02)	(0.14)	(0.06)
D06	0.081	-0.032	0.190*	0.024
	(0.07)	(0.03)	(0.11)	(0.08)
D07	0.081	-0.034	0.073	0.024
	(0.07)	(0.03)	(0.14)	(0.12)
D08	0.155**	0.098*	0.039	0.079
	(0.07)	(0.05)	(0.28)	(0.12)
Bailed-out*D07	0.072*	0.007	0.013	0.021
	(0.04)	(0.01)	(0.11)	(0.06)
Bailed-out*D08	0.066	0.048	0.227	0.093
	(0.11)	(0.05)	(0.19)	(0.09)
Return on assets	0.023	0.020	-6.875	0.387
	(0.19)	(0.11)	(8.63)	(0.38)
ln(total assets)	-0.127	-0.073	0.355	-0.090
	(0.14)	(0.11)	(0.86)	(0.35)
Interest rate	0.031	-0.162		
	(0.13)	(0.10)		
Observations	1,781	3,328	1,226	2,309
Within R-squared	0.047	0.092	0.093	0.051
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

This table shows fixed effects regression results. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. The specifications include customer fixed effects (FE) and bank dummies to capture bank fixed effects (FE). The bank dummies are dropped in column 3 and 4 to avoid multicollinearity. The interest rate on household loans is also dropped in column 3 and 4 to avoid multicollinearity. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.7. Lack of trust in the government – early responses

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D07	-0.025	-0.016	0.019	-0.001
	(0.04)	(0.03)	(0.03)	(0.01)
D08	0.204	0.095*	0.112**	0.113***
	(0.23)	(0.05)	(0.05)	(0.03)
Lack of trust	-0.001	0.028	0.012	0.027
	(0.04)	(0.02)	(0.04)	(0.02)
Lack of trust*Bailed-out	-0.132	-0.078*	-0.071	-0.230**
	(0.09)	(0.04)	(0.18)	(0.11)
Bailed-out*D07	0.011	0.012	0.033	-0.061
	(0.06)	(0.03)	(0.15)	(0.06)
Lack of trust*D07	0.008	0.006	0.008	0.005
	(0.05)	(0.02)	(0.05)	(0.02)
Lack of trust*Bailed-out*D07	0.011	0.017	0.228	0.223**
	(0.08)	(0.04)	(0.34)	(0.11)
Bailed-out*D08	-0.358*	-0.086	0.112	0.070
	(0.21)	(0.07)	(0.19)	(0.09)
Lack of trust*D08	0.016	-0.069*	0.011	-0.070*
	(0.07)	(0.04)	(0.07)	(0.04)
Lack of trust*Bailed-out*D08	0.189	0.252***	0.159	0.019
	(0.12)	(0.07)	(0.34)	(0.11)
Generalized trust	-0.062*	-0.004	-0.041	-0.008
	(0.03)	(0.02)	(0.04)	(0.02)
Observations	914	1,666	631	1,174
(Within) R-squared	0.112	0.151	0.091	0.115
Customer FE	YES	YES	YES	YES
Bank FE	NO	NO	YES	NO
Bank controls	YES	YES	NO	NO

This table shows fixed effects regression results. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2008. *D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Lack of trust* is a binary dummy capturing whether the customer has low trust in the government. *Generalised trust* is a dummy with value 1 if one believes that other people are trustworthy in general. The first two columns show the results for the nationalisation and the last two columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. The specifications include bank controls, although interest rate on household savings is dropped in column 2. All bank controls are omitted from column 3 and 4 to avoid multicollinearity. Bank dummies were included to capture bank fixed effects (FE). To avoid multicollinearity, bank dummies are dropped from column 1, 2 and 4. All specifications include customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.8. Risk aversion – early responses

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	0.037	-0.021	0.005	0.078
	(0.04)	(0.02)	(0.16)	(0.07)
D06	0.090	-0.035	0.144	0.083
	(0.07)	(0.03)	(0.12)	(0.09)
D07	0.123	-0.044	0.136	0.103
	(0.08)	(0.04)	(0.18)	(0.13)
D08	0.161**	0.108	0.151	0.171
	(0.08)	(0.07)	(0.33)	(0.13)
Risk aversion	0.019	0.018*	0.029	0.019**
	(0.02)	(0.01)	(0.02)	(0.01)
Risk aversion*Bailed-out	0.028	-0.014	0.096	0.100
	(0.05)	(0.02)	(0.17)	(0.08)
Bailed-out*D07	0.049	0.012	0.048	0.050
	(0.06)	(0.02)	(0.17)	(0.08)
Risk aversion*D07	-0.075**	0.007	-0.067*	0.005
	(0.04)	(0.01)	(0.03)	(0.01)
Risk aversion*Bailed-out*D07	0.038	-0.022	-0.000	-0.079
	(0.07)	(0.02)	(0.16)	(0.09)
Bailed-out*D08	-0.042	-0.049	0.319	0.166
	(0.17)	(0.07)	(0.24)	(0.13)
Risk aversion*D08	-0.076	-0.047*	-0.024	-0.046*
	(0.06)	(0.03)	(0.06)	(0.03)
Risk aversion*Bailed-out*D08	0.182*	0.187***	-0.172	0.016
	(0.11)	(0.06)	(0.29)	(0.14)
Observations	1,595	2,800	1,106	1,935
Within R-squared	0.065	0.128	0.091	0.069
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES
Bank controls	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Risk aversion* is a dummy variable with value 1 if one is risk averse and zero otherwise. The first two columns show the results for the nationalisation and the last two columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. The specifications include customer fixed effects (FE) and bank dummies to capture bank fixed effects (FE). Bank controls are included although interest rate on household savings is dropped in column 3 and 4 to avoid multicollinearity. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.9. Aggregate effect on switching away from the intervened bank – including 2009

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	0.007	-0.018	-0.137	-0.036
	(0.02)	(0.02)	(0.24)	(0.18)
D06	0.026	-0.022	0.146	-0.116
	(0.05)	(0.03)	(0.26)	(0.48)
D07	0.034	-0.024	-0.035	-0.092
	(0.05)	(0.03)	(0.33)	(0.38)
D08	0.087	0.089***	-0.044	0.214
	(0.06)	(0.03)	(0.22)	(0.60)
D09	0.013	0.137*	0.624	0.549
	(0.12)	(0.07)	(0.71)	(1.94)
Bailedout*D08	0.007	0.050*	0.126	-0.057
	(0.05)	(0.03)	(0.34)	(0.48)
Bailedout*D09	0.166*	0.006	-2.511	-0.006
	(0.09)	(0.03)	(2.23)	(0.35)
Return on assets	0.013*	0.002	-9.868	0.889
	(0.01)	(0.01)	(7.66)	(2.22)
ln(total assets)	0.051	-0.060	0.616	-0.432
	(0.13)	(0.05)	(0.69)	(1.52)
Interest rate	0.028	-0.125	-0.221	-0.636
	(0.13)	(0.09)	(0.86)	(2.40)
Observations	2,099	3,914	1,487	2,854
Within R-squared	0.043	0.074	0.073	0.041
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2009. *D05, D06, D07*, *D08* and *D09* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. We exclude respondents who had an account at the intervened bank in question or Rabobank at 01-01-2009 but not at 01-01-2008. The specifications include bank and customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.10. Lack of trust in the government and risk aversion – including 2009

	Fortis/ABN Amro				ING			
	1	2	3	4	5	6	7	8
	Savings	Current	Savings	Current	Savings	Current	Savings	Current
Bailed-out*D08	0.051	-0.029	-0.030	-0.038	0.101	0.009	0.066	0.038
	(0.13)	(0.06)	(0.07)	(0.03)	(0.15)	(0.15)	(0.45)	(0.48)
Bailed-out*D09	-2.488	-0.679	0.187	0.016	-3.580	-0.416	-2.429	0.223
	(1.80)	(0.64)	(0.12)	(0.05)	(3.69)	(0.36)	(2.60)	(0.34)
Lack of trust*Bailed-out	-0.088	-0.051*			0.105	-0.031		
	(0.07)	(0.03)			(0.14)	(0.08)		
Lack of trust*D08	0.035	-0.066**			0.015	-0.065**		
	(0.06)	(0.03)			(0.06)	(0.03)		
Lack of trust*Bailed-out*D08	0.158	0.209***			-0.047	-0.150		
	(0.10)	(0.06)			(0.28)	(0.12)		
Lack of trust*D09	-0.008	-0.004			-0.048	-0.003		
	(0.06)	(0.02)			(0.06)	(0.02)		
Lack of trust*Bailed-out*D09	0.044	0.062			-0.001	-0.076		
	(0.10)	(0.05)			(0.23)	(0.09)		
Risk aversion*Bailed-out			0.018	-0.019			0.086	0.068
			(0.04)	(0.02)			(0.16)	(0.06)
Risk aversion*D08			-0.049	-0.043*			-0.009	-0.043*
			(0.05)	(0.02)			(0.05)	(0.02)
Risk aversion*Bailed-out*D08			0.086	0.168***			-0.145	0.020
			(0.10)	(0.05)			(0.27)	(0.12)
Risk aversion*D09			-0.079	-0.022			-0.068	-0.033*
			(0.05)	(0.02)			(0.06)	(0.02)
Risk aversion*Bailed-out*D09			-0.012	0.016			-0.046	0.011
			(0.10)	(0.04)			(0.23)	(0.05)
Observations	1,175	2,148	1,894	3,315	839	1,609	1,348	2,406
Within R-squared	0.079	0.103	0.053	0.097	0.070	0.102	0.068	0.058
Customer FE	YES	YES	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES
Bank controls	YES	YES	YES	YES	YES	NO	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to the bank in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2009 in the trust specification and 2004-2009 in the risk aversion specifications. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Lack of trust* and *Risk* aversion are binary variables capturing whether the customer has respectively low trust in the government and a high level of risk aversion. *Generalised trust* is a dummy capturing whether one believes that other people are trustworthy in general and is included in the trust specifications. The first four columns show the results for the nationalisation and the last four columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. We exclude respondents who had an account at the intervened bank in question or Rabobank at 01-01-2009 but not at 01-01-2008. Bank controls are included, although ln(total assets) and the interest rate on household savings are dropped in column 5 to avoid multicollinearity. All bank controls are dropped in column 6 to avoid multicollinearity. All specifications include customer fixed effects (FE) and bank dummies to capture bank fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

customers of the control bank. The marginal effect has a similar magnitude as in our baseline analysis. We do not find a role for trust in the government for 2009. Neither in case of a nationalisation, nor in case of a capital injection, irrespective of the banking product in question.

The positive effect of risk aversion on switching with the current account after a nationalisation is confirmed. The triple interaction is with a magnitude of 17 percentage points also economically relevant. Risk aversion has an immediate effect as we only find differences in switching behaviour across individuals with different levels of risk aversion in 2008. Looking at consumer responses to a capital injection, we again do not find an effect of risk aversion or lack of trust in the government in 2008, nor do we find an effect in 2009.

3.7.2 Switching to intervened banks

So far we have focused on one way of switching: switching *away* by existing customers. In an additional test we investigate switching *to* bailed-out banks. The regression equation is similar to equation 3.2 except that we include lagged bank control variables of the bank the customer is with at the end of the year. Besides, the sample is different. Now we focus on customers of the bailed-out and the control bank at the end of the year. The bailed-out indicator is equal to one if one is customer of an intervened bank at year end. Hence, β_6 captures whether respondents are more likely to switch to an intervened bank than to the control bank, relative to the period before. In none of the specifications do we find a significant net effect (see Table 3.11). Second, we do not find an effect of risk aversion or lack of trust in the government (see Table 3.12). Consequently we conclude that the interventions do not trigger switches towards the intervened bank.

3.7.3 Bank-customer relationship

We know from the literature that the bank-customer relationship is important for potential switching behaviour. For example, Brown et al. (2017) find that withdrawal risk is halved when the customer has a mortgage loan at the same bank and is even completely eliminated when a customer had all banking products at the same bank before the crisis. Similarly, Van der Cruijsen and Diepstraten (2017) and Brunetti et al. (2016) document that households with multiple bank relationships are more likely to switch. It might be the case that one

Table 3.11. Aggregate effect on switching *to* the intervened bank

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	-0.004	0.002	0.225	0.025
	(0.03)	(0.01)	(0.29)	(0.08)
D06	-0.006	-0.002	0.019	0.041
	(0.05)	(0.02)	(0.20)	(0.09)
D07	0.029	-0.003	0.220	0.058
	(0.06)	(0.02)	(0.39)	(0.13)
D08	-0.005	-0.002	0.358	0.049
	(0.06)	(0.02)	(0.56)	(0.14)
Bailed-out*D08	0.075	0.021	0.175	0.079
	(0.09)	(0.02)	(0.15)	(0.08)
Return on assets	-0.087	0.040	7.705	-0.045
	(0.17)	(0.04)	(8.26)	(0.33)
ln(total assets)	-0.152	-0.037	-1.704	-0.210
	(0.15)	(0.06)	(2.09)	(0.58)
Interest rate	1.286	2.536	32.376	1.234
	(3.96)	(1.63)	(39.22)	(13.26)
Observations	1,777	3,320	1,258	2,456
Within R-squared	0.014	0.037	0.034	0.102
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to the bank in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the end of the year. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. The specifications include bank and customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

bank has more loyal customers than another bank, which drives the results we find.

Therefore, we run a robustness test including the variable *single bank*. This is a dummy variable with value 1 if the respondent has his main mortgage loan, savings account and current account at the same bank and zero otherwise. Table 3.13, 3.14 and 3.15 show that our main findings are not driven by switching costs. Furthermore, if anything, we

Table 3.12. Lack of trust in the government and risk aversion - switching *to* intervened banks

	Fortis/ABN Amro				ING			
	1	2	3	4	5	6	7	8
	Savings account	Current account	Savings account	Current account	Savings account	Current account	Savings account	Current account
Lack of trust	0.010	0.007			0.006	-0.008		
	(0.03)	(0.01)			(0.03)	(0.01)		
Risk aversion			-0.023	0.020			-0.023	0.001
			(0.02)	(0.02)			(0.02)	(0.01)
Bailed-out*D08	-0.325*	0.133	0.039	0.040	0.013	0.148	0.188	-0.032
	(0.17)	(0.10)	(0.14)	(0.04)	(0.08)	(0.11)	(0.20)	(0.03)
Lack of trust*D08	-0.049	0.003			-0.057*	-0.006		
	(0.04)	(0.02)			(0.03)	(0.02)		
Lack of trust*Bailed-out	-0.037	-0.021			0.043	0.006		
	(0.07)	(0.03)			(0.14)	(0.08)		
Lack of trust*Bailed-out*D08	0.006	-0.008			0.208	-0.116		
	(0.09)	(0.04)			(0.18)	(0.09)		
Generalized trust	-0.042	-0.002			-0.036	0.002		
	(0.03)	(0.01)			(0.03)	(0.00)		
Risk aversion*D08			-0.030	0.040			-0.052	0.010
			(0.04)	(0.02)			(0.04)	(0.02)
Risk aversion*Bailed-out			0.036	-0.035			0.233*	0.006
			(0.05)	(0.03)			(0.12)	(0.03)
Risk aversion*Bailed-out*D08			0.039	-0.068			-0.329	0.181
			(0.10)	(0.05)			(0.27)	(0.11)
Observations	897	1,666	1,590	1,790	647	1,302	1,136	1,298
Within R-squared	0.038	0.077	0.017	0.127	0.108	0.193	0.065	0.226
Customer FE	YES	YES	YES	YES	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES	YES	YES	YES	YES
Bank controls	YES	YES	YES	YES	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to the bank in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2008 in the trust specification and 2004-2008 in the risk aversion specifications. *Lack of trust* and *Risk* aversion are binary variables capturing whether the customer has respectively low trust in the government and a high level of risk aversion. *Generalised trust* is a dummy capturing whether one believes that other people are trustworthy in general. The first four columns show the results for the nationalisation and the last four columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. Bank controls are included, although ln(total assets) and the interest rate on household savings are dropped in column 5 and 6 to avoid multicollinearity. All specifications include year fixed effects, customer fixed effects (FE) and bank dummies to capture bank fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.13. Aggregate effect on switching away from the intervened bank – the bank-customer relationship

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	-0.001	-0.026*	-0.153	-0.056
	(0.03)	(0.01)	(0.26)	(0.19)
D06	0.007	-0.038	0.127	-0.179
	(0.06)	(0.03)	(0.27)	(0.50)
D07	0.023	-0.040	-0.050	-0.140
	(0.06)	(0.03)	(0.35)	(0.39)
D08	0.107*	0.091*	-0.034	0.282
	(0.06)	(0.06)	(0.21)	(0.60)
Bailed-out*D08	-0.006	0.041	0.119	-0.110
	(0.09)	(0.05)	(0.37)	(0.49)
Return on assets	0.078	0.028	-10.355	1.219
	(0.18)	(0.11)	(8.25)	(2.26)
ln(total assets)	0.002	-0.054	0.641	-0.597
	(0.13)	(0.11)	(0.70)	(1.54)
Interest rate	-0.038	-0.163	-0.296	-0.928
	(0.13)	(0.10)	(0.95)	(2.46)
Single bank	-0.145***	-0.007	-0.110*	-0.036
	(0.05)	(0.02)	(0.07)	(0.03)
Observations	1,781	3,328	1,226	2,309
Within R-squared	0.070	0.092	0.109	0.055
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Single bank* is a dummy variable with value 1 if the respondent has his main mortgage loan, savings account and current account at the same bank and zero otherwise. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. The specifications include bank and customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.14. Lack of trust in the government – the bank-customer relationship

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D07	0.782	5.469	-0.147	0.011
	(3.17)	(3.64)	(0.16)	(0.01)
D08	3.656	22.846	-0.384	0.159***
	(13.58)	(15.06)	(0.45)	(0.05)
Lack of trust	-0.004	0.031*	0.010	0.029*
	(0.03)	(0.02)	(0.03)	(0.02)
Bailed-out*D08	0.231	3.399	0.115	-0.005
	(2.31)	(2.33)	(0.15)	(0.16)
Lack of trust*D08	0.009	-0.073**	0.006	-0.073**
	(0.06)	(0.04)	(0.06)	(0.04)
Lack of trust*Bailed-out	-0.128	-0.063*	0.045	-0.090
	(0.08)	(0.03)	(0.14)	(0.10)
Lack of trust*Bailed-out*D08	0.189*	0.241***	0.001	-0.149
	(0.10)	(0.07)	(0.30)	(0.12)
Generalized trust	-0.055	-0.003	-0.035	-0.008
	(0.03)	(0.02)	(0.04)	(0.02)
Single bank	-0.193**	-0.042	-0.125	-0.045
	(0.08)	(0.05)	(0.11)	(0.06)
Observations	914	1,666	631	1,174
Within R-squared	0.154	0.154	0.105	0.111
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	NO
Bank controls	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2008. *D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Lack of trust* is a binary dummy capturing whether the customer has low trust in the government. *Generalised trust* is a dummy with value 1 if one believes that other people are trustworthy in general. *Single bank* is a dummy variable with value 1 if the respondent has his main mortgage loan, savings account and current account at the same bank and zero otherwise. The first two columns show the results for the nationalisation and the last two columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. The specifications include bank controls although ln(total assets) and interest rate on household savings are dropped in column 3 and 4 to avoid multicollinearity. Bank dummies are included to capture bank fixed effects (FE). One additional bank dummy is dropped in column 2 to avoid multicollinearity. All specifications include customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table 3.15. Risk-aversion – the bank-customer relationship

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	0.012	-0.021	-0.200	0.041
	(0.03)	(0.01)	(0.32)	(0.18)
D06	0.032	-0.036	0.006	-0.009
	(0.06)	(0.03)	(0.32)	(0.49)
D07	0.048	-0.041	-0.145	0.029
	(0.07)	(0.03)	(0.43)	(0.37)
D08	0.118	0.109	0.030	0.261
	(0.07)	(0.07)	(0.22)	(0.64)
Risk aversion	-0.010	0.020**	0.003	0.020**
	(0.02)	(0.01)	(0.02)	(0.01)
Bailed-out*D08	-0.084	-0.052	0.051	0.051
	(0.15)	(0.07)	(0.49)	(0.49)
Risk aversion*D08	-0.045	-0.049*	0.007	-0.046*
	(0.06)	(0.03)	(0.05)	(0.03)
Risk aversion*Bailed-out	0.045	-0.021	0.090	0.066
	(0.04)	(0.02)	(0.16)	(0.07)
Risk aversion*Bailed-out*D08	0.161	0.194***	-0.153	0.047
	(0.11)	(0.06)	(0.29)	(0.13)
Single bank	-0.152***	-0.016	-0.131*	-0.037
	(0.06)	(0.03)	(0.07)	(0.03)
Observations	1,595	2,800	1,106	1,935
Within R-squared	0.086	0.129	0.108	0.072
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	YES
Bank controls	YES	YES	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. *Risk aversion* is a dummy variable with value 1 if one is risk averse and zero otherwise. *Single bank* is a dummy variable with value 1 if the respondent has his main mortgage loan, savings account and current account at the same bank and zero otherwise. The first two columns show the results for the nationalisation and the last two columns show the results for the capital injection. In all cases, the sample is restricted to customers of the intervened bank studied and Rabobank. The specifications include bank fixed effects (FE), customer fixed effects (FE) and bank controls. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

confirm that a strong bank-customer relationship reduces the probability that the customer will leave the bank.

3.7.4 Combining both bail-outs in one regression

As a last robustness test, we estimate the effects of the nationalisation and the capital injection in one regression in Appendix F.3. Table F.3.1 displays the aggregate effect on switching away from the intervened bank. That is, column 1 and 3 of Table 3.3 as well as column 2 and 4 of Table 3.3 are now combined in one regression.

We confirm that customers of the nationalised bank did not switch away more after the troubles and intervention than they did in previous years, compared to customers of the control bank. In addition, we again find that customers of the recapitalized bank were not more likely to switch away with their current account. In contrast, we now find that customers of the recapitalized bank were more likely to switch away with their savings account (significant at the 10% level).

Table F.3.2 shows the role played by trust in the government. Again we provide results without (column 1 and 3) and with (column 2 and 4) customer fixed effects. In all specifications we find positive and significant interaction terms regarding the nationalisation as before. Hence we find that customers with lower levels of trust in the government are more likely to switch away after a nationalisation, irrespective of the banking product. Besides, we confirm that trust in the government does not play a role with respect to a capital injection as all triple interaction terms are insignificant.

Table F.3.3 shows that the results of risk aversion are also robust to this alternative estimation strategy. Risk averse consumers are more likely to switch away after a nationalisation with their current account, but not with their savings account, nor after a capital injection.

3.8 Conclusion

The aim of this study is to investigate the effect of government interventions at banks on consumer switching behaviour. We focus in particular on the roles played by trust in the government and risk aversion. We hypothesize that consumers with low levels of trust in the government are more likely to switch away after a nationalisation, as the government

becomes the owner of the bank after this type of bail-out. As the government only injects money but does not get control in case of a capital injection, we do not expect any effects after this type of intervention. Second, we hypothesize that risk averse consumers are more likely to stay with the bank after an intervention given that default risk of the bank is reduced.

We are the first to exploit a panel dataset which allows us to employ a difference-in-difference analysis. This way we are able to control for systematic differences across customers of banks, which we show to be important. We distinguish between a nationalisation and a capital injection to gain insight in the importance of the scope of the intervention, which is novel in the switching literature. Moreover, we analyse switching with the savings and current account separately as prior research shows that both switching propensities and the main factors related to switching depend on the banking product (Van der Cruijsen and Diepstraten, 2017).

We find that the aggregate switching behaviour of consumers at intervened banks is similar before and after the troubles and intervention. This holds for both type of interventions and banking products. Second, we find heterogeneity in consumer responses to government interventions. Compared to consumers who trust the government, consumers with no or little trust in the government are more likely to switch away after a nationalisation (relative to the control bank). This holds for both the savings account and current account. In addition, we show that, compared to others, risk averse consumers are more likely to switch away with the current account after a nationalisation, relative to customers of the control bank. This indicates that a nationalisation can make consumers better aware of the financial problems the bank experienced, which overshadows the stabilising effect of the intervention.

These results yield important policy implications. Although the goal of a nationalisation is to secure trust and stability in the system, the opposite will occur when a large proportion of customers does not trust the government, or is risk averse and the nationalisation makes them more aware of the troubles at their bank.

Our results also imply that consumer responses depend on the type of intervention. This insight is important for the design of government interventions. While we do find heterogeneity in responses to a nationalisation, we find no differences in responses to a

capital injection. Moreover, the responses of risk averse customers depend on the banking product in question. There is no difference in switching with the savings account after a nationalisation for risk averse and non-risk averse customers, but there is a difference in switching with the current account for these two groups (relative to customers of the control bank).

Appendix

Appendix A.3 The need for government interventions

This appendix provides a short description of the problems of each bank that resulted in their need for government support in 2008. This description is based on research conducted by the Parliamentary Inquiry Committee Financial System (2012).

In 2007, a consortium of three banks – Royal Bank of Scotland, Fortis and Santander – acquired ABN AMRO. As the part taken over by Fortis was undercapitalized, it needed capitalization before it could be integrated with Fortis. However, because of the drying-up of the interbank market, Fortis had funding problems. At the same time, the operational performance of Fortis was under pressure due to worsening market conditions. Fortis entered a vicious circle leading to a drop in trust, which in turn resulted in withdrawals of institutional customers.[66] Taken all together, the combination of worsening market conditions and the integration process created the need for government support. After exploring other solutions, the government took over all Dutch Fortis parts on 3 October 2008. On 21 November 2008, the minister of Finance declared that Fortis Bank Nederland and the part of ABN Amro would be integrated into a single bank. The two banks merged in July 2010.

A few days after the nationalisation, the Dutch government announced it had earmarked EUR 20 billion for healthy and viable banks and insurance companies that were in trouble because of the financial crisis. ING was the first to make use of this offer and received 10 billion Euro on 19 October 2008 in Core Tier 1 securities. ING's problems arose at ING Direct USA, a consumer bank without physical offices. US regulation required ING to invest at least 65% of savings in consumer credit and ING achieved this by investing in mortgages and residential mortgage backed securities. The largest part of the mortgage bonds were Alt-A mortgage bonds, which are at the heart of the problems. After the US mortgage bubble burst, market analysts started to question ING's Alt-A portfolio, and even though the credit losses on the portfolio were limited, ING had to record losses for accounting reasons. Trust in the market for Alt-A products declined and after the collapse of

[66] Withdrawals were from institutional clients rather than from private individuals.

Lehman Brothers, people realized that banks are able to default. This led to a decrease of the market's trust in ING, causing a drop in ING's share price. ING also suffered losses on the investments made by the insurance arm of the bank. On October 19, the Dutch government agreed to buy core tier 1 securities worth 10 billion Euro. However, this capital injection did not solve the problems and as a result the minister of Finance and ING signed the Illiquid Back-Up Facility on 26 January 2009 to arrange the takeover of 80% of Alt-A portfolio by the government and from 30 January 2009 onwards ING participated in a guarantee.

For each of the aforementioned government interventions, the intervention was not a response to households switching their accounts. Hence there is no reverse causality. The problems at the banks were unrelated to the domestic retail banking operations.

Appendix B.3 Pre-intervention switching trends

Table B.3.1 Pre-intervention switching trends

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D05	0.009	-0.003	0.009	-0.004
	(0.02)	(0.01)	(0.02)	(0.01)
D06	0.054**	0.006	0.053**	0.005
	(0.02)	(0.01)	(0.02)	(0.01)
D07	0.004	-0.012**	0.004	-0.012**
	(0.01)	(0.01)	(0.02)	(0.01)
Bailed-out*D06	-0.048	-0.008	-0.027	0.022
	(0.03)	(0.01)	(0.09)	(0.06)
Bailed-out*D07	0.033	0.018	0.015	0.009
	(0.03)	(0.01)	(0.08)	(0.04)
Observations	1,432	2,653	989	1,838
Bank dummies	YES	YES	YES	YES
R-squared	0.012	0.007	0.030	0.024

This table shows the estimates of fixed effects models to test whether the pre-intervention switching trends of the treated and control bank were similar. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. *D05, D06* and *D07* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. The first two columns show the results for Fortis/ABN Amro and the last two columns show the results for ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. The specifications include bank fixed effects. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Appendix C.3 Description and summary statistics of variables

Table C.3.1 Description and summary statistics of all variables

Variable	Description	N	Mean	Sd	Min	Max
Switch dummies						
Switch savings account	Binary dummy (1 = switched savings account in this year, 0 = else).	1901[a]	0.088	0.283	0	1
Switch current account	Binary dummy (1 = switched current account in this year, 0 = else).	3526[b]	0.031	0.174	0	1
Bail out dummies						
Fortis/ABN Amro	Binary dummy (1 = savings or current account holder of Fortis/ABN Amro, 0 = Rabobank).	3617[c]	0.371	0.483	0	1
ING	Binary dummy (1 = savings or current account holder of ING, 0 = Rabobank).	2556[d]	0.099	0.298	0	1
Nationalisation	Binary dummy (1 = savings or current account holder of ABN Amro/Fortis, 0 = Rabobank and ING).	3,526[e]	0.345	0.475	0	1
Capital injection	Binary dummy (1 = savings or current account holder of ING, 0 = Rabobank and Fortis/ABN Amro).	3,526[e]	0.056	0.230	0	1
Year dummies						
D04	Binary dummy (1 = 2004, 0 = otherwise).	3850[f]	0.204	0.403	0	1
D05	Binary dummy (1 = 2005, 0 = otherwise).	3850[f]	0.189	0.391	0	1
D06	Binary dummy (1 = 2006, 0 = otherwise).	3850[f]	0.188	0.391	0	1
D07	Binary dummy (1 = 2007, 0 = otherwise).	3850[f]	0.217	0.412	0	1
D08	Binary dummy (1 = 2008, 0 = otherwise).	385[f]	0.203	0.402	0	1
Customer characteristics (1/2)						
Lack of trust	Binary dummy (1= low level of average trust in national politicis and civil service, 0 = otherwise).	1936[g]	0.537	0.499	0	1
Generalized trust	Binary dummy (1= other people are in general trustworthy, 0 = otherwise).	1936[g]	0.669	0.471	0	1
Risk aversion	Binary dummy (1 = above median value of risk aversion factor, 0 = otherwise).	3273[h]	0.498	0.500	0	1
Male	Binary dummy (1= male, 0 otherwise)	435[i]	0.614	0.487	0	1
Education: bachelor degree or higher	Binary dummy (1 = successful completion of higher vocational education and/or university education, 0 = otherwise).	435[i]	0.398	0.490	0	1
Age 35-44	Binary dummy (1= between 35 and 44, 0=otherwise).	435[i]	0.154	0.361	0	1
Age 45-54	Binary dummy (1= between 45 and 54, 0=otherwise).	435[i]	0.159	0.366	0	1
Age 55-64	Binary dummy (1= between 55 and 64, 0=otherwise).	435[i]	0.264	0.442	0	1
Age 65 plus	Binary dummy (1= 65 or older, 0=otherwise).	435[i]	0.278	0.449	0	1

Variable	Description	N	Mean	Sd	Min	Max
Income 10-20	Binary dummy (1=gross income in euros between 10,000 and 20,000, 0=otherwise).	435[i]	0.136	0.343	0	1
Income 20-30	Binary dummy (1=gross income in euros between 20,000 and 30,000, 0=otherwise).	435[i]	0.205	0.404	0	1
Income 30-40	Binary dummy (1=gross income in euros between 30,000 and 40,000, 0=otherwise).	435[i]	0.214	0.410	0	1
Income > 40	Binary dummy (1= gross income in euros 40,000 or more, 0=otherwise).	435[i]	0.326	0.469	0	1
Responsible for household finances	Binary dummy (1= responsible for household's financial affairs, 0=otherwise).	435[i]	0.828	0.378	0	1
Degree of urbanisation	Degree of urbanisation of respondent's residence based on the address density per km^2 (1 = 500 or less, 2 = 500-1000, 3 = 1000-1500, 4 = 1500-2500, 5 = more than 2500).	435[i]	2.931	1.299	1	5
Factor risk aversion	Factor of risk aversion based on the following statements: 1) 'I think it is more important to have safe investments and guaranteed returns, than to take a risk to have a chance to get the highest possible returns.', 2) 'I do not invest in shares, because I find this too risky.', 3) 'If I think an investment will be profitable, I am prepared to borrow money to make this investment.', 4) 'I want to be certain that my investments are safe.', 5) 'If I want to improve my financial position, I should take financial risks.', and 6) 'I am prepared to take the risk to lose money, when there is also a chance to gain money.'.	435[i]	-0.008	0.959	-2.906	1.612
Value savings account	Value of the savings account in euros.	435[i]	19793.490	32386.780	0	250000
Single bank	Binary dummy (1=main mortgage loan, current account and savings account at the same bank, 0=otherwise).	3850[f]	0.695	0.460	0	1
Bank level variables						
ln(total assets)	Value of the logarithm of total assets.	20[j]	19.982	0.672	18.552	20.753
Return on assets	Value of net income to total assets (*100%).	20[j]	0.126	0.132	0.061	0.666
Interest rate	Average interest rates on household loans in a year (*100%).	20[j]	2.641	0.294	2.103	3.081

This table reports the number of observations (N), mean, standard deviation (sd), minimum (min), and maximum (max) of the variables used in this study. [a] includes all observations used in the aggregate effects specification for the savings account (column 1 and 3 in Table 3.3). [b] includes all observations used in the aggregate effects specification for the current account (column 2 and 4 in Table 3.3). [c] includes all observations used in the aggregate effects specification for the nationalisation of Fortis/ABN Amro (column 1 and 2 in Table 3.3). [d] includes all observations used in the aggregate effects specification for the capital injection of ING (column 3 and 4 in Table 3.3).[e] includes all observations in the aggregate specification of the current account when estimating both bail-outs together (column 2 in Table F.3.1 in Appendix F.3).[f] includes all observations in the aggregate effects specifications (column 1, 2, 3 and 4 in Table 3.3). [g] includes all observations of the fixed effects heterogeneity specifications studying the effect of lack of trust in the government (column 2, 4, 6 and 8 in Table 3.4). [h] includes all observations of the heterogeneity specifications studying the effect of risk aversion (column 1, 2, 3 and 4 in Table 3.5). [i] includes the observations in the cross-sectional analyses (Table D.3.1 in Appendix D.3). [j] includes one observation per bank-year of the banks used in this study concerning the period 2004-2008.

Appendix D.3 Cross-sectional regression results

Table D.3.1 Cross-sectional regression results

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
Bailed-out	0.053	0.072**	0.274**	0.142
	(0.05)	(0.03)	(0.13)	(0.09)
Male	-0.033	0.053	-0.043	0.045
	(0.05)	(0.04)	(0.06)	(0.05)
Education: bachelor degree or higher	0.012	0.101**	0.007	0.074*
	(0.05)	(0.04)	(0.06)	(0.04)
Age: 35-44	-0.129*	-0.008	-0.145*	-0.066
	(0.07)	(0.05)	(0.09)	(0.06)
Age: 45-54	-0.051	0.053	-0.114	-0.055
	(0.08)	(0.06)	(0.09)	(0.07)
Age: 55-64	0.008	0.060	0.021	-0.011
	(0.08)	(0.06)	(0.10)	(0.07)
Age: 65 plus	0.001	0.027	-0.041	-0.033
	(0.08)	(0.06)	(0.09)	(0.07)
Income: 10-20	-0.010	-0.051	-0.000	-0.003
	(0.09)	(0.06)	(0.09)	(0.08)
Income: 20-30	0.027	0.032	0.083	0.009
	(0.09)	(0.07)	(0.11)	(0.08)
Income: 30-40	0.006	-0.063	0.096	0.001
	(0.09)	(0.06)	(0.11)	(0.08)
Income: > 40	0.039	-0.101	0.162	-0.089
	(0.09)	(0.07)	(0.11)	(0.08)
Responsible for household finances	0.056	-0.053	0.070	-0.027
	(0.06)	(0.05)	(0.07)	(0.05)
Degree of urbanisation	-0.005	-0.005	-0.011	-0.005
	(0.02)	(0.01)	(0.02)	(0.01)
Factor risk aversion	-0.009	0.030*	0.015	0.007
	(0.03)	(0.02)	(0.03)	(0.02)
Value savings account	-0.000	0.000	-0.000	0.000
	(0.00)	(0.00)	(0.00)	(0.00)
Constant	0.131	0.058	0.104	0.077
	(0.08)	(0.05)	(0.08)	(0.06)
Observations	298	358	199	243
R-squared	0.028	0.079	0.087	0.074

This table shows the estimates of cross-sectional regression analyses, including observations of 2008. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank. The header of each column denotes the banking product in question. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Appendix E.3 Aggregate effect using a shorter sample period

Table E.3.1 Aggregate effect

	Fortis/ABN Amro		ING	
	1	2	3	4
	Savings account	Current account	Savings account	Current account
D07	2.236	-0.172	-0.093	0.007
	(3.10)	(3.68)	(0.11)	(0.01)
D08	9.857	-0.441	-0.200	0.092**
	(13.33)	(15.20)	(0.32)	(0.04)
Bailed-out*D08	1.434	-0.121	0.261**	-0.003
	(2.25)	(2.38)	(0.12)	(0.12)
Observations	1,086	2,028	743	1,414
Within R-squared	0.069	0.115	0.130	0.073
Customer FE	YES	YES	YES	YES
Bank FE	YES	YES	YES	NO
Bank controls	YES	YES	YES	YES

This table shows the estimates fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2008. *D07* and *D08* are year dummies. The dummy *Bailed-out* denotes whether the customer is with the bailed-out bank at the beginning of the year. The first two columns show the results of the nationalisation of Fortis/ABN Amro, the last two columns show the results of the capital injection at ING. In all cases, the sample is restricted to customers of the intervened bank in question and Rabobank. The specifications include bank fixed effects (FE), customer fixed effects (FE) and bank controls although ln(total assets) and interest rate on household savings are omitted from column 3 and 4 to avoid multicollinearity. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Appendix F.3 Combining both bail-outs in one regression

Table F.3.1 Aggregate effect on switching away from the intervened bank

	1	2
	Savings account	Current acount
D05	0.014	-0.028*
	(0.03)	(0.02)
D06	0.034	-0.046*
	(0.06)	(0.03)
D07	0.051	-0.055*
	(0.07)	(0.03)
D08	0.139**	0.056
	(0.07)	(0.05)
Nationalisation*D08	-0.007	0.021
	(0.09)	(0.04)
Capital injection*D08	0.227*	0.003
	(0.13)	(0.06)
Return on assets	0.077	0.072
	(0.18)	(0.09)
ln(total assets)	-0.067	0.021
	(0.14)	(0.09)
Interest rate	-0.032	-0.122
	(0.13)	(0.09)
Observations	1,901	3,526
Within R-squared	0.054	0.084
Customer FE	YES	YES
Bank FE	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched to another bank in a given year. The header of each column denotes the banking product in question. *D05, D06, D07* and *D08* are year dummies. *Nationalisation* is a dummy with value 1 if the respondent was customer of Fortis/ABN Amro at the beginning of the year and zero otherwise. *Capital injection* is a dummy with value 1 is the respondent was customer of ING at the beginning of the year and zero otherwise. We consider the period 2004-2008. In all cases, the sample is restricted to customers of Fortis, ABN Amro, ING and Rabobank. The specifications include bank and customer fixed effects (FE). Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table F.3.2 Exploring heterogeneity: The role of lack of trust in the government

	1	2	3	4
	Savings account	Savings account	Current account	Current account
D07	-0.038	0.133	-0.051	0.067
	(0.16)	(0.13)	(0.09)	(0.07)
D08	0.335	0.917*	-0.090	0.503*
	(0.69)	(0.55)	(0.39)	(0.30)
Lack of trust	0.003	0.013	-0.006	0.034**
	(0.02)	(0.03)	(0.01)	(0.02)
Nationalisation*D08	-0.319	-0.285	-0.094	-0.093
	(0.22)	(0.21)	(0.13)	(0.07)
Capital injection*D08	-0.311	-0.371	0.169	-0.078
	(0.32)	(0.26)	(0.20)	(0.18)
Lack of trust*D08	-0.025	-0.004	-0.049*	-0.075**
	(0.06)	(0.06)	(0.03)	(0.04)
Lack of trust*Nationalisation	-0.081*	-0.130	0.019	-0.070**
	(0.04)	(0.08)	(0.01)	(0.03)
Lack of trust*Capital injection	0.067	-0.001	-0.015	-0.096
	(0.13)	(0.13)	(0.07)	(0.10)
Lack of trust*Nationalisation*D08	0.177*	0.184*	0.132**	0.243***
	(0.10)	(0.11)	(0.05)	(0.07)
Lack of trust*Capital injection*D08	0.177	0.049	-0.206	-0.145
	(0.26)	(0.28)	(0.13)	(0.12)
Generalized trust	-0.050**	-0.058*	0.007	0.006
	(0.02)	(0.03)	(0.01)	(0.02)
Return on assets	0.408	0.494	0.069	0.076
	(0.35)	(0.35)	(0.28)	(0.12)
ln(total assets)	0.236	-1.214	0.459	-0.674
	(1.73)	(1.42)	(0.97)	(0.78)
Interest rate	-0.610	-1.608	0.306	-0.760
	(1.22)	(1.00)	(0.72)	(0.52)
Observations	981	981	1,778	1,778
(Within) R-squared	0.049	0.099	0.065	0.172
Customer FE	NO	YES	NO	YES
Bank FE	YES	YES	YES	YES

This tables shows the results of fixed effects regressions. Column 1 and 3 show the results of a simple regression without customer fixed effects. The even columns include customer fixed effects (FE). The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2006-2008. *D07* and *D08* are year dummies. *Nationalisation* is a dummy with value 1 if the respondent was customer of Fortis/ABN Amro at the beginning of the year and zero otherwise. *Capital injection* is a dummy with value 1 is the respondent was customer of ING at the beginning of the year and zero otherwise. In all cases, the sample is restricted to customers of Fortis, ABN Amro, ING and Rabobank. *Lack of trust* is a binary dummy capturing whether the customer has low trust in the government. *Generalised trust* is a dummy with value 1 if one believes that other people are trustworthy in general. Bank dummies are included to capture bank fixed effects (FE). One additional bank dummy is dropped in the last specification to avoid multicollinearity. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Table F.3.3 Exploring heterogeneity: The role of risk aversion

	1	2
	Savings account	Current account
D05	0.010	-0.014
	(0.03)	(0.02)
D06	0.035	-0.034
	(0.06)	(0.03)
D07	0.043	-0.047
	(0.07)	(0.03)
D08	0.119	0.079
	(0.07)	(0.05)
Risk aversion	0.003	0.019**
	(0.02)	(0.01)
Nationalisation*D08	-0.113	-0.069
	(0.15)	(0.06)
Capital injection*D08	0.262	-0.016
	(0.19)	(0.08)
Risk aversion*D08	-0.057	-0.049*
	(0.06)	(0.03)
Risk aversion*Nationalisation	0.039	-0.021
	(0.05)	(0.02)
Risk aversion*Capital injection	0.071	0.046
	(0.15)	(0.06)
Risk aversion*Nationalisation*D08	0.169	0.197***
	(0.11)	(0.06)
Risk aversion*Capital injection*D08	-0.085	0.088
	(0.29)	(0.13)
Return on assets	0.111	0.050
	(0.22)	(0.10)
ln(total assets)	0.044	0.043
	(0.14)	(0.10)
Interest rate	0.052	-0.101
	(0.13)	(0.10)
Observations	1,703	2,974
Within R-squared	0.072	0.121
Customer FE	YES	YES
Bank FE	YES	YES

This table shows the results of fixed effects regressions. The dependent variable is *Switch,* which is a dummy variable indicating whether the customer switched banks in a given year. The header of each column denotes the banking product in question. We consider the period 2004-2008. *D05, D06, D07* and *D08* are year dummies. *Nationalisation* is a dummy with value 1 if the respondent was customer of Fortis/ABN Amro at the beginning of the year and zero otherwise. *Capital injection* is a dummy with value 1 is the respondent was customer of ING at the beginning of the year and zero otherwise. In all cases, the sample is restricted to customers of Fortis, ABN Amro, ING and Rabobank. The specifications include bank fixed effects (FE), customer fixed effects (FE) and bank controls. Robust standard errors clustered at the customer level are in parentheses. ***, **, * denote statistical significance at the 0.01, 0.05 and 0.10 level respectively.

Chapter 4

A penny saved is a penny earned: Determinants of savings behaviour

4.1 Introduction

Recent developments in government policies increase households' responsibilities with respect to their finances. Where Dutch households could borrow more than 100% of the housing value in the past, this loan-to-value ratio is reduced with 1 percentage point each year to 100% in 2018 (De Nederlandsche Bank, 2015c). In Finland, the maximum loan-to-value ratio has decreased to 90% in 2016 (Finanssivalvonta, 2017)[67], while in Sweden new collateralized loans are capped at 85% of the market value of the house since 2010 (Finansinspektionen, 2015). At the same time, the proportion of self-employed workers has increased in the UK, the Netherlands, France and Belgium (OECD, 2015) and European countries are switching from defined benefits pension schemes to defined contribution schemes (Allianz, 2013). All these adjustments increase the need of personal savings to finance upcoming needs.

However, at the same time Nibud (2017) concludes that 2.5 of the 7.7 million Dutch households do not have enough savings to cover unexpected expenses, 61% of the UK population aged between 35 and 44 is not confident that they save enough for their future (CEBR, 2016) and less than half of the European consumers is able to cover 3 months of regular spending (ING, 2013). Now that personal savings are becoming more important, it is important to understand differences in savings behaviour.[68]

[67] The maximum loan-to-value equals 95% for first-home purchases.
[68] The goal of this paper is to understand differences in savings behaviour across individuals and does not intend to say anything about optimal savings behaviour. This research is an empirical description of savings behaviour and its determinants.

There is a large literature on household financial decision making. Campbell (2006) compares positive and normative household finance and concludes that some households make serious investment mistakes, especially lower educated and poorer households.[69] Focusing on savings, Cronqvist and Siegel (2015) report that 35% of variation in savings rates across individuals is explained by genetic variation. Many others consider other variables to explain the remaining 65%. Empirically, we have learned that older people tend to have higher total savings (Lunt and Livingstone, 1991), are less likely to have consumer loans (Georgarakos et al., 2014), but have higher values of total debt (Webley and Nyhus, 2013). More educated individuals have higher values of net wealth (Lusardi and Mitchell, 2007), have more non-housing wealth (Lusardi and Mitchell, 2007), have more debt (Webley and Nyhus, 2001), save more (Bucciol and Veronesi, 2014; Webley and Nyhus, 2013; Webley and Nyhus, 2006; Nyhus and Webley, 2001) and are more likely to invest in stocks (Campbell, 2006; Hong et al., 2004).

Where some studies focus in particular on the aforementioned role of socio-economic characteristics, others focus on parental teaching (Shim et al., 2010), household administration skills (Lusardi and Mitchell, 2007), personality factors (Fisher and Montalto, 2010), social interactions (Brown et al., 2016; Georgarakos et al., 2014; Hong et al., 2014; Georgarakos et al., 2010; Duflo and Saez, 2003) or a combination of some dimensions (Brounen et al., 2016; Bucciol and Veronesi, 2014; Webley and Nyhus, 2006).[70] However, a broad study combining all these dimensions is lacking.

This study is the first to examine all five aforementioned dimensions simultaneously. Using the annual DNB household survey (2005-2011), I first investigate whether all these dimensions explored in the current literature capture different aspects. I create principal components per dimension to reduce the data and then investigate the correlations between the principal components. The results show that the principal components are weakly correlated. Consequently, focusing on some dimensions in the analysis and leaving the others out, as done in previous studies, does not introduce an omitted variable bias.

[69] See Campbell (2006) for an overview of work on participation and asset allocation, diversification, household mortgage decisions and retail financial markets.
[70] See Chapter 2 for an overview of the literature.

Hereafter, I study which of the dimensions are most important in explaining savings behaviour. The literature offers various savings measures. Some use a binary dummy capturing whether one saved in the past year (Bucciol and Veronesi, 2014), where others focus on the level of bank savings (Webley and Nyhus, 2006), the total level of savings (Webley and Nyhus, 2013), the amount saved within a year (Bucciol and Veronesi, 2014) or the willingness to save (Brounen et al., 2016). Consequently, I examine three measures of past savings behaviour (a binary dummy capturing whether one saved in the past 12 months, the amount saved in the past 12 months in EUR and accumulated life-time net wealth in EUR) as well as a forward-looking measure capturing whether one is planning to save in the next 12 months.

Out of the five dimensions identified, the socio-economic dimension and the social circle are most important in explaining savings behaviour and parental teaching explains least of the variation in savings behaviour. More specifically, the principal component *PC_economic* has the largest marginal effect on whether one saved in the past year, the amount saved in the past year and whether one is planning to save. As *PC_economic* loads heavily on the respondent's health, economic outlook for the coming year and whether his income in the past year was similar to a regular year, it will be difficult for policymakers to stimulate savings via this route. Similarly, stimulating savings via one's social circle is a complex task. Alternatively, mandatory savings plans might be a more productive alternative. This will be especially helpful in stimulating savings for groups of people who need to rely most on their own savings in the future. An example of such group is self-employed workers who need to arrange insurance and retirement savings themselves.

Given that the principal component *PC_literacy* has the largest marginal effect on net wealth, another way to stimulate savings is to increase financial literacy through education. One way of achieving this is by organizing seminars on savings. Lusardi (2004) documents that seminars foster savings, especially for low educated individuals and those who save little.

This study is closest to Brounen et al. (2016) as they also relate savings behaviour to a variety of explanatory dimensions. This paper differs from the aforementioned paper in several ways. First, the research questions are different. Whereas the goal of Brounen et al. (2016) is to explain variation in savings behaviour by using household background and

personality variables, this paper adopts a helicopter view. I first examine whether the five dimensions are distinct and then research which dimensions are most important in explaining savings behaviour. Second, this study extends the set of explanatory variables by also including the social circle dimension. Third, I include more and more direct measures of savings behaviour. Brounen et al. (2016) examine whether one 'is willing to sacrifice his well-being in the present to achieve certain results in the future' (p.99) to measure savings. In contrast, I focus on whether one put money aside in the past 12 months and if so, how much money has been put aside. In addition, I focus on accumulated life-time net wealth and whether one is planning to put money aside in the next 12 months. This allows me to compare savings measures, something Brounen et al. (2016) could not do.

The remainder of this paper is organized as follows: the next section provides an overview of the literature on savings motives and the dimensions studied in this research. Section 4.3 presents the data and explains the construction of variables and the methodology. Section 4.4 discusses the results of the empirical analyses and Section 4.5 concludes.

4.2 Literature review

4.2.1 Motives to save and attitude towards saving

In his seminal work, Keynes (1936) outlined 8 reasons for savings: 1) precautionary savings motive, 2) life-cycle motive, 3) inter-temporal substitution motive, 4) improvement motive, 5) independence motive, 6) enterprise motive, 7) bequest motive, and 8) avarice motive. Browning and Lusardi (1996) added the down payment motive to this list. Katona (1975) shows that US consumers saved for, amongst others, emergencies and retirement, while they were less likely to save to earn future income in the 1960s. Also Japanese households tend to save for precautionary reasons and retirement, which is consistent with life-cycle theory (Horioka and Watanabe, 1997). More recently, the precautionary savings motive was the most important reason to save in the UK in 2010 (Crawford et al., 2015) and in the Euro area from 2008 to 2011 (Le Blanc et al., 2016). However, there is heterogeneity across countries, e.g. German and Slovenian households are less likely to

save for unexpected events than others, while saving to pay off debt is more important in The Netherlands and Malta than in other countries.

Zooming in on savings behaviour after retirement, De Nardi et al. (2015) document that a large part of retirement savings are used to insure against the risk of high medical expenses and death expenses.

Savings motives are not mutually exclusive and might coexist at the same time. Le Blanc et al. (2016) document significant correlations between most pairs of savings motives. They find e.g. a positive relationship between saving for unexpected events and saving to invest in financial assets. Fisher and Montalto (2010) empirically show that the motives to save for emergencies and retirement are related to saving regularly.

4.2.2 Socio-economic variables

It is well-documented that socio-economic variables (e.g. age, gender, education) are related to households' asset- and liability holdings. Older people tend to have higher total savings (Lunt and Livingstone, 1991), are less likely to have consumer loans (Georgarakos et al., 2014), but have higher values of total debt (Webley and Nyhus, 2013). More educated individuals have higher values of net wealth (Lusardi and Mitchell, 2007), have more non-housing wealth (Lusardi and Mitchell, 2007), have more debt (Webley and Nyhus, 2001), save more (Bucciol and Veronesi, 2014; Webley and Nyhus, 2013; Webley and Nyhus, 2006; Nyhus and Webley, 2001), and are more likely to invest in stocks (Hong et al., 2004).

Lusardi and Mitchell (2007) report that income is positively related to net worth and non-housing wealth, while there is also a positive relationship with debt (Webley and Nyhus, 2001), the propensity to save (Bucciol and Veronesi, 2014; Fisher and Montalto, 2010), the savings amount (Bucciol and Veronesi, 2014; Webley and Nyhus, 2006; Nyhus and Webley, 2001) and the propensity to invest in the stock market (Brounen et al., 2016).

If there is a difference in savings behaviour between males and females, females save less (Bucciol and Veronesi, 2014) and have less total savings than males (Lunt and Livingstone, 1991). Furthermore, households with a partner are more likely to save (Bucciol and Veronesi, 2014) and have higher savings amounts (Bucciol and Veronesi, 2014), while there is a negative relationship between household size and the propensity to save (Bucciol and Veronesi, 2014) and the amount saved (Bucciol and Veronesi, 2014;

Nyhus and Webley, 2001). Lastly, financially literate consumers are more willing to save and to invest in the stock market (Brounen et al., 2016).

4.2.3 Parental teaching

Another strand of the literature focuses on the role played by parents. Parents can influence their children in four ways (Webley and Nyhus, 2006); through modelling, discussion and guidance, habit formation and independence. Several studies (e.g. Brounen et al., 2016; Bucciol and Veronesi, 2014) show that homemade financial education during youth and/or adolescence affects financial decision making later in life and Shim et al. (2010) conclude that the role played by parents is more important than work experience and high school financial education. Brounen et al. (2016) report that individuals who had a side job during teenage years and who were stimulated to save by their (grand) parents are more willing to save during adulthood. In contrast, having received pocket money at age 12 does not affect one's willingness to save, nor do any of these variables impact stock market participation.

Where Brounen et al. (2016) focus on the willingness to save, Bucciol and Veronesi (2014) examine actual savings behaviour in the past year. They confirm that only giving pocket money does not increase the likelihood to save, but show that it positively affects the amount saved. Furthermore, the authors provide evidence that a mix of parental teaching strategies is most effective: respondents who received pocket money at age 8-12, whose parents controlled how they could spend the money and who received advice on saving at age 12-16 have a higher propensity to save and saved a larger amount than others. However, the effects of financial socialization on the propensity to save decay with age. Webley and Nyhus (2006) take this into account by using a sample of respondents younger than 50 years and confirm the positive effect of economic socialisation on the amount of savings, but only for singles. For couples, their partner's beliefs and actions might dilute the effect of upbringing.

Webley and Nyhus (2013) take a broader perspective by also emining household debt, using a sample of young adults (age 18-32) in the Netherlands. They report that respondents who had a job on the side at age 12-16 have more debt and less total savings, while respondents who were encouraged to save by their (grand)parents have higher total

savings. Having received pocket money between 8 and 12 years old does not affect the level of savings, nor debt. Norvilitis and MacLean (2010) document that US college students who received hand-on assistance in handling money from their parents have credit card debt, while students who talk with their parents about how to handle money have higher credit card debt.[71]

4.2.4 Household administration skills

Others focus on how household administration skills are related to financial decision making. Brounen et al. (2016) find that not the experience of managing the administration matters, but the way of doing this is important for savings behaviour. While keeping track of expenses is not related to the willingness to save, respondents who keep a tight administration are more willing to sacrifice their well-being in the present for future achievements. In contrast, managing the household administration matters for stock market participation, rather than how it is done.

Rabinovich and Webley (2007) compare savings techniques of individuals who were planning to save and subsequently saved with those who were planning to save but failed to do so. They show that Dutch savers are more often transferring part of their income to a different bank account than non-savers. Furthermore, they find that from 2000 onwards Dutch savers find it easier to control expenditures than Dutch non-savers.

Webley and Nyhus (2006) link the difficulty to control expenditures to the value of savings and report that respondents (both singles and couples) who have problems with controlling expenditures have lower savings. In a more recent study, Webley and Nyhus (2013) link this skill to various types of assets and debt and document opposite results. Respondents who find it difficult to control expenditures have more liquid savings and total savings and have less debt.

4.2.5 Personality factors

Also personality variables have been identified as an important determinant of savings behaviour. The period one takes into consideration in planning expenditures and savings,

[71] Since the authors use a cross-sectional dataset there might be reverse causality: parents begin to talk about handling money after their children started accumulating debt.

his time horizon, seems to be one of the most robust covariates of savings in prior studies (Rabinovich and Webley, 2007). It is positively related to the propensity to save (Bucciol and Veronesi, 2014; Fisher and Montalto, 2010), willingness to save (Brounen et al., 2016), the amount saved (Bucciol and Veronesi, 2014; Webley and Nyhus, 2006) and total net worth (Lusardi, 1998). Although individuals with longer planning horizons are more likely to save, there is no relationship with stock market activity (Brounen et al., 2016). A related but broader concept is one's future orientation, which captures the extent to which an individual considers immediate versus future consequences of his behaviour. Webley and Nyhus (2013) document that present-oriented individuals have lower levels of liquid savings and total savings, while one's future orientation is not related with his value of debt. This is in contrast with findings of Webley and Nyhus (2006) who document no significant relationship between future orientation and bank savings, neither for singles nor for couples.

Another personality trait related to saving and investment decisions is one's locus of control, the extent to which individuals belief they can control events that affect them (Rotter, 1954). Brounen et al. (2016) distinguish between the internal dimension, the extent to which someone believes to have control over the situation, and the chance dimension, the extent to which someone believes things happen to him. They show that respondents with a higher score on the internal dimension are more likely to save, while respondents with a higher score on the chance construct are more likely to invest in the stock market.

4.2.6 Social circle

Lastly, it is shown that social interactions affect household financial decision making. Hong et al. (2004) examine whether stock market participation is influenced by social interaction, either by word-of-mouth effects or observational learning. They report that sociable households have a 4 percent higher probability to invest in the stock market than others. This effect is stronger in states with higher stock market participation rates. Ivkovic and Weisbenner (2007) document a neighbourhood effect in stock purchases. A 10 percentage point increase in stock purchases of a certain industry is associated with a 2 percentage point increase in the household's stock purchases of that industry. These effects

are more pronounced for local purchases and for purchases among households in more sociable states. Consequently the results suggest strong word-of-mouth effects among US investors.

Not only do social interactions affect stock market decisions, they also play a role in retirement plan decisions (Duflo and Saez, 2003) and decisions on household assets and debt (Brown et al., 2016; Georgarakos et al., 2014). Duflo and Saez (2003) set up an experiment in which a random sample of employees in a subset of university departments received an invitation to attend a benefits fair. The authors report that, after the fair, Tax Deferred Account (TDA) retirement plans enrolment was higher for employees in treated departments than for non-treated departments. In addition, the effect of the enrolment is almost as large for treated and non-treated employees within treated department, suggesting a social network effect.

Brown et al. (2016) document that the probabilities of holding housing and non-housing assets, and secured and unsecured debt are positively related to social interactions, measured as active club membership. Conditional on holding a particular liability or asset, the amount increases with social interactions as well. Georgarakos et al. (2014) focus on borrowing behaviour by linking it to perceived relative standing, measured by consumers' perceived average income of their acquaintances. They find a positive effect of perceived average peer income on the likelihood of having a (un)collateralized loan and the conditional amount of the loan, for those who consider themselves poorer than their peers. Their results furthermore suggest that direct comparisons with spending standards of the social circle affect the likelihood of having uncollateralized loans. Where the aforementioned studies show that peer effects influence behaviour, Georgarakos et al. (2010) find that peers also affect consumers' perceived vulnerability. In countries with less expanded mortgage markets, having a debt-to-income ratio above the median leads to feelings of distress, over and above the effects of own income and the own debt-to-income ratio. Hence this finding points in the direction of social stigma considerations.

4.3 Data and variable construction

4.3.1 DNB Household Survey

I use the annual DNB Household Survey (DHS) to gather information on consumers' savings, investments, debt and all personal characteristics to measure the dimensions.[72,73] The dataset constitutes a representative sample of the Dutch speaking population in the Netherlands and contains approximately 2000 households. The survey waves 2005-2012 include all relevant variables for this study and hence the period of investigation is 2005-2011.[74] I restrict the sample to the household head and, if applicable, the (un)married partner.

As outlined in Section 4.2, all dimensions consist of multiple components. As I have 25 variables to measure the dimensions, I perform principal component analyses to reduce the data. Section 4.3.2.2-4.3.2.6 describe the process and the results, after the explanation of the dependent variables in Section 4.3.2.1. Appendix A.4 provides definitions and summary statistics of all variables used in this study.

4.3.2 Variables

4.3.2.1 Savings behaviour

There are several ways to define savings as outlined by Dynan et al. (2004). One can focus on an active component excluding capital gains or one can include all forms of savings. I start with a direct measure of savings by examining whether a household put any money aside in the past 12 months. The dummy *having saved* equals one if the respondent answers confirmatory and zero otherwise.[75] All respondents who saved money are subsequently asked to indicate about how much they have put aside by checking one of seven ranges (from less than 1500 EUR to 75000 EUR and more) or I don't know. Following Bucciol and Veronesi (2014) and CentERdata (2016) a continuous variable *amount saved* is

[72] Previous studies have used the survey to analyze, amongst others, the willingness to save (Brounen et al., 2016), having debt (Georgarakos et al., 2014), stock market participation (Van Rooij et al., 2011; Hong et al., 2004) and portfolio diversification (Von Gaudecker, 2013).

[73] See http://www.centerdata.nl/en/projects-by-centerdata/dnb-household-survey-dhs for more information on the DHS. URL last accessed on 22 May 2017.

[74] The survey asks about the value of assets, investments and debt at December 31 of the previous year.

[75] Since the exact wording does not include "saving" one might be concerned that respondents interpret the question differently. However this question is preceded by the introductory text "the following questions are on saving" and the question "Do you think it makes sense to save money, considering the current general economic situation?". Hence, I am confident that respondents interpret the question correctly.

constructed equal to the central value of each range or the threshold value for the extreme range. Whereas these variables capture savings behaviour in a particular year, *net wealth* denotes accumulated life time savings by focusing on the level of savings on a particular date. It is the sum of liquid savings, investment savings and insurance savings, net of non-mortgage debt at year end (see e.g. Webley and Nyhus, 2013; Nyhus and Webley, 2001) and hence it comprises a broader measure of savings.[76,77,78,79,80] Lastly, a measure of savings intention is constructed. *Planning to save* has value 1 if one is certainly or perhaps planning to put money aside and has value 0 if one is probably not or certainly not planning to put money aside.

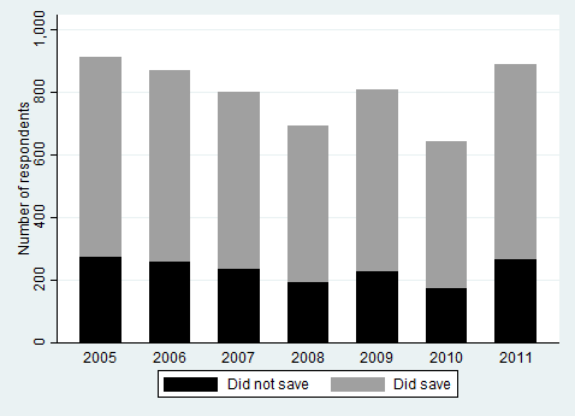
Panel A of Figure 4.1 shows that each year, approximately 70% of respondents put money aside. This is comparable to findings of Nibud (2012) which reports that 75% of Dutch households saved in 2009. Dutch individuals are more likely to save than people living in the UK, as 47% of the latter group reported in 2010 to have saved in the past two years (Crawford et al., 2015). This heterogeneity in savings rates across countries is also documented in Crossley et al. (2012). The evolution of the average amount saved by savers is plotted in panel B. In 2005, savers saved on average 5254 EUR. This amount increased till 2009 when the average amount saved equaled 6313 EUR. From then on it gradually decreased to 5815 EUR in 2011. The increase in savings during the financial crisis is in line with many other European countries and might be a response to economic uncertainty (Mody et al., 2012). Panel C presents frequencies of lifetime accumulated net wealth in the range -50000 EUR to 150000 EUR. A large proportion of the data lies around zero and the data is right skewed. Lastly, panel D shows that the proportion of respondents that is

[76] The two most popular mortgage types during the sample period were the *aflossingsvrije-* and *spaarhypotheek.* In both cases one does not redeem until the end of the contract (Rabobank, 2014). Consequently I assume that the value of the mortgage and the value of the house are equal, which implies that they cancel out.
[77] CentERdata provides aggregated wealth data for each respondent. If a respondent does not know the exact value of a subcomponent, he is presented a range of values and asked to indicate in what range the value lies. In case one selects the last category, for example 50.000 euros or more, the lower bound is added to the total amount (in this example 50.000 euro). If the respondents selects another answer, the middle value of the range is added. If the respondent does not select a range, the average value of the two previous years is added. If this is not available, an imputed value is used. CentERdata runs a regression on all observations for which data is available and uses this to calculate a predicted value (including an error term) for missing observations. Thanks to this methodology, there is no selection bias.
[78] Net wealth is expressed in 2005 euros (http://ec.europa.eu/eurostat/web/hicp/data/database) and is winsorized at the 5% level to account for outliers.
[79] Restricting the sample to 18-32 year olds of the 2006-survey waves gives numbers comparable to Webley and Nyhus (2013).
[80] Retirement savings are not included.

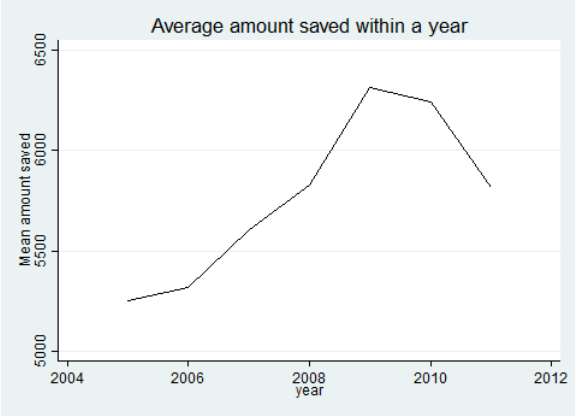
planning to save is relatively stable over time and equals approximately 80%. 84% of the respondents who are planning to save in the next year, also saved in the previous year.

Figure 4.1. Savings measures

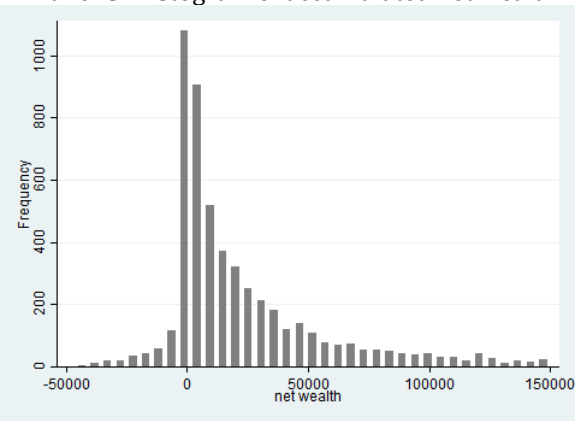
Panel A: Having saved by year



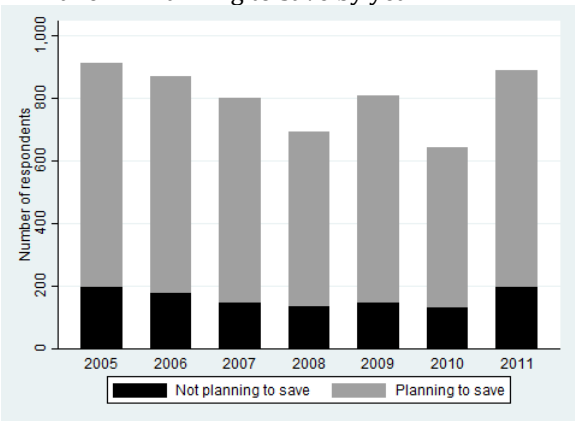
Panel B: Yearly average amount saved



Panel C: Histogram of accumulated net wealth



Panel D: Planning to save by year



Panel A shows the number of respondents who did not save (black) and who did save (grey) in the past 12 months by year. Panel B presents the mean amount saved by year for those respondents who indicated that they put money aside in the past 12 months. Panel C shows the frequency bars of (unwinsorized) accumulated net wealth, from -50000 EUR to 150000 EUR. Panel D shows the number of respondents who are not planning to save in the next 12 months (black) and who are planning to save (grey) by year.

4.3.2.2 Socio-economic variables

The first set of characteristics to explain savings behaviour includes socio-economic variables. *Account* is a binary dummy with value 1 if the respondent is responsible for household finances and 0 otherwise. *Financial literacy* captures the respondent's self-assessed knowledge with respect to financial matters, ranging from 1 (not knowledgeable) to 4 (very knowledgeable). *Urban* indicates the degree of urbanization of the city of

residence, ranging from 1 (very low degree of urbanization) to 5 (very high degree of urbanization). *Health* specifies the respondent's general assessment of his own health, from 1 (poor) to 5 (excellent). *Positive economic outlook* is a dummy with value 1 if the respondent believes that his expenses will be (much) lower than his income in the next 12 months and zero otherwise. Lastly, *regular income* measures whether the respondent's income of the 12 past months was regular (value=1) or unusually high or low (value=0).

I apply a principal component analysis to determine the principal component structure of the 6 socio-economic indicators. Varimax rotation is used to obtain orthogonal principal components. Principal components with eigenvalues above 1 are retained as proposed by Kaiser (1960), resulting in 3 principal components. Table 4.1 shows the rotated principal component loadings of the 3 principal components that explain most of the variation. The first principal component is mostly defined by *health*, *regular income* and *positive economic outlook* and is called *PC_economic* henceforth. The second principal component is mostly defined by whether someone is responsible for household finances and financial literacy, and is therefore called *PC_financial_literacy*. The third principal component is mainly defined by the residence of the respondent. The uniqueness column presents the variance that is not shared with other variables.

Table 4.1. Principal component analysis of socio-economic variables

	PC 1 PC_economic	PC 2 PC_literacy	PC 3 PC_residence	Uniqueness
Account	-0.185	0.819	0.163	0.269
Financial literacy	0.217	0.839	-0.099	0.240
Urban	0.013	0.026	0.963	0.072
Health	0.687	0.029	-0.174	0.498
Positive economic outlook	0.663	0.120	0.186	0.511
Regular income	0.637	-0.080	0.060	0.585

This table shows rotated principal component loadings based on principal component analysis with varimax rotation of socio-economic variables. PC stands for principal component.

4.3.2.3 Parental teaching

The DNB household survey contains 6 questions on (grand)parental teaching during child- and adulthood. For all variables, the answer given the first time the survey is filled out is

used, as this was closest to child- and adulthood. *Allowance* is a binary dummy with value 1 if the respondent received an allowance between age 8 and 12, and zero otherwise. *Chores* captures whether the respondent sometimes or often did little household chores at age 8-12 for which he received money from his parents, or not. *Spend* denotes whether the respondent could spend at least a part of his money as pleased between age 8 and 12 (value=1), or whether his parents decided how to spend most of the money (value=0). *Job* equals one for respondents who had a few or many jobs on the side between 12 and 16 years old, and zero otherwise. Further, whether (grand)parents gave *advice* and practical help regarding budgeting and whether (grand)parents *stimulated to save* at age 12-16 are considered.

A principal component analysis with varimax rotation reduces the 6 variables to 2 principal components. The first principal component is mostly defined by parental teaching during childhood. It explains 35.1% of the total variation. The second principal component is characterized by having received financial advice on budgeting and whether one was stimulated to save and explains 29.3% of the variation. This principal component is henceforth called *PC_advice_adulthood*. Table 4.2 shows that for most of the variables, the uniqueness is low, indicating that most of the variance is shared with other variables.

Table 4.2. Principal component analysis of parental teaching variables

	PC 1 PC_childhood	PC 2 PC_advice_adulthood	Uniqueness
Allowance	0.847	0.169	0.255
Chores	0.676	0.102	0.533
Spend	0.841	-0.006	0.292
Job	0.447	0.081	0.794
Advice	0.148	0.919	0.134
Stimulated to save	-0.001	0.932	0.132

This table shows rotated principal component loadings based on principal component analysis with varimax rotation of parental teaching variables. PC stands for principal component.

4.3.2.4 Household administration skills

3 variables are included to proxy the respondent's administration skills. First, respondents are asked how well they *keep track* of their expenditures, on scale 1 (very bad) to 5 (very good). Second, the difficulty to *control* expenditures is included, measured on a 7 points

scale where a higher value indicates that the respondent finds it more difficult to control expenditures. Third, I include whether someone puts money aside for particular *purposes* to reserve amounts for different expenditures (binary dummy).

Principal component analysis reveals that the three variables can be reduced to two principal components, with the first mainly capturing whether the respondent keeps track of household finances and finds it hard to control expenditures. Hence this principal component is named *PC_managing_expenditures*. The second principal component is mainly defined by whether he puts money aside for particular purposes (see Table 4.3).

Table 4.3. Principal component analysis of household administration skills variables

	PC 1 PC_managing expenditures	PC 2 PC_particular_purposes	Uniqueness
Keep track	-0.751	0.420	0.259
Control	0.819	0.311	0.233
Purposes	0.032	0.917	0.158

This table shows rotated principal component loadings based on principal component analysis with varimax rotation of household administration skills. PC stands for principal component.

4.3.2.5 Personality factors

The next dimension to explain savings behaviour captures personality factors. Future orientation expresses the extent to which an individual considers immediate versus future consequences of his behaviour. 10 Statements like "I am only concerned about the present, because I trust that things will work themselves out in the future" are included in the DNB Household Survey.[81] To make scores consistent, some scores are reversed such that in all cases a higher value implies that someone is more future oriented. *Future* denotes the average value on all statements.

Second, the time period used with regard to planning expenditures and savings is captured by *time horizon*. It is an ordinal variable ranging from 1 (the next couple of months) to 5 (more than 10 years from now).

Next, locus of control is included. As in Brounen et al. (2016) a distinction is made between the *internal* dimension and the *chance* dimension. A higher value on the internal

[81] The statements are not included in the survey waves of 2008 and hence the values of 2007 are used. From 2010 onwards, the question is only asked if not asked before.

dimension indicates that someone believes that he can control events that affect him. A higher value on the chance dimension reveals that someone believes that things happen to him.[82] Some statements are recoded before conducting the principal component analysis to make scores consistent.

In addition, the questionnaire includes statements on how *organized* someone is, e.g. "I am always well prepared". Respondents indicate on a scale from 1-5 to what extent they agree with the statement. After recoding some statements such that a higher values implies that someone is more organized, the mean value is calculated.

Out of the 5 variables constructed to measure personality, two principal components are retained (see Table 4.4). The first principal component is mainly identified by the respondent's time horizon and future orientation and is therefore called *PC_future_orientation*, while the second principal component is mainly identified by how organized someone is, whether he believes that he has control over situations or whether he feels that things happen to him. Therefore this principal component is called *PC_influence*.

Table 4.4. Principal component analysis of personality variables

	PC 1 PC_future_orientation	PC 2 PC_influence	Uniqueness
Future	0.755	0.209	0.386
Time horizon	0.835	-0.057	0.300
Internal	0.151	0.687	0.505
Chance	-0.263	-0.510	0.670
Organized	-0.081	0.702	0.501

This table shows rotated principal component loadings based on principal component analysis with varimax rotation of personality measures. PC stands for principal component.

4.3.2.6 Social circle

The last dimension to explain savings is the social circle of a respondent. Social descriptive norms, beliefs about behaviour of others, are included by using the response to the statement "Most people in my environment are saving money". Respondents indicate on a

[82] As these statements are not included in the survey in 2008 and 2010, data from 2007 and 2009 are used.

scale from 1 (totally disagree) to 7 (totally agree) to what extent they agree with the statement.[83]

Relative standing is based on the statements 1) I think I have more assets than others in my environment, 2) other people in my environment have more money to spend than I, 3) if I compare myself with my friends, I think in general I am financially better off, 4) I can spend more on durable consumer goods than others in my environment. Statement 2 is reversed such that a higher value indicates that one is better off than his environment (scale 1-7).[84] *Relative standing* is the average values of the four statements.

The binary dummy *financial advice* has value 1 if parents, friends or acquaintances are the respondent's most important source of advice when making financial decisions. The binary variable *borrow* equals one for those who believe they are currently in the position to borrow a substantial amount from family or friends.

The three measures of the social circle are reduced to two principal components, *PC_environment* and *PC_relative standing*. The principal components explain 31.9% and 29.7% of the total variance, respectively.

To summarize, 5 dimensions are included in this study to explain variation in savings behaviour; 1) socio-economic variables, 2) parental teaching, 3) household administration skills, 4) personality factors and 5) social-circle. Using principal component analyses, the 25 variables to measure these dimensions have been reduced to 11 principal components.

Table 4.5. Principal component analysis of social circle variables

	PC 1 PC_environment	PC 2 PC_relative_standing	Uniqueness
Environment saves	0.682	0.096	0.525
Relative standing	0.345	-0.771	0.287
Financial advice	0.342	0.761	0.305
Borrow	0.759	-0.084	0.418

This table shows rotated principal component loadings based on principal component analysis with varimax rotation of measures of the social circle. PC stands for principal component.

4.3.3 Methodology

[83] Since this question is not asked in the waves of 2008 and 2010, the responses in 2007 and 2009 are used.
[84] Responses of 2007 and 2009 are used to proxy relative standing in 2008 and 2010.

To answer the first question of whether all dimensions capture different aspects, the relationships between the dimensions are considered. If all principals capture something else, they should have low correlations. However, correlations do not allow to control for the potential impact of other principal components. Therefore, as a second test, each principal component is regressed on all other principal components. A high value of the adjusted R^2 is an indication that principal components capture something similar as much of the variation in a specific principal component is then explained by the other principal components.

To investigate which dimension is most important in explaining whether someone saved in the past year, the following OLS regressions are run:

$$\text{Having saved}_{i,t} = \beta_1 * C_{i,t} + \alpha_{p,t} + \varepsilon_{i,t} \quad (4.1)$$

$$\text{Having saved}_{i,t} = \beta_1 * C_{i,t} + \beta_2 * D_{i,t} + \alpha_{p,t} + \varepsilon_{i,t} \quad (4.2)$$

i denotes the individual, *t* time in years and *p* the province where the respondent lives. Equation 4.1 is the baseline regression where the dummy *having saved* is regressed on a vector of control variables (*C*) and province-time dummies ($\alpha_{p,t}$). The control variables include *age, male, risk aversion, education, log income*, *hhsize,* and *employment status* (see Appendix A.4 for definitions and summary statistics of all variables). As these are standard control variables in the literature, I employ them as controls rather than part of a dimension. Province-time dummies are included to capture unobserved regional shocks and the standard errors are clustered at the household level to account for correlations within a household. Using the Shapley value, I demonstrate the proportion of R^2 explained by the control variables and each dimension in this comprehensive specification.

Equation 4.2 extends the first equation by adding a vector of variables belonging to a specific dimension (*D*). This dimension is either 1) socio-economic, which includes the principal components *PC_financial_literacy, PC_economic* and *PC_residence,* 2) parental teaching consisting of *PC_childhood* and *PC_advice_adulthood*, 3) administration skills containing *PC_managing_expenditures* and *PC_particular_purposes,* 4) personality factors including *PC_future_orientation* and *PC_influence* or 5) social circle comprising of

PC_environment and *PC_relative_standing.* All principal components are standardized to have a mean of 0 and a standard deviation of 1 to facilitate comparisons of the regressions coefficients.

First, individual and joint significance of the variables belonging to a dimension are considered. To investigate the importance of a specific dimension in explaining savings behaviour, the adjusted R^2 is examined. Comparing the adjusted R^2 of equation 4.2 with the one obtained by equation 4.1 reveals the variation in savings behaviour explained by a particular dimension. The regression with the highest increase in adjusted R^2 explains most of the variation in savings behaviour.

Hereafter, I run a comprehensive OLS regression including all dimensions, control variables and province-time dummies to investigate whether the relationships still hold once controlling for the other dimensions:

$$\text{Having saved}_{i,t} = \beta_1 * S_{i,t} + \beta_2 * PT_i + \beta_3 * H_{i,t} + \beta_4 * P_{i,t} + \beta_5 * SC_{i,t} + \beta_6 * C_{i,t} + \alpha_{p,t} + \varepsilon_{i,t} \quad (4.3)$$

Again, *i* denotes the individual, *t* time in years and *p* the province where the respondent lives. *S* is a vector including the principal components belonging to the socio-economic dimension, *PT* is a vector including the principal components belonging to the parental teaching dimension, *H* is a vector including the principal components belonging to the household administration skills dimension, *P* is a vector including the principal components belonging to the personality dimension, *SC* is a vector including the principal components belonging to the social circle dimension and *C* is a vector including the same control variables as in equation 4.1 and 4.2. Using the Shapley value, I demonstrate the proportion of R^2 explained by the control variables and each dimension in this comprehensive specification.

Subsequently, I examine which of the dimensions is most important in explaining the amount saved in a year. OLS estimates are likely to be biased as I only observe the amount saved for respondents who saved in the past year. As this might be a non-randomly selected sample, it might lead to a specification error. To solve this issue, I employ a

Heckman two step model (1979).

In line with Heckman (1979) I estimate a Probit model of the probability of having saved in the past year in the first step.[85] To meet the exclusion restriction necessary for identification, I include *employment status* as additional variable in the Probit estimation which is not included in the second step.[86] *Employment status* is likely to influence whether one saved in a year, but not the amount saved in a year.[87] For the latter, the wage will be important. The first step produces the inverse Mills ratio, which captures the selection effect. This variable is added to the second step which regresses the amount saved on the same variables as the first step, except for the instrument. The setup is similar as before. I start with the baseline regression which only includes control variables and then I first investigate each dimension separately and subsequently simultaneously.

To study variation in net wealth and the intention to save, I rerun regressions 4.1, 4.2 and 4.3 with the appropriate dependent variable.

4.4 Results

4.4.1 Relationships between the dimensions

The first question of this research is whether all dimensions of savings behaviour as explored in the current literature capture different aspects. If all principal components capture something else, they should have low correlations. Panel A of Table 4.6 shows the pairwise correlations between the principal components. The largest correlation found is between *PC_influence* and *PC_managing_expenditures*, equaling -0.275. As a rule of thumb, correlations between -0.3 and 0.3 are considered weak and correlations with absolute values between 0.3 and 0.7 are considered moderate (Gerstman, 2016). Hence all correlations are perceived weak. However, this does not necessarily indicate that the principal components are independent from each other. Weak correlations are also found

[85] I follow conventions and estimate a Probit model in the first step. Examples of papers in corporate finance that estimate a Probit model in the first step are Villalonga and Amit (2006), Campa and Kedia (2002) and Shehata (1991).
[86] Strictly speaking, the two steps can include exactly the same explanatory variables. Then, the probit estimation is identified through nonlinearity of the inverse Mills-ratio. However, as the inverse Mills ratio is approximately linear over a wide range, it is preferred to include an instrument (Puhani, 2000).
[87] Someone might be concerned that there is reverse causality: because one saves a lot in a year, he does not have to work. As only 0.73% of the respondents saved more than 28750 EUR in a year, this concern is mitigated.

when the principal components are measured with noise.

To test the robustness of the principal components, I conduct a principal component analysis on all variables simultaneously without dividing the variables into dimensions. Table B.4.1 in Appendix B.4 demonstrates that the 24 variables are reduced to 8 principal components. At first sight, the second principal component is similar to *PC_childhood*, the third principal component is similar to *PC_advice_adulthood*, the fourth principal component is similar to *PC_environment,* the sixth principal component is similar to *PC_literacy* and the seventh principal component is similar to *PC_future_orientation*. The correlation table B.4.2 in Appendix B.4 confirms this as the correlation coefficients are respectively 0.9, 1, 0.8, 0.9 and 0.9. In addition, the correlation between the first principal component and *PC_economic* is considered high with a value of 0.7 (Gerstman, 2016). The fifth principal component is moderately correlated with *PC_managing_expenditures* (-0.6), *PC_particular_purposes* (0.6) and *PC_influence* (0.5) and the eight principal component is moderately correlated with *PC_residence* (-0.6). Hence, performing a principal component analysis on all variables simultaneously leads to similar principal components.

Given that all dimensions are weakly correlated, it implies that excluding a dimension from the regression analysis does not introduce an omitted variable bias.

Panel B of Table 4.6 tabulates the pairwise correlations between the principal components and the control variables. Although most of the correlations are statistically different from zero, the magnitudes of correlations are low or moderate. The largest correlation is found between *age* and *PC_childhood* with a value of -0.365. This implies that older people tend to have lower scores on the principal component that loads heavily on whether one received allowance, did household chores and could spend money as pleased between 8 and 12 years old.

As a second test I regress each principal component on all other principal components. A high value for the adjusted R^2 implies that a large part of the variation in one principal component is explained by the other principal components. Therefore, this would point in the direction of capturing something similar. Table 4.7 shows the adjusted R^2 for each regression. Maximum 17.3% of the variation in a specific principal component is explained by the other principal components. This is the case for

Table 4.6. Pairwise correlations

Panel A.

	PC_literacy	PC_economic	PC_residence	PC_childhood	PC_advice_adulthood	PC_managing_expenditures	PC_particular_purposes	PC_future_orientation	PC_influence	PC_environment	PC_relative_standing
PC_economic	-0.002 0.855	1									
PC_residence	-0.019 0.149	-0.005 0.736	1								
PC_childhood	0.097 0.000	0.018 0.183	0.033 0.014	1							
PC_advice_adulthood	0.048 0.000	0.093 0.000	-0.025 0.059	-0.052 0.000	1						
PC_managing_expenditures	-0.262 0.000	-0.172 0.000	0.014 0.306	0.073 0.000	-0.042 0.002	1					
PC_particular_purposes	0.020 0.143	-0.112 0.000	0.005 0.733	0.086 0.000	0.015 0.253	0.006 0.659	1				
PC_future_orientation	0.099 0.000	0.068 0.000	0.020 0.127	0.072 0.000	0.089 0.000	-0.082 0.000	-0.029 0.028	1			
PC_influence	0.170 0.000	0.174 0.000	-0.034 0.011	0.071 0.000	0.126 0.000	-0.275 0.000	-0.004 0.764	-0.003 0.803	1		
PC_environment	0.030 0.027	0.205 0.000	0.010 0.478	0.152 0.000	0.163 0.000	0.022 0.107	-0.046 0.001	0.130 0.000	0.195 0.000	1	
PC_relative_standing	-0.180 0.000	-0.231 0.000	0.032 0.017	-0.051 0.000	-0.038 0.005	0.207 0.000	0.104 0.000	-0.166 0.000	-0.193 0.000	-0.018 0.188	1

This table shows pairwise correlations between the principal components as well as the significance level. The number of observations is 5,612

Panel B.

	PC_literacy	PC_economic	PC_residence	PC_childhood	PC_advice_adulthood	PC_managing_expenditures	PC_particular_purposes	PC_future_orientation	PC_influence	PC_environment	PC_relative_standing
Age	-0.009	-0.075	0.002	-0.365	-0.154	-0.227	-0.095	-0.053	-0.048	-0.294	-0.096
	0.521	0.000	0.871	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Male	0.213	0.038	-0.006	0.009	-0.061	-0.056	-0.088	0.056	0.039	-0.035	-0.192
	0.000	0.005	0.644	0.481	0.000	0.000	0.000	0.000	0.003	0.009	0.000
Risk aversion	-0.155	-0.022	0.007	-0.074	-0.023	-0.079	0.025	-0.081	0.050	-0.028	0.145
	0.000	0.104	0.620	0.000	0.091	0.000	0.057	0.000	0.000	0.038	0.000
Education	0.152	0.117	0.080	0.090	0.054	-0.014	-0.083	0.214	0.086	0.116	-0.114
	0.000	0.000	0.000	0.000	0.000	0.281	0.000	0.000	0.000	0.000	0.000
Log (net income)	0.229	0.102	0.104	0.034	-0.017	-0.018	-0.083	0.155	0.074	0.071	-0.176
	0.000	0.000	0.000	0.011	0.196	0.170	0.000	0.000	0.000	0.000	0.000
Hhsize	-0.095	0.057	-0.255	0.095	0.051	0.142	0.090	-0.014	0.011	0.087	-0.015
	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.297	0.424	0.000	0.253
Employment	0.060	0.161	0.035	0.272	0.115	0.184	0.035	0.091	0.029	0.213	-0.029
	0.000	0.000	0.010	0.000	0.000	0.000	0.009	0.000	0.031	0.000	0.033

This table shows pairwise correlations between the principal components and the control variables as well as the significance level. The number of observations is 5,612.

Table 4.7. Regressions of each principal component on all other principal components

Dependent variable	Adjusted R-squared	Observations
PC_literacy	0.113	5,612
PC_economic	0.130	5,613
PC_residence	0.003	5,614
PC_childhood	0.065	5,615
PC_advice_adulthood	0.051	5,616
PC_managing_expenditures	0.173	5,617
PC_particular_purposes	0.031	5,618
PC_future_orientation	0.063	5,619
PC_influence	0.160	5,620
PC_environment	0.129	5,621
PC_relative_standing	0.141	5,622

This table presents the adjusted R^2 of regressing a principal component on all other principal components. Standard errors are clustered at the household level.

PC_managing_expenditures and *PC_influence.* Other regressions report (much) lower adjusted R^2's. For example, only 0.3% of the variation in *PC_residence* is explained by the other principal components. A detailed overview of the regression estimates is available on request.

4.4.2 Most important dimensions in explaining savings behaviour

Now it is important to understand which of the dimensions are most important in explaining variation in saving behaviour. Table 4.8 displays the results of having saved in the past 12 months, Table 4.9 shows the results of the amount saved in the past 12 months, Table 4.10 presents estimates of the net wealth regressions and Table 4.11 shows the outcomes of the planning to save specifications.

Please note that Tables 4.8, 4.10 and 4.11 present OLS results, where the first column shows the baseline specification. The next 5 columns add each dimension separately, the 6th column includes all variables simultaneously, the 7th column shows marginal effects and the last column shows the proportion of R^2 explained by the control variables and each dimension. The marginal effect is based on the most comprehensive specification and is calculated as the percentage change in the mean value of the dependent variable stemming from a one standard deviation increase in the independent variable.

As outlined in Section 4.3.3 a Heckman two step model is estimated for the amount saved in the past year. This is to guarantee that the analysis is not suffering from a selection bias. The first column of Table 4.9 shows the estimates for the first step of the baseline regression. For brevity, the estimates of the other first steps are not shown but are available on request.

First, the results of adding a specific dimension to the baseline regression are discussed, followed by an investigation of the robustness of the results when all variables are included simultaneously. Hereafter I examine the joint significance of all variables belonging to a dimension to ultimately conclude which dimensions are most important in explaining savings behaviour.

The control variables in the baseline regressions show the expected signs. Higher educated individuals are more likely to have saved in the past year, saved more and have higher values of net wealth, which is in line with Bucciol and Veronesi (2014) and Webley and Nyhus (2006). Net income is positively related to all four measures of savings which confirms findings of Brounen et al. (2016), Bucciol and Veronesi (2014), Fisher and Montalto (2010) and Nyhus and Webley (2001). Besides, there is a positive relationship between the level of risk aversion and having saved in the past year as in Fisher and Montalto (2010).

In all four analyses, at least one of the principal components of the socio-economic dimension is statistically significant. A higher value of *PC_literacy* is associated with a larger amount saved and more net wealth, *PC_economic* is positively related to all four savings measures and while *PC_residence* is related to whether one is planning to save in the coming year.

Considering parental teaching, I find that *PC_childhood* is never significant at the 10% level, while *PC_advice_adulthood* is positively linked to whether one saved, net wealth and whether one is planning to save. The findings confirm the outcomes reported by Brounen et al. (2016) and Bucciol and Veronesi (2014) that people who received advice on budgeting and saving during adulthood are more likely to save as an adult. In contrast, they do not confirm that, conditional on having saved, these people save more as outlined in Bucciol and Veronesi (2014). This stems from the use of principal components rather than

Table 4.8. Regressions having saved in the past year (1/2)

	1	2	3	4
	Having saved	Having saved	Having saved	Having saved
Age	-0.000	-0.000	-0.000	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Male	-0.060***	-0.061***	-0.055***	-0.067***
	(0.02)	(0.02)	(0.02)	(0.02)
Riskaversion	0.024***	0.024***	0.025***	0.020**
	(0.01)	(0.01)	(0.01)	(0.01)
Education	0.052**	0.029	0.049**	0.046**
	(0.02)	(0.02)	(0.02)	(0.02)
Log(net income)	0.035***	0.028**	0.036***	0.034***
	(0.01)	(0.01)	(0.01)	(0.01)
Hhsize	-0.008	-0.009	-0.007	-0.003
	(0.01)	(0.01)	(0.01)	(0.01)
Employment status	0.083***	0.048**	0.081***	0.096***
	(0.03)	(0.02)	(0.03)	(0.03)
PC_literacy		0.010		
		(0.01)		
PC_economic		0.122***		
		(0.01)		
PC_residence		0.011		
		(0.01)		
PC_childhood			-0.010	
			(0.01)	
PC_advice_adulthood			0.043***	
			(0.01)	
PC_managing_expenditures				-0.075***
				(0.01)
PC_particular_purposes				-0.006
				(0.01)
PC_future_orientation				
PC_influence				
PC_environment				
PC_relative_standing				
Adjusted R-squared	0.025	0.094	0.034	0.050
P-value F-test		0.000	0.000	0.000

This table shows regression estimates with *having saved* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. The 8th column shows marginal effects of the most comprehensive specification. It shows the percentage change in the average propensity of having saved in the past year resulting from a one standard deviation increase in the variable. The last column shows the proportion of R^2 explained by each dimension. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 4.8. Regressions having saved in the past year (2/2)

	5	6	7	8	9
	Having saved	Having saved	Having saved	Marginal effect	Shapley
Age	0.000	0.001	0.000	0.000	10.660%
	(0.00)	(0.00)	(0.00)		
Male	-0.061***	-0.068***	-0.055***	-0.038	
	(0.02)	(0.02)	(0.02)		
Riskaversion	0.024***	0.030***	0.023***	0.033	
	(0.01)	(0.01)	(0.01)		
Education	0.024	0.030	0.006	0.004	
	(0.02)	(0.02)	(0.02)		
Log(net income)	0.024**	0.022**	0.018*	0.026	
	(0.01)	(0.01)	(0.01)		
Hhsize	-0.007	-0.011	-0.010	-0.017	
	(0.01)	(0.01)	(0.01)		
Employment status	0.090***	0.079***	0.061***	0.043	
	(0.03)	(0.02)	(0.02)		
PC_literacy			-0.011	-0.016	35.123%
			(0.01)		
PC_economic			0.092***	0.130	
			(0.01)		
PC_residence			0.015	0.021	
			(0.01)		
PC_childhood			-0.018*	-0.025	3.886%
			(0.01)		
PC_advice_adulthood			0.019**	0.027	
			(0.01)		
PC_managing_expenditures			-0.040***	-0.056	7.478%
			(0.01)		
PC_particular_purposes			0.013*	0.018	
			(0.01)		
PC_future_orientation	0.060***		0.043***	0.061	11.764%
	(0.01)		(0.01)		
PC_influence	0.054***		0.012	0.017	
	(0.01)		(0.01)		
PC_environment		0.085***	0.061***	0.086	22.181%
		(0.01)	(0.01)		
PC_relative_standing		-0.066***	-0.033***	-0.047	
		(0.01)	(0.01)		
Adjusted R-squared	0.054	0.077	0.142		
P-value F-test	0.000	0.000			

Table 4.9. Regressions amount saved in the past year (1/2)

	1	2	3	4	5
	Having saved	Amount saved	Amount saved	Amount saved	Amount saved
Employment status	0.243***				
	(0.05)				
Age	-0.001	1.428	-14.468	2.568	-12.189
	(0.00)	(12.32)	(11.61)	(12.29)	(13.21)
Male	-0.172***	752.412**	-235.008	737.194**	487.514
	(0.04)	(349.97)	(391.25)	(341.99)	(330.05)
Risk aversion	0.074***	-170.191	248.530	-167.043	-145.343
	(0.02)	(148.17)	(160.69)	(148.09)	(128.25)
Education	0.163***	1,438.459***	1,675.598***	1,446.986***	1,412.983***
	(0.04)	(311.47)	(295.70)	(301.83)	(272.61)
Log(net income)	0.106***	645.962***	1,074.132***	648.033***	744.125***
	(0.02)	(244.35)	(218.26)	(243.95)	(213.98)
Hhsize	-0.027	113.466	34.252	113.868	190.460*
	(0.02)	(110.87)	(129.83)	(110.58)	(105.82)
PC_literacy			573.774***		
			(141.59)		
PC_economic			2,711.187***		
			(520.60)		
PC_residence			258.569		
			(157.58)		
PC_childhood				70.706	
				(125.59)	
PC_advice_adulthood				-82.992	
				(204.79)	
PC_managing_expenditures					-592.447**
					(252.99)
PC_particular_purposes					-794.992***
					(110.62)
PC_future_orientation					
PC_influence					
PC_environment					
PC_relative_standing					
Lambda		-1,972.577	7,576.219***	-1,926.979	-498.915
		(2,638.72)	(2,678.76)	(2,630.75)	(2,088.26)
Observations	5,505	3,875	3,875	3,875	3,875
Adjusted R2		0.042	0.063	0.041	0.062
P-value F-test			0.000	0.804	0.000

This table shows the results of a two step Heckman model. The identifying variable in the first step is *employment status*. The inverse Mills ratio from the first step is included in the second step (Lambda). The first column shows regressions estimates of the first step of the baseline specification. Column 2 – 8 show regressions estimates of the second step of the other specifications. Each time, the additional variables are added to both the first and second step of the regression method. Column 9 shows marginal effects of the most comprehensive specification. It shows the percentage change in the average amount saved based on a one standard deviation increase in the independent variable. The last column shows the proportion of R^2 explained by each dimension. All specifications include province-time dummies. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 4.9. Regressions amount saved in the past year (2/2)

	6	7	8	9	10
	Amount saved	Amount saved	Amount saved	Marginal effect	Shapley
Employment status					
Age	4.456	-9.227	-10.949	-0.027	15.767%
	(10.62)	(9.75)	(10.52)		
Male	693.600**	147.347	24.823	0.002	
	(325.45)	(338.72)	(299.36)		
Risk aversion	-128.627	179.930	228.921*	0.041	
	(136.95)	(147.31)	(127.59)		
Education	1,252.850***	1,457.276***	1,005.275***	0.086	
	(251.01)	(252.56)	(238.62)		
Log(net income)	594.158***	745.141***	621.916***	0.109	
	(194.89)	(182.76)	(158.71)		
Hhsize	107.033	-29.573	64.441	0.013	
	(108.00)	(111.14)	(110.84)		
PC_literacy			234.375*	0.041	14.338%
			(123.54)		
PC_economic			1,353.249***	0.236	
			(265.95)		
PC_residence			180.523	0.031	
			(136.58)		
PC_childhood			-142.337	-0.025	0.629%
			(127.39)		
PC_advice_adulthood			-67.410	-0.012	
			(123.27)		
PC_managing_expenditures			-268.229*	-0.047	8.994%
			(162.43)		
PC_particular_purposes			-502.934***	-0.088	
			(115.64)		
PC_future_orientation	696.056***		827.146***	0.144	8.979%
	(220.41)		(154.30)		
PC_influence	199.319		-41.385	-0.007	
	(203.32)		(122.92)		
PC_environment		967.766***	765.808***	0.133	24.150%
		(284.94)	(187.87)		
PC_relative_standing		-1,745.359***	-1,305.391***	-0.227	
		(232.01)	(143.65)		
Lambda	-1,642.333	2,628.343	3,078.346*		
	(2,194.35)	(2,123.64)	(1,638.02)		
Observations	3,875	3,875	3,875		
Adjusted R2	0.056	0.087	0.113		
P-value F-test	0.001	0.000			

Table 4.10. Regressions net wealth (1/2)

	1	2	3	4
	Net wealth	Net wealth	Net wealth	Net wealth
Age	610.391***	665.763***	640.383***	539.903***
	(83.78)	(82.77)	(91.72)	(82.15)
Male	5,937.240***	3,585.015*	6,071.877***	4,850.093**
	(2,073.48)	(2,005.39)	(2,101.48)	(2,017.56)
Riskaversion	-3,147.944***	-2,368.177***	-3,116.491***	-3,368.901***
	(887.42)	(851.58)	(882.12)	(851.68)
Education	10,466.814***	8,166.811***	10,210.575***	9,145.533***
	(2,155.96)	(2,098.99)	(2,157.65)	(2,071.03)
Log(net income)	8,049.072***	6,770.792***	8,095.260***	7,880.984***
	(1,071.99)	(1,008.04)	(1,069.63)	(1,022.72)
Hhsize	-55.038	552.482	-7.904	601.999
	(792.38)	(800.00)	(788.43)	(764.32)
Employment status	-2,086.647	-2,494.045	-2,317.920	-1,148.807
	(2,379.33)	(2,318.95)	(2,384.91)	(2,300.38)
PC_literacy		8,313.768***		
		(845.08)		
PC_economic		4,547.948***		
		(753.02)		
PC_residence		40.983		
		(1,082.41)		
PC_childhood			333.836	
			(1,079.88)	
PC_advice_adulthood			2,380.677**	
			(999.45)	
PC_managing_expenditures				-5,094.349***
				(816.68)
PC_particular_purposes				-6,120.380***
				(740.77)
PC_future_orientation				
PC_influence				
PC_environment				
PC_relative_standing				
Adjusted R-squared	0.155	0.202	0.158	0.189
P-value F-test		0.000	0.057	0.000

This table shows regression estimates with *net wealth* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. Column 8 shows marginal effects of the most comprehensive specification. It shows the percentage change in the average net wealth resulting from a one standard deviation increase in the variable. The last column shows the proportion of R^2 explained by each dimension. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 4.10. Regressions net wealth (2/2)

	5	6	7	8	9
	Net wealth	Net wealth	Net wealth	Marginal effect	Shapley
Age	666.223***	589.712***	631.275***	0.306	36.578%
	(80.69)	(81.73)	(86.05)		
Male	5,960.340***	4,474.385**	2,506.557	0.042	
	(2,004.18)	(1,982.97)	(1,895.96)		
Riskaversion	-3,096.390***	-2,219.880***	-1,540.654*	-0.053	
	(856.25)	(835.92)	(793.77)		
Education	7,454.384***	8,530.963***	4,561.508**	0.076	
	(2,149.79)	(2,076.54)	(2,032.49)		
Log(net income)	6,974.019***	6,957.093***	5,491.270***	0.188	
	(1,020.33)	(990.64)	(908.31)		
Hhsize	5.886	-560.236	697.573	0.028	
	(759.67)	(742.96)	(734.08)		
Employment status	-1,530.824	-2,860.135	-2,004.301	-0.034	
	(2,302.11)	(2,283.50)	(2,190.22)		
PC_literacy			7,258.255***	0.247	16.796%
			(827.63)		
PC_economic			1,667.947**	0.057	
			(754.71)		
PC_residence			558.253	0.019	
			(1,015.55)		
PC_childhood			-820.045	-0.028	1.149%
			(979.20)		
PC_advice_adulthood			722.071	0.025	
			(907.76)		
PC_managing_expenditures			-458.596	-0.016	12.235%
			(810.03)		
PC_particular_purposes			-5,603.347***	-0.190	
			(715.61)		
PC_future_orientation	6,927.633***		5,363.834***	0.182	10.322%
	(844.66)		(773.59)		
PC_influence	4,253.888***		1,034.431	0.035	
	(830.40)		(832.90)		
PC_environment		3,476.348***	2,111.683***	0.072	17.353%
		(762.25)	(739.39)		
PC_relative_standing		-9,181.728***	-6,511.652***	-0.221	
		(757.89)	(729.57)		
Adjusted R-squared	0.190	0.208	0.270		
P-value F-test	0.000	0.000			

Table 4.11. Regressions planning to save (1/2)

	1	2	3	4
	Planning to save	Planning to save	Planning to save	Planning to save
Age	-0.003***	-0.003***	-0.003***	-0.003***
	(0.00)	(0.00)	(0.00)	(0.00)
Male	-0.036**	-0.038**	-0.033*	-0.038**
	(0.02)	(0.02)	(0.02)	(0.02)
Riskaversion	0.027***	0.027***	0.028***	0.026***
	(0.01)	(0.01)	(0.01)	(0.01)
Education	0.027	0.007	0.025	0.026
	(0.02)	(0.02)	(0.02)	(0.02)
Log(net income)	0.024**	0.017*	0.024**	0.023**
	(0.01)	(0.01)	(0.01)	(0.01)
Hhsize	0.004	0.004	0.004	0.005
	(0.01)	(0.01)	(0.01)	(0.01)
Employment status	0.059***	0.030	0.057***	0.064***
	(0.02)	(0.02)	(0.02)	(0.02)
PC_literacy		0.011		
		(0.01)		
PC_economic		0.102***		
		(0.01)		
PC_residence		0.019*		
		(0.01)		
PC_childhood			-0.004	
			(0.01)	
PC_advice_adulthood			0.035***	
			(0.01)	
PC_managing_expenditures				-0.027***
				(0.01)
PC_particular_purposes				0.004
				(0.01)
PC_future_orientation				
PC_influence				
PC_environment				
PC_relative_standing				
Adjusted R-squared	0.034	0.097	0.042	0.038
P-value F-test		0.000	0.000	0.001

This table shows regression estimates with *planning to save* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. Column 8 shows marginal effects of the most comprehensive specification. It shows the percentage change in the average propensity to save in the coming 12 months resulting from a one standard deviation increase in the variable. The last column shows the proportion of R^2 explained by each dimension. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table 4.11. Regressions planning to save (2/2)

	5	6	7	8	9
	Planning to save	Planning to save	Planning to save	Marginal effect	Shapley
Age	-0.002***	-0.002**	-0.002**	-0.036	14.756%
	(0.00)	(0.00)	(0.00)		
Male	-0.037**	-0.041**	-0.031*	-0.019	
	(0.02)	(0.02)	(0.02)		
Riskaversion	0.027***	0.031***	0.029***	0.037	
	(0.01)	(0.01)	(0.01)		
Education	0.005	0.010	-0.012	-0.007	
	(0.02)	(0.02)	(0.02)		
Log(net income)	0.015	0.014	0.008	0.010	
	(0.01)	(0.01)	(0.01)		
Hhsize	0.004	0.001	0.002	0.003	
	(0.01)	(0.01)	(0.01)		
Employment status	0.065***	0.056***	0.033*	0.021	
	(0.02)	(0.02)	(0.02)		
PC_literacy			0.004	0.005	37.984%
			(0.01)		
PC_economic			0.087***	0.109	
			(0.01)		
PC_residence			0.022**	0.028	
			(0.01)		
PC_childhood			-0.012	-0.015	4.542%
			(0.01)		
PC_advice_adulthood			0.017**	0.021	
			(0.01)		
PC_managing_expenditures			0.010	0.013	1.566%
			(0.01)		
PC_particular_purposes			0.019***	0.024	
			(0.01)		
PC_future_orientation	0.046***		0.036***	0.045	11.566%
	(0.01)		(0.01)		
PC_influence	0.046***		0.021***	0.026	
	(0.01)		(0.01)		
PC_environment		0.069***	0.048***	0.060	20.442%
		(0.01)	(0.01)		
PC_relative_standing		-0.045***	-0.021***	-0.026	
		(0.01)	(0.01)		
Adjusted R-squared	0.058	0.074	0.130		
P-value F-test	0.000	0.000			

a direct measure of advice, see Table C.4.2 in Appendix C.4. In general, it seems that parental teaching during adulthood is more productive than teaching during childhood.

The next dimension captures household administration skills. The principal component *PC_managing_expenditures* is negatively related to all dependent variables as expected. This variable loads heavily on whether one finds it difficult to control expenditures and the extent to which one keeps tracks of the administration. A higher value expresses more difficulties to deal with household administration and therefore it is not surprising that higher values on this variable are associated with lower savings. *PC_particular_purposes* is negatively related to the amount saved and net wealth, but not to the other measures. An explanation is that consumers spend their savings immediately once they reached their goal resulting in a lower amount saved in a given year and lower values of net wealth.

PC_future_orientation and *PC_influence* are included to examine the role of personality factors. All analyses show a positive effect of *PC_future_orientation* which confirms findings of Bucciol and Veronesi (2014) and Fisher and Montalto (2010) that consumers with longer saving horizons are more likely to save and save more. *PC_influence* is linked to whether one saved, net wealth and whether one is planning to save but not the amount saved. The variable loads heavily on whether one believes he has control over situations and hence it seems that perceiving to have control is important for saving.

Lastly, the social circle dimension is examined. *PC_environment* loads heavily on whether one believes that others in his environment save and whether one believes he can borrow from family and friends. The positive effect of *PC_environment* on all measures of savings indicates that people are more likely to save and save more when their environment does so. Hence, social descriptive norms, beliefs about behaviour of others, are important. Finally, I document a negative relationship beween *PC_relative_standing* and all dependent variables. This principal component loads heavily on feeling worse off than the environment and using advice from friends and family. Therefore the negative relationship can be driven by comparison-motivated consumption (Georgarakos et al., 2014). As people have the tendency to keep up with consumption of peers, those people who are worse off than their peers will decrease their savings.

In short, most of the variables are significantly related to savings and the results are

comparable for different measures of savings behaviour. Section 4.4.1 shows that the correlations between the principal components are moderate or low and hence the results should be robust to including all principal components simultaneously. The last but two column of each table shows that this is indeed the case as most of the results remain the same. Thus excluding one or more dimensions from the analysis will not bias the results and hence estimates from prior studies focusing on (a) specific dimension(s) are correct.

So far the statistical significance of the variables is discussed. To provide insight in the economic significance, I present the marginal effect of each explanatory variable in the one but last column of each table. It should be interpreted as the percentage change in the mean value of the dependent variable stemming from a one standard deviation increase in the independent variable. Again I find consistent results. The marginal effect of *PC_economic* is highest in three out of four analyses (having saved, amount saved in the past year and whether one is planning to save). For example, a one standard deviation increase in *PC_economic* is related to a 23.6% change in the amount saved in a year. The marginal effects of age and *PC_literacy* are highest in the net wealth specification. A one standard deviation increase in age increases net wealth with 30.6% and a one standard deviation increase in *PC_literacy* increases net wealth with 24.7%.

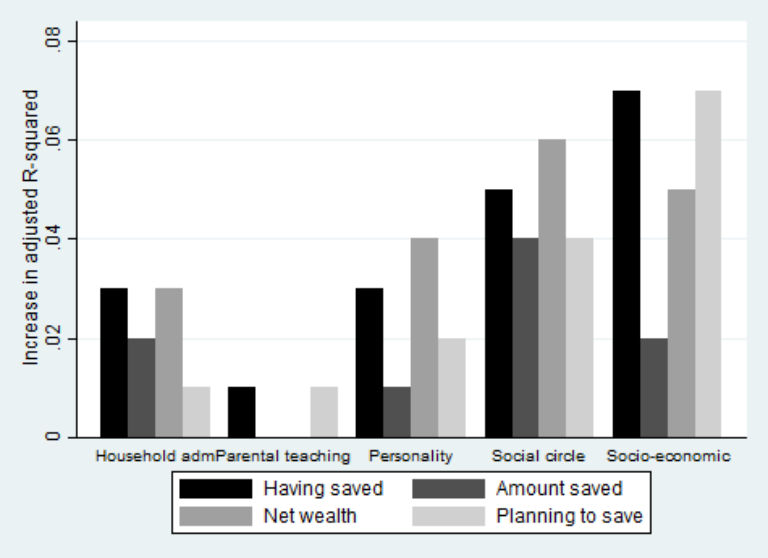
Up to this point the emphasis has been on individual variables. To test the joint significance of variables belonging to a dimension, F-tests are conducted. All dimensions are significant at the 10% level with respect to whether one saved in the past year, net wealth and whether one is planning to save. Parental teaching techniques are not jointly significant in explaining the amount saved. Therefore, the general conclusion is that all dimensions investigated in the literature are important in explaining savings behaviour.

We learned that all dimensions are important in explaining variation in savings, but which dimensions are most important? Figure 2 graphically presents the increase in the adjusted R^2 from adding a dimension to the baseline regression. The increases in the adjusted R^2's are highest when adding the socio-economic dimension or social circle dimension to the baseline. Adding the socio-economic dimension to the control variables increases the adjusted R^2 from 2.5% to 9.4% for whether one saved in the past year (Table 4.8) and from 3.4% to 9.7% for whether one is planning to save in the coming 12 months (Table 4.11). Adding the social circle increases the adjusted R^2 from 4.2% in the baseline

case to 8.7% for the amount saved (Table 4.9) and from 15% to 20.8% for net wealth (Table 4.10). Parental teaching techniques explain least of the variation in savings.[88] As outlined by Bucciol and Veronesi (2014) the effects of financial socialization decay with age and since the average age in the sample is 55 years, this might explain this result.

Since Brounen et al. (2016) use a different savings measure and report R^2's instead of adjusted R^2's, the reported values are not perfectly comparable. Brounen et al. (2016) document slightly higher R^2's: 6.6% in the basic specification versus 2.5% (having saved) and 3.4% (planning to save) in this study. Their most comprehensive specification explains 18.5% of the variation in their savings measures, while this study explains 14.2% (having saved) and 13.0%(planning to save) of the dependent variables in the most comprehensive specifications.

Figure 4.2. Increase in the adjusted R^2 by dimension



This graph shows the increase in the adjusted R^2 from adding a specific dimension to the baseline specification. The x-axis presents the five dimensions and the color of the bar indicates the dependent variable of the specification. This figure is based on Table 4.8-4.11.

[88] I report a 0.1% decrease in the adjusted R^2 when adding the parental teaching dimension to the baseline for the amount saved in the past year. This is due to differences in the first step of the Heckman estimation. While the first step of the baseline specification includes only control variables, the first step of parental teaching specification also contains principal components. This leads to different values of the inverse Mills-ratio from the first step, which is included in the second step. This explains the drop in the adjusted R^2.

Before, I showed how much each dimension adds to the control variables. Using the Shapley value, I next demonstrate the proportion of R^2 explained by the control variables and each dimension in the most comprehensive specification. The last column of Table 4.8 – Table 4.11 provides the results. For example, the socio-economic dimension explains 35.1% of R^2 in the having saved specification and 38.0% in the planning to save specification. For all dependent variables, the dimension that leads to the largest increase in the adjusted R^2, is also the dimension that explains the largest proportion of R^2 when considering all dimension simultaneously. Only in the net wealth specification the control variables explain more than one of the dimensions.

To summarize, all dimensions identified explain some of the variation in savings behaviour, with the socio-economic dimension and the social circle explaining most of the variation and parental teaching techniques explaining least of the variation. The results are consistent across the various measures of savings behaviour.

4.4.3 Additional tests

Since having saved and planning to save are binary dummies, OLS estimates might give predicted values outside the zero-one range. As an additional test, I run random effects Probit models as in Bucciol and Veronesi (2014). Table C.4.1 and C.4.2 (Appendix C.4) confirm that the variables of all dimensions are jointly related to whether one saved in the past 12 months and whether one is planning to save in the coming 12 months.

To investigate whether all dimensions are unique, all variables are first reduced to a smaller set of principal components. Subsequently, the principal components are used in the regression analyses. Appendix D.4 reruns all analyses using the variables underlying the principal components. For brevity, the coefficients of the control variables are not displayed. The conclusion that all variables of all dimensions are jointly significantly related to the dependent variable, except parental teaching techniques in the specification of the amount saved, is confirmed. Besides, the socio-economic dimension and the socio-circle are again found to be mostly related to savings behaviour.

Appendix E.4 extends the sample period to 2005-2015. While all control variables are available for a longer period of time, not all variables used to construct the principal components are available after 2011. Consequently, I conduct additional analyses based on

the control variables only. These specifications are similar to the baseline specifications discussed before. For brevity, the estimates of the first step of the Heckman estimation are not presented.

The first column of each table in Appendix E.4 displays the results of the baseline specification for 2005-2015. The results are similar to the results reported in Table 4.8, 4.9, 4.10 and 4.11 of the paper. There are a few exceptions. While a significant effect is reported for *male* in Table 4.9, I do not find that males saved more in the past year in 2005-2015. Second, while risk aversion is not significantly related to the amount saved in 2005-2011, I find that risk averse respondents saved less in the past year in 2005-2015. Lastly, I find that respondents who completed higher vocational education or university education saved more in the past year than others in 2005-2015, while no significant effect is found for 2005-2011.

As the period includes both crisis and non-crisis years, it is questionable whether this affects the results. Therefore, I rerun the regressions on two samples. The crisis sample includes the years 2007-2010 (second column of each table in Appendix E.4) and the non-crisis sample comprises the other years (third column of each table in Appendix E.4). At first sight, the results are consistent across crisis and non-crisis years. For most of the coefficients, the sign and whether the coefficient is statistically significant is the same in both periods. For example, in both periods males are less likely to have saved in the past year than females and older people have higher values of net wealth. One of the exceptions is the relationship between risk aversion and the amount saved in the past year. In crisis years, risk averse respondents saved less than non-risk averse respondents. This is a notable finding as Mody et al. (2012) illustrate that savings increase in the face of economy-wide uncertainty. Therefore, especially risk averse households are expected to save more in crisis periods. Risk aversion is not significantly related to the amount saved in other years. Hence, the negative coefficient in the first column is driven by the crisis years.

To test formally whether there is a differential effect for each variable in crisis and non-crisis periods I extend the specifications with interaction terms. Each control variable is interacted with a dummy variable *crisis* which has value 1 for the years 2007-2010 and zero otherwise. The last column of each table in Appendix E.4 presents the results. The relationship between each control variable and *having saved* and *planning to save* is similar

in crisis and non-crisis years as indicated by the insignificant interaction terms. In contrast, older people tend to save less in crisis years than in non-crisis years, and males and respondents with a paid job have higher values of net wealth in crisis years than in non-crisis years.

Although the findings of the sample split suggest that risk averse respondents save less than others in crisis years but not in other years, behaviour of risk averse respondents is not statistically different in the two time periods. Therefore the results suggest that the precautionary savings motive is not more important in crisis years than in other years for risk averse persons.

As most of the variables have similar relationships with all savings measures in crisis and non-crisis times, the results seems to be non-time specific. More research is needed to investigate whether the results of the dimensions can also be generalized.

4.5 Conclusion

Recent developments have increased consumers' responsibilities with respect to their finances. As a result, it is important to understand differences in savings behaviour. The literature on savings behaviour documents a role for socio-economic variables (e.g. Bucciol and Veronesi, 2014; Webley and Nyhus, 2013; Lusardi and Mitchell, 2007; Webley and Nyhus, 2006; Nyhus and Webley, 2001), parental teaching (e.g. Bucciol and Veronesi, 2014; Shim et al., 2010), household administration skills (e.g. Lusardi and Mitchell, 2007), personality variables (e.g. Fisher and Montalto, 2010) and social interactions (e.g. Brown et al., 2016). Current studies examine these dimensions separately or combine only some of the dimensions. This is the first study to simultaneously research all five dimensions.

I first show that all dimensions are weakly correlated. This implies that excluding a dimension from the regression analysis does not introduce an omitted variable bias. Hereafter, I ask which dimensions are most important in explaining savings behaviour.

There are different ways to measure savings behaviour. Some studies focus on the amount saved within a year (Bucciol and Veronesi, 2014), where others examine the level of bank saving (Webley and Nyhus, 2006), the total level of savings (Webley and Nyhus, 2013), a binary dummy capturing whether one saved in the past year (Bucciol and Veronesi, 2014), or the willingness to save (Brounen et al., 2016). Consequently, I examine

three measures of past savings behaviour (a binary dummy capturing whether one saved in the past 12 months, the amount saved in the past 12 months in EUR and accumulated life-time net wealth in EUR) as well as a forward-looking measuring capturing whether one is planning to save in the next 12 months.

The results show that the socio-economic dimension and the social circle are most important in explaining savings behaviour, irrespective of the way savings is defined. More specifically, the principal component *PC_economic* has the largest marginal effect on whether one saved in the past year, the amount saved in the past year and whether one is planning to save. This variable loads heavily on the respondent's health, economic outlook for the coming year and whether his income in the past year was similar to a regular year. Besides, the social circle dimension is important. However, it will be difficult for policy makers to stimulate savings via these routes. Alternatively, mandatory savings plans might be a more fruitful alternative. This will be especially helpful in stimulating savings for groups of people who need to rely most on their own savings in the future. An example of such group is self-employed workers who need to arrange insurance and retirement savings themselves.

Given that *PC_literacy* has the largest marginal effect on net wealth, another manner to stimulate savings is to increase financial literacy through education. One way of achieving this is by organizing seminars on savings as Lusardi (2004) shows that seminars foster savings, especially for low educated individuals and those who save little.

Since the different measures of savings behaviour produce a consistent picture, conclusions do not depend on the definition of savings behaviour.

Appendix

Appendix A.4 Overview of all variables

Table A.4.1 Overview of all variables

Variable name	Description	N	Mean	Sd	Min	Max
Dependent variables						
Having saved	Binary dummy (1=put money aside during the past 12 months, 0 = otherwise)	5,612	0.710	0.454	0	1
Amount saved	The amount of money put aside during the past 12 months	3,875	5744	7031	750	75000
Net wealth	Liquid savings + investment savings + insurance savings - non-mortgage debt	5,612	29431.330	41337.130	-7600.905	140709.900
Planning to save	Binary dummy (1 = certainly or perhaps planning to put money aside in the next 12 months, 0 = probably or certainly not planning to put money aside in the next 12 months)	5,612	0.799	0.401	0	1
Independent variables						
Socio-economic						
Account	Binary dummy (1 = responsible for household finances, 0 = otherwise)	5,612	0.739	0.439	0	1
Financial literacy	How knowledgeable do you consider yourself with respect to financial matters, from 1 = not knowledgeable to 4 = very knowledgeable	5,612	2.141	0.706	1	4
Urban	Degree of urbanization of the town/city of residence, from 1 = very low degree of urbanization to 5 = very high degree of urbanization	5,612	3.005	1.311	1	5
Health	In general, would you say your health is... 1 = poor to 5 = excellent	5,612	3.866	0.679	1	5
Positive economic outlook	Binary dummy (1 = believe that expenses will be (much) lower than income in the next 12 months, 0 otherwise)	5,612	0.370	0.483	0	1
Regular income	Binary dummy (1 = income in past 12 months was similar to regular year, 0 = otherwise)	5,612	0.937	0.242	0	1

Variable name	Description	N	Mean	Sd	Min	Max
PC_literacy	Standardized principal component based on urban, account, regular income, financial literacy, health and positive economic outlook.	5,612	0	1	-2.204	2.523
PC_economic	Standardized principal component based on urban, account, regular income, financial literacy, health and positive economic outlook.	5,612	0	1	-4.654	2.297
PC_residence	Standardized principal component based on urban, account, regular income, financial literacy, health and positive economic outlook.	5,612	0	1	-2.255	2.333
Parental teaching						
Allowance	Binary dummy (1 = received allowance from parents between 8 and 12 years of age, 0 = otherwise)	5,612	0.494	0.500	0	1
Chores	Binary dummy (1 = did little household chores for which (s)he received money from parents between 8 and 12 years of age, 0 = otherwise)	5,612	0.319	0.466	0	1
Spend	Binary dummy (1 = could spend (part of) money as pleased between 8 and 12 years old, 0 = otherwise)	5,612	0.463	0.499	0	1
Job	Binary dummy (1 = had a few of many jobs on the side between 12 and 16 years of age, 0 = otherwise)	5,612	0.386	0.487	0	1
Advice	Binary dummy (1 = (grand)parents taught how to budget between 12 and 16 years of age, 0 = otherwise)	5,612	0.489	0.500	0	1
Stimulated to save	Binary dummy (1 = (grand)parents stimulated to save between the age of 12 and 16, 0 = otherwise)	5,612	0.594	0.491	0	1
PC_childhood	Standardized principal component based on allowance, chores, spend, job, advice and stimulated to save.	5,612	0	1	-1.405	1.908
PC_advice_adulthood	Standardized principal component based on allowance, chores, spend, job, advice and stimulated to save.	5,612	0	1	-1.398	1.175

Variable name	**Description**	N	Mean	Sd	Min	Max
Household administration skills						
Keep track	How well do you keep track of your (household) expenditures? From 1 (don't keep track to 5 I keep very good track	5,612	3.483	1.108	1	5
Control	Do you find it easy or difficult to control your expenditures? From 1 very easy to 7 very difficult	5,612	2.738	1.439	1	7
Purposes	Binary dummy (1 = put money aside for particular purposes, 0 = otherwise)	5,612	0.347	0.476	0	1
PC_managing_expenditures	Standardized principal component based on keep track, control and purposes.	5,612	0	1	-1.696	3.456
PC_particular_purposes	Standardized principal component based on keep track, control and purposes.	5,612	0	1	-1.791	2.540

Variable name	Description	N	Mean	Sd	Min	Max
Personality factors						
Future	Average of the following statements: 1) I think about how things can change in the future, and try to influence those things in my everyday life.', 2) 'I often work on things that will only pay off in a couple of years.', 3) 'I am only concerned about the present, because I trust that things will work themselves out in the future.' (R), 4) 'With everything I do, I am only concerned about the immediate consequences (say a period of a couple of days or weeks). (R), 5) 'I am willing to sacrifice my well-being in the present to achieve certain goals in the future.', 6) 'I think it is important to take warnings about negative consequences of my acts seriously, even if these negative consequences would only occur in the distant future.', 7) I think it is more important to work on things that have important consequences in the future, than to work on things that have immediate but less important consequences., 8) 'In general, I ignore warnings about future problems because I think these problems will be solved before they get critical.' (R), 9) 'I think there is no need to sacrifice things now for problems that lie in the future, because it will always be possible to solve these future problems later.' (R), 10) 'I only respond to urgent problems, trusting that problems that come up later can be solved in a later stage.' (R).	5,612	4.191	0.824	1	7
Time horizon	Which of the time-horizons mentioned below is in your household most important with regard to planning expenditures and savings? 1) the next couple of months, 2) the next year, 3) the next couple of years, 4) the next 5 to 10 years, 5) more than 10 years from now.	5,612	2.337	1.145	1	5

Variable name	Description	N	Mean	Sd	Min	Max
Chance	Average of the following statements: 1) 'There is little one can do to prevent poverty.', 2) 'Becoming rich has nothing to do with luck.', 3) 'Regarding money, there isn't much you can do for yourself when you are poor.', 4) 'It's not always wise for me to save because many things turn out to be a matter of good or bad fortune.', 5) 'It is chiefly a matter of fate whether I become rich or poor.', 6) 'Only those who inherit or win money can possible become rich.'.	5,612	3.370	0.873	1	7
Internal	Average of the following statements: 1) 'Saving and careful investing is a key factor in becoming rich.', 2) 'Whether or not I get to become wealthy depends mostly on my ability.', 3) 'In the long run, people who take very good care of their finances stay wealthy.', 4) 'If I become poor, it's usually my own fault.', 5) 'I am usually able to protect my personal interests.', 6) 'When I get what I want, it's usually because I worked hard for it.', 7) 'My life is determined by my own actions.'.	5,612	4.499	0.819	1	7
Organized	Average of the following statements: 1) 'I do chores right away.', 2) 'I'll leave my things lying around.' (R), 3) 'I live my life according to schedules.', 4) 'I neglect my obligations.' (R), 5) 'I pay attention to details.', 6) 'I am accurate in my work.', 7) 'I forget to put things back where they belong.' (R), 8) 'I am always well prepared.', 9) 'I often make a mess of things.' (R), 10) I like order.	5,612	3.694	0.596	1.200	5
PC_future_orientation	Standardized principal component based on future, time horizon, chance, internal and organized.	5,612	0	1	-3.307	3.042
PC_influence	Standardized principal component based on future, time horizon, chance, internal and organized.	5,612	0	1	-3.904	3.687

Variable name	Description	N	Mean	Sd	Min	Max
Social circle						
Environment saves	Most people in my environment are saving money, from 1 totally disagree to 7 totally agree	5,612	4.218	1.173	1	7
Relative standing	Average of the following statements: 1) 'I think I have more assets than others in my environment.', 2) 'Other people in my environment have more money to spend than I.' (R), 3) 'If I compare myself with my friends, I think in general I am financially better off.', 4) 'I can spend more on durable consumer goods than others in my environment.'.	5,612	3.785	0.995	1	7
Financial advice	Binary dummy (1 = parents friends or acquiantances are the most important source of advice when making financial decisions, 0 = otherwise)	5,612	0.213	0.410	0	1
Borrow	Binary dummy (1 = currently in the position to borrow a substantail sum of money from family or friends, 0 = otherwise).	5,612	0.303	0.460	0	1
PC_environment	Standardized principal component based on environment saves, relative standing, financial advice and borrow.	5,612	0	1	-2.835	3.248
PC_relative_standing	Standardized principal component based on environment saves, relative standing, financial advice and borrow.	5,612	0	1	-2.751	3.362
Controls						
Age	Age in years	5,612	54.943	14.261	22	93
Male	Binary dummy (1 = male, 0 = female)	5,612	0.579	0.494	0	1

Variable name	Description	N	Mean	Sd	Min	Max
Risk aversion	Average of the following statements: 1) 'I think it is more important to have safe investments and guaranteed returns, than to take a risk to have a chance to get the highest possible returns.', 2) 'I do not invest in shares, because I find this too risky.', 3) 'If I think an investment will be profitable, I am prepared to borrow money to make this investment.' (R), 4) 'I want to be certain that my investments are safe.', 5) 'If I want to improve my financial position, I should take financial risks.' (R), and 6) 'I am prepared to take the risk to lose money, when there is also a chance to gain money.' (R).	5,612	5.352	1.021	1.333	7
Education	Binary dummy (1 = succesfully completed higher vocational education and/or university education, 0 = otherwise).	5,612	0.395	0.489	0	1
Hhsize	Number of household members	5,612	2.362	1.177	1	7
Log (net income)	Logarithm of net income	5,612	9.741	1.010	6.157	10.777
Employment	Binary dummy (1 = has a paid job, 0 = otherwise)	5,612	0.512	0.500	0	1
Crisis	Binary dummy (1= year is 2007, 2008, 2009, 2010, 0 = otherwise)	8,768[a]	0.540	0.498	0	1

This table reports the number of observations (N), mean, standard deviation (sd), minimum (min), and maximum (max) of the variables used in this study. (R) indicates that the coding is reversed. [a] is based on the observations included in the having specific specification including all years (column 1 in Table E.4.1).

Appendix B.4 Principal component analysis on all variables simultaneously

Table B.4.1 Rotated principal component loadings

	PC 1	PC 2	PC 3	PC 4	PC 5	PC 6	PC 7	PC 8	Uniqueness
Account	-0.098	0.040	0.052	-0.010	0.032	0.839	0.007	-0.102	0.271
Financial literacy	0.273	0.105	0.039	0.084	0.284	0.640	0.041	0.222	0.364
Urban	0.030	0.253	-0.137	0.075	-0.073	0.194	-0.039	-0.570	0.542
Health	0.306	-0.013	0.083	0.465	0.060	-0.048	-0.251	0.257	0.549
Positive economic outlook	0.698	0.052	0.054	0.109	0.005	-0.030	0.151	-0.060	0.468
Regular income	0.502	-0.127	0.178	0.050	-0.123	-0.079	-0.253	0.037	0.611
Allowance	0.017	0.876	0.181	0.095	-0.013	0.046	0.021	-0.060	0.185
Chores	0.021	0.584	0.090	0.027	0.074	-0.149	0.019	0.443	0.426
Spend	0.006	0.846	0.006	-0.014	-0.030	0.073	0.021	-0.001	0.277
Job	-0.148	0.269	0.045	0.299	-0.120	0.121	-0.002	0.543	0.490
Advice	0.016	0.183	0.892	0.061	0.029	0.019	0.022	0.028	0.164
Stimulated to save	0.057	0.011	0.922	0.036	-0.003	0.033	0.059	0.028	0.141
Keep track	0.073	-0.026	-0.029	-0.151	0.759	0.255	0.024	-0.055	0.327
Control	-0.670	0.057	-0.051	0.063	-0.297	-0.114	-0.018	0.089	0.432
Purposes	-0.288	0.205	0.061	0.112	0.484	-0.226	0.022	0.100	0.564
Future	-0.008	0.065	0.112	0.125	0.123	0.117	0.742	-0.036	0.386
Time horizon	0.220	-0.008	0.042	-0.068	-0.066	-0.085	0.717	0.109	0.407
Internal	0.217	0.008	0.063	0.443	0.126	0.081	0.267	0.043	0.657
Chance	-0.321	-0.137	-0.016	-0.374	0.004	-0.125	-0.157	0.017	0.697
Organized	0.148	-0.092	0.078	0.122	0.646	-0.008	0.051	0.069	0.524
Environment saves	-0.020	-0.024	0.233	0.531	0.014	-0.076	0.221	-0.143	0.587
Relative standing	0.663	0.115	0.014	0.122	-0.018	-0.010	0.177	0.141	0.481
Financial advice	-0.290	0.077	0.045	0.318	-0.020	-0.327	-0.182	-0.458	0.457
Borrow	0.079	0.240	0.097	0.600	-0.172	0.063	-0.008	0.035	0.533

This table shows rotated prinicipal component loadings based on principal component analysis with varimax rotation of all variables simultaneously. PC stands for principal component.

Table B.4.2 Correlations

	PC_ literacy	PC_ economic	PC_ residence	PC_ childhood	PC_advice_ adulthood	PC_managing expenditures	PC_particular_ purposes	PC_future_ orientation	PC_ influence	PC_ environment	PC_relative_ standing
PC 1	0.094	0.700	0.094	-0.006	0.011	-0.488	-0.408	0.131	0.283	0.120	-0.583
	0.000	0.000	0.000	0.675	0.413	0.000	0.000	0.000	0.000	0.000	0.000
PC 2	0.069	-0.027	0.228	0.938	-0.017	0.045	0.161	0.053	0.002	0.123	-0.051
	0.000	0.046	0.000	0.000	0.193	0.001	0.000	0.000	0.897	0.000	0.000
PC 3	0.029	0.082	-0.088	-0.055	0.976	-0.012	0.009	0.051	0.051	0.146	0.048
	0.027	0.000	0.000	0.000	0.000	0.357	0.524	0.000	0.000	0.000	0.000
PC 4	0.073	0.304	0.005	0.056	0.013	0.112	0.057	0.044	0.468	0.760	0.117
	0.000	0.000	0.707	0.000	0.347	0.000	0.000	0.001	0.000	0.000	0.000
PC 5	0.192	0.011	-0.130	-0.013	0.012	-0.624	0.565	-0.096	0.480	-0.080	0.025
	0.000	0.430	0.000	0.316	0.391	0.000	0.000	0.000	0.000	0.000	0.065
PC 6	0.867	-0.137	0.170	0.003	0.037	-0.202	-0.141	0.030	0.107	-0.067	-0.204
	0.000	0.000	0.000	0.832	0.005	0.000	0.000	0.023	0.000	0.000	0.000
PC 7	0.069	-0.169	0.013	0.021	0.047	-0.041	-0.001	0.896	0.146	0.126	-0.222
	0.000	0.000	0.323	0.108	0.001	0.002	0.939	0.000	0.000	0.000	0.000
PC 8	0.085	0.105	-0.620	0.215	-0.023	0.114	0.073	0.014	0.007	-0.165	-0.364
	0.000	0.000	0.000	0.000	0.081	0.000	0.000	0.298	0.583	0.000	0.000

This table shows pairwise correlations between the principal components as well as the significance level. The number of observation is 5,612.

Appendix C.4 Random effects probit models

Table C.4.1 Having saved in the past year

	1	2	3	4	5	6	7
	Having saved	Having saved	Having saved	Having saved	Having saved	Having saved	Having saved
Age	-0.006	-0.006	-0.005	-0.009*	-0.004	-0.002	-0.004
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Male	-0.306***	-0.323***	-0.294***	-0.322***	-0.322***	-0.337***	-0.315***
	(0.11)	(0.10)	(0.11)	(0.11)	(0.10)	(0.10)	(0.10)
Risk aversion	0.111***	0.108***	0.110***	0.102**	0.106***	0.130***	0.108***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Education	0.428***	0.291***	0.401***	0.388***	0.274**	0.288***	0.128
	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.11)	(0.10)
Log(net income)	0.138***	0.129***	0.142***	0.140***	0.113**	0.099**	0.094**
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Hhsize	-0.085*	-0.078*	-0.083*	-0.066	-0.076	-0.095**	-0.075
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Employment status	0.343***	0.194*	0.336***	0.382***	0.351***	0.324***	0.234**
	(0.12)	(0.11)	(0.12)	(0.12)	(0.12)	(0.11)	(0.11)
PC_literacy		0.059					-0.034
		(0.04)					(0.04)
PC_economic		0.446***					0.365***
		(0.04)					(0.04)
PC_residence		0.051					0.084
		(0.06)					(0.06)
PC_childhood			-0.020				-0.070
			(0.06)				(0.05)
PC_advice_adulthood			0.230***				0.108**
			(0.05)				(0.05)
PC_managing_expenditures				-0.305***			-0.197***
				(0.04)			(0.04)
PC_particular_purposes				0.021			0.06
				(0.04)			(0.03)
PC_future_orientation					0.274***		0.209***
					(0.04)		(0.04)
PC_influence					0.232***		0.081**
					(0.04)		(0.04)
PC_environment						0.342***	0.273***
						(0.04)	(0.04)
PC_relative_standing						-0.281***	-0.185***
						(0.04)	(0.04)
Constant	0.296	0.635	0.149	0.410	0.544	0.367	0.825
	(0.85)	(0.79)	(0.84)	(0.83)	(0.86)	(0.82)	(0.81)
P-value F-test		0.000	0.000	0.000	0.000	0.000	

This table shows random effects probit estimates with *having saved* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table C.4.2 Planning to save

	1	2	3	4	5	6	7
	Planning to save	Planning to save	Planning to save	Planning to save	Planning to save	Planning to save	Planning to save
Age	-0.019***	-0.019***	-0.018***	-0.020***	-0.017***	-0.014***	-0.013***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Male	-0.156	-0.185*	-0.141	-0.161	-0.174*	-0.177*	-0.159
	(0.11)	(0.10)	(0.10)	(0.11)	(0.10)	(0.10)	(0.10)
Risk aversion	0.136***	0.140***	0.136***	0.132***	0.128***	0.160***	0.151***
	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)
Education	0.301***	0.159	0.273**	0.297***	0.161	0.171*	0.025
	(0.11)	(0.10)	(0.11)	(0.11)	(0.104)	(0.10)	(0.10)
Log(net income)	0.069	0.052	0.073	0.073	0.05	0.031	0.013
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Hhsize	-0.025	-0.010	-0.024	-0.022	-0.019	-0.035	-0.015
	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Employment status	0.372***	0.200*	0.359***	0.383***	0.384***	0.348***	0.207*
	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.12)	(0.11)
PC_literacy		0.108***					0.061
		(0.04)					(0.04)
PC_economic		0.504***					0.444***
		(0.04)					(0.04)
PC_residence		0.137**					0.168***
		(0.05)					(0.05)
PC_childhood			-0.027				-0.070
			(0.05)				(0.05)
PC_advice_adulthood			0.220***				0.103**
			(0.05)				(0.05)
PC_managing_expenditures				-0.130***			0.023
				(0.04)			(0.04)
PC_particular_purposes				0.075**			0.111***
				(0.04)			(0.04)
PC_future_orientation					0.198***		0.157***
					(0.04)		(0.04)
PC_influence					0.276***		0.148***
					(0.04)		(0.04)
PC_environment						0.393***	0.314***
						(0.04)	(0.04)
PC_relative_standing						-0.233***	-0.136***
						(0.04)	(0.04)
Constant	2.255***	2.632***	2.137**	2.223***	2.534***	2.130***	2.700***
	(0.83)	(0.80)	(0.83)	(0.82)	(0.89)	(0.82)	(0.84)
P-value F-test		0.000	0.000	0.001	0.000	0.000	

This table shows random effects probit estimates with *planning to save* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Appendix D.4 Using the variables underlying the principal components

Table D.4.1 Having saved in the past year

	1	2	3	4	5	6
	Having saved	Having saved	Having saved	Having saved	Having saved	Having saved
Account	-0.037**					-0.025
	(0.02)					(0.02)
Financial literacy	0.018					-0.004
	(0.01)					(0.01)
Urban	-0.008					-0.005
	(0.01)					(0.01)
Health	0.029**					0.008
	(0.01)					(0.01)
Positive economic	0.265***					0.198***
outlook	(0.02)					(0.02)
Regular income	0.169***					0.140***
	(0.03)					(0.03)
Allowance		0.023				0.009
		(0.03)				(0.02)
Chores		-0.017				-0.028
		(0.02)				(0.02)
Spend		-0.037				-0.035*
		(0.02)				(0.02)
Job		-0.001				-0.004
		(0.02)				(0.02)
Advice		0.015				-0.004
		(0.02)				(0.02)
Stimulated to save		0.082***				0.045**
		(0.02)				(0.02)
Keep track			-0.027***			-0.020***
			(0.01)			(0.01)
Control			-0.084***			-0.047***
			(0.01)			(0.01)
Purposes			0.098***			0.103***
			(0.02)			(0.02)
Future				0.010		0.011
				(0.01)		(0.01)
Time horizon				0.040***		0.025***
				(0.01)		(0.01)
Internal				0.040***		0.008
				(0.01)		(0.01)
Chance				-0.009***		-0.003
				(0.00)		(0.00)
Organized				0.026*		-0.001
				(0.01)		(0.01)
Environment saves					0.055***	0.038***
					(0.01)	(0.01)
Relative standing					0.091***	0.039***
					(0.01)	(0.01)
Financial advice					-0.002	0.015
					(0.02)	(0.02)
Borrow					0.033*	0.022
					(0.02)	(0.02)
Controls	YES	YES	YES	YES	YES	YES
Adjusted R-squared	0.122	0.033	0.093	0.056	0.085	0.188
P-value F-test	0.000	0.001	0.000	0.000	0.000	

This table shows regression estimates with *having saved* as dependent variable. All specifications include control variables (*age, male, risk aversion, education, hhsize, log(net income)* and *employment*) and province-time dummies. The standard errors are clustered at the household level. For brevity, the control variables are not displayed. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table D.4.2 Amount saved in the past year

	1	2	3	4	5	6
	Amount saved	Amount saved	Amount saved	Amount saved	Amount saved	Amount saved
Account	-849.833***					-415.595
	(281.22)					(262.40)
Financial literacy	988.412***					661.551***
	(177.11)					(174.35)
Urban	-70.068					-88.967
	(99.72)					(96.44)
Health	136.142					7.841
	(196.71)					(173.19)
Positive economic outlook	3,436.014***					2,701.055***
	(951.44)					(462.52)
Regular income	-148.604					-280.425
	(780.88)					(587.31)
Allowance		142.331				262.283
		(299.63)				(269.99)
Chores		321.079				123.599
		(258.37)				(244.91)
Spend		-150.079				-532.213**
		(304.22)				(258.59)
Job		-193.514				-232.468
		(240.59)				(225.70)
Advice		531.428*				366.374
		(275.15)				(256.44)
Stimulated to save		-817.043*				-574.010**
		(440.37)				(272.90)
Keep track			-385.730***			-426.197***
			(140.71)			(112.85)
Control			-1,170.347***			-305.018**
			(296.21)			(130.56)
Purposes			-367.912			-335.838
			(409.03)			(298.15)
Future				33.388		106.829
				(147.74)		(143.88)
Time horizon				786.890***		606.801***
				(163.90)		(109.83)
Internal				288.039		-118.029
				(191.16)		(143.48)
Chance				-53.070		4.433
				(36.19)		(22.64)
Organized				224.070		8.162
				(212.20)		(192.02)
Environment saves					251.526	82.355
					(188.73)	(119.66)
Relative standing					2,028.891***	1,253.476***
					(285.39)	(142.35)
Financial advice					-768.060***	-415.259
					(277.83)	(271.98)
Borrow					691.732***	512.290**
					(265.22)	(241.50)
Lambda	866.956	-2,326.633	3,346.835	304.659	2,702.559	1,349.496
	(2,312.49)	(2,704.67)	(2,266.63)	(2,267.28)	(1,988.91)	(1,334.75)
Adjusted R^2	0.103	0.042	0.062	0.061	0.096	0.142
P-value F-test	0.000	0.157	0.000	0.000	0.000	

This table shows the results of a two step Heckman model. The identifying variable in the first step is *employment status*. The inverse Mills ratio from the first step is included in the second step (Lambda). All estimates are from the second step of the methodology. All specifications include control variables (*age, male, risk aversion, education, hhsize* and *log(net income)*) and province-time dummies. For brevity, the control variables are not displayed. The number of observations equal 3,875. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table D.4.3 Net wealth

	1	2	3	4	5	6
	Net wealth	Net wealth	Net wealth	Net wealth	Net wealth	Net wealth
Account	10,568.979***					12,437.923***
	(1,690.84)					(1,746.91)
Financial literacy	7,203.451***					5,088.512***
	(1,219.93)					(1,181.30)
Urban	-1,463.019*					-1,032.966
	(813.59)					(778.09)
Health	-989.826					-1,957.151*
	(1,248.70)					(1,164.62)
Positive economic outlook	13,984.794***					7,518.470***
	(1,632.00)					(1,542.93)
Regular income	3,954.788					1,372.670
	(2,465.33)					(2,328.94)
Allowance		3,048.117				1,584.910
		(2,469.65)				(2,185.59)
Chores		-3,192.580				-3,272.864*
		(2,087.06)				(1,898.03)
Spend		875.696				-267.501
		(2,417.09)				(2,190.65)
Job		-1,462.979				-2,247.902
		(2,136.41)				(1,839.39)
Advice		2,055.670				1,482.472
		(2,312.18)				(2,069.81)
Stimulated to save		3,544.449				512.528
		(2,285.04)				(2,069.42)
Keep track			-941.357			-2,394.043***
			(811.48)			(782.02)
Control			-4,761.497***			-1,932.556***
			(491.78)			(488.83)
Purposes			-8,473.264***			-7,584.142***
			(1,465.71)			(1,392.78)
Future				3,077.595***		2,803.378***
				(1,077.23)		(970.64)
Time horizon				4,095.164***		2,867.949***
				(691.33)		(641.60)
Internal				3,778.085***		1,410.705
				(936.23)		(887.91)
Chance				-641.361***		-266.385*
				(160.08)		(152.90)
Organized				-68.654		-1,760.985
				(1,418.31)		(1,366.83)
Environment saves					1,270.485**	390.186
					(611.32)	(588.24)
Relative standing					9,286.463***	6,237.753***
					(882.21)	(849.39)
Financial advice					-8,583.368***	-5,371.097***
					(1,289.50)	(1,230.61)
Borrow					1,366.234	430.386
					(1,785.69)	(1,654.07)
Adjusted R-squared	0.216	0.155	0.186	0.188	0.211	0.282
P-value F-test	0.000	0.075	0.000	0.000	0.000	

This table shows regression estimates with *net wealth* as dependent variable. All specifications include control variables (*age, male, risk aversion, education, hhsize, log(net income)* and *employment*) and province-time dummies. For brevity, the control variables are not displayed. The standard errors are clustered at the household level. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table D.4.4 Planning to save

	1	2	3	4	5	6
	Planning to save	Planning to save	Planning to save	Planning to save	Planning to save	Planning to save
Account	-0.009					-0.003
	(0.01)					(0.01)
Financial literacy	0.002					-0.001
	(0.01)					(0.01)
Urban	-0.003					-0.001
	(0.01)					(0.01)
Health	0.022*					0.011
	(0.01)					(0.01)
Positive economic outlook	0.252***					0.222***
	(0.01)					(0.01)
Regular income	0.108***					0.096***
	(0.03)					(0.03)
Allowance		0.015				0.002
		(0.02)				(0.02)
Chores		-0.004				-0.008
		(0.02)				(0.02)
Spend		-0.027				-0.025
		(0.02)				(0.02)
Job		0.002				-0.003
		(0.02)				(0.01)
Advice		0.001				-0.010
		(0.02)				(0.02)
Stimulated to save		0.079***				0.048***
		(0.02)				(0.02)
Keep track			-0.022***			-0.020***
			(0.01)			(0.01)
Control			-0.040***			-0.004
			(0.01)			(0.01)
Purposes			0.072***			0.076***
			(0.01)			(0.01)
Future				0.024**		0.023***
				(0.01)		(0.01)
Time horizon				0.018***		0.009
				(0.01)		(0.01)
Internal				0.040***		0.016*
				(0.01)		(0.01)
Chance				-0.006***		-0.003*
				(0.00)		(0.00)
Organized				0.012		0.003
				(0.01)		(0.01)
Environment saves					0.044***	0.029***
					(0.01)	(0.01)
Relative standing					0.065***	0.028***
					(0.01)	(0.01)
Financial advice					0.009	0.021
					(0.02)	(0.02)
Borrow					0.035**	0.020
					(0.01)	(0.01)
Adjusted R-squared	0.134	0.039	0.054	0.056	0.076	0.170
P-value F-test	0.000	0.001	0.000	0.000	0.000	

This table shows regression estimates with *planning to save* as dependent variable. All specifications include control variables (*age, male, risk aversion, education, hhsize, log(net income)* and *employment*) and province-time dummies. For brevity, the control variables are not displayed. The standard errors are clustered at the household level. The line p-value F-test shows the p-value of the F-test whether all variables belonging to a dimension are jointly significant. All specifications include 5,612 observations. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Appendix E.4 Extending the sample period to 2005-2015

Table E.4.1 Having saved in the past year

	1	2	3	4
	Having saved	Having saved	Having saved	Having saved
Age	-0.000	-0.000	-0.001	-0.001
	(0.00)	(0.00)	(0.00)	(0.00)
Male	-0.052***	-0.049**	-0.056***	-0.056***
	(0.02)	(0.02)	(0.02)	(0.02)
Risk aversion	0.024***	0.025***	0.021**	0.021**
	(0.01)	(0.01)	(0.01)	(0.01)
Education	0.063***	0.068***	0.057***	0.057***
	(0.02)	(0.02)	(0.02)	(0.02)
Log(net income)	0.036***	0.038***	0.033***	0.033***
	(0.01)	(0.01)	(0.01)	(0.01)
Hhsize	-0.005	-0.004	-0.006	-0.006
	(0.01)	(0.01)	(0.01)	(0.01)
Employment status	0.071***	0.068***	0.077***	0.077***
	(0.02)	(0.03)	(0.02)	(0.02)
Age*Crisis				0.000
				(0.00)
Male*Crisis				0.006
				(0.02)
Risk aversion*Crisis				0.004
				(0.01)
Education*Crisis				0.010
				(0.02)
Log(net income)*Crisis				0.006
				(0.01)
Hhsize*Crisis				0.002
				(0.01)
Employment status*Crisis				-0.010
				(0.03)
Observations	8,768	4,735	4,033	8,768
Adjusted R-squared	0.025	0.027	0.022	0.025
Period		Crisis	Non-Crisis	

This table shows regression estimates with *having saved* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table E.4.2 Amount saved in the past year

	1	2	3	4
	Amount saved	Amount saved	Amount saved	Amount saved
Employment status				
Age	10.980	12.009	5.674	26.436*
	(10.46)	(16.52)	(15.24)	(13.61)
Male	401.840	741.170	91.828	547.479
	(293.52)	(489.33)	(407.99)	(384.24)
Risk aversion	-255.787*	-565.551**	64.398	-136.737
	(131.48)	(224.03)	(178.78)	(168.10)
Education	1,168.940***	698.161	1,537.535***	1,038.776***
	(306.71)	(544.14)	(399.11)	(366.08)
Log(net income)	874.441***	392.187	1,345.440***	863.456***
	(239.86)	(408.67)	(321.53)	(276.72)
Hhsize	24.555	-67.219	82.882	140.569
	(89.47)	(148.76)	(125.83)	(128.21)
Age*Crisis				-30.060**
				(14.78)
Male*Crisis				-251.241
				(455.76)
Risk aversion*Crisis				-204.921
				(195.45)
Education*Crisis				262.522
				(409.05)
Log(net income)*Crisis				20.838
				(261.96)
Hhsize*Crisis				-235.617
				(175.75)
Lambda	-3,172.679	-9,265.211**	2,993.086	-3,057.176
	(2,534.37)	(4,390.30)	(3,297.92)	(2,506.78)
Observations	6046	3,296	2,750	6046
Adjusted R-squared	0.035	-0.006	0.009	0.034
Period		Crisis	Non-Crisis	

This table shows regression estimates with *amount saved* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level. The negative adjusted R^2 in the second column is due to a small R^2 and a high variable to sample size ratio.

Table E.4.3 Net wealth

	1	2	3	4
	Net wealth	Net wealth	Net wealth	Net wealth
Age	621.175***	674.495***	575.150***	575.150***
	(73.93)	(90.29)	(73.54)	(73.57)
Male	5,234.138***	6,453.318***	3,882.264**	3,882.264**
	(1,809.85)	(2,045.38)	(1,872.10)	(1,872.89)
Risk aversion	-3,002.053***	-2,493.801***	-3,616.976***	-3,616.976***
	(787.33)	(915.81)	(821.89)	(822.23)
Education	10,560.446***	11,411.775***	9,501.742***	9,501.742***
	(1,949.86)	(2,230.17)	(1,925.48)	(1,926.28)
Log(net income)	10,150.732***	9,684.569***	10,661.448***	10,661.448***
	(1,016.24)	(1,178.94)	(1,044.38)	(1,044.81)
Hhsize	138.342	188.769	45.758	45.758
	(710.91)	(843.48)	(695.40)	(695.69)
Employment status	-2,635.791	-420.534	-4,743.220**	-4,743.220**
	(2,100.12)	(2,681.74)	(2,104.49)	(2,105.37)
Age*Crisis				99.345
				(72.21)
Male*Crisis				2,571.053*
				(1,528.36)
Risk aversion*Crisis				1,123.175
				(760.14)
Education*Crisis				1,910.033
				(1,524.23)
Log(net income)*Crisis				-976.879
				(928.17)
Hhsize*Crisis				143.012
				(615.74)
Employment status*Crisis				4,322.687*
				(2,363.89)
Observations	7,350	3,934	3,416	7,350
Adjusted R-squared	0.169	0.165	0.172	0.169
Period		Crisis	Non-Crisis	

This table shows regression estimates with *net wealth* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

Table E.4.4 Planning to save

	1	2	3	4
	Planning to save	Planning to save	Planning to save	Planning to save
Age	-0.002***	-0.002**	-0.003***	-0.003***
	(0.00)	(0.00)	(0.00)	(0.00)
Male	-0.037***	-0.030*	-0.046***	-0.046***
	(0.01)	(0.02)	(0.02)	(0.02)
Risk aversion	0.023***	0.024***	0.021***	0.021***
	(0.01)	(0.01)	(0.01)	(0.01)
Education	0.036**	0.041**	0.030*	0.030*
	(0.01)	(0.02)	(0.02)	(0.02)
Log(net income)	0.017**	0.013	0.022**	0.022**
	(0.01)	(0.01)	(0.01)	(0.01)
Hhsize	0.001	0.003	-0.002	-0.002
	(0.01)	(0.01)	(0.01)	(0.01)
Employment status	0.062***	0.066***	0.059***	0.059***
	(0.02)	(0.02)	(0.02)	(0.02)
Age*Crisis				0.001
				(0.00)
Male*Crisis				0.016
				(0.02)
Risk aversion*Crisis				0.003
				(0.01)
Education*Crisis				0.011
				(0.02)
Log(net income)*Crisis				-0.009
				(0.01)
Hhsize*Crisis				0.006
				(0.01)
Employment status*Crisis				0.008
				(0.02)
Observations	8,642	4,674	3,968	8,642
Adjusted R-squared	0.033	0.030	0.035	0.033
Period		Crisis	Non-Crisis	

This table shows regression estimates with *planning to save* as dependent variable. All specifications include province-time dummies and the standard errors are clustered at the household level. *** denotes significance at the 1% level, ** at the 5% level and * at the 10% level.

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