Agony of Choice – Trading off Stability and Competition in the Banking Markets

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Michael Hellwig* Falk Hendrik Laser†

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Abstract: We investigate the trade-off between financial stability and competition policy by focusing on the merger of ABN AMRO and Fortis Bank NL in the Dutch retail banking market. The financial crisis delayed the completion of the merger giving rise to anti-competitive behavior in the transitory period. Based on a structural model we simulate interest rates for savings accounts treating the banks as two separate entities despite a factually combined ownership. Our analysis builds on representative data on Dutch consumer choice for savings accounts conditional on individual choice sets and product characteristics covering the time period from 2008 to 2010. We model the demand for savings accounts as discrete choice for differentiated products using a random-coefficients logit model. On the supply side we assume Bertrand Nash competition in a multiproduct oligopoly. Our results indicate anti-competitive effects in terms of too low interest rates. To the best of our knowledge we are the first to apply merger simulation methods in the context of banking using disaggregated data.

JEL: D22, G21, G34, L11, L25, L40, L41

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*ZEW – Leibniz Centre for European Economic Research and MaCCI Mannheim Centre for Competition and Innovation, Address: P.O. Box 10 34 43, D-68034 Mannheim, Germany, E-Mail: hellwig@zew.de

†Goethe University Graduate School of Economics, Finance and Management (GSEFM) and Technische Universität Darmstadt, Department of Law and Economics, Address: Hochschulstraße 1, D-64289 Darmstadt, Germany, E-Mail: laser@vwl.tu-darmstadt.de

1 Introduction

In practice competition policy often involves a trade-off between different policy goals. While policy makers often put forward the protection of jobs,[1] in banking the stabilization of financial markets is a main policy goal and especially was during the recent financial crisis. Allowing market consolidation through mergers served as a measure to mitigate the adverse effects of the financial crisis in several cases (e.g. JPMorgan Chase and Bear Stearns, or Bank of America and Merril Lynch in the U.S.; Lloyds and HBOS in the U.K.; and mergers among Landesbanken in Germany). Yet, such measures were highly controversial. For instance, the Office of Fair Trading objected to the merger of HBOS and Lloyds voicing concerns about the greater than 30 % market share of the new entity and the elimination of HBOS as a challenger to the four larger established banks. The Secretary of State, however, overruled the objection, which was in line with the Bank of England, the Financial Services Authority and the Treasury stressing the necessity to maintain financial stability (Vives, 2016). This example illustrates the dilemma policy makers can find themselves in. While mergers might be instrumented to mitigate the effects of financial crises, interventions could result in harmful increases of market power.

In this paper, we investigate the trade-off between financial stability and competition policy by focusing on the merger of ABN AMRO and Fortis Bank NL in the Dutch financial sector. This is a particularly interesting case. Being one of the largest bank takeovers in recent years financial stability concerns prompted policy makers to engage in substantial market interventions involving state aid and allowing a merger in an already concentrated market.

Initially, a consortium of Royal Bank of Scotland, Fortis (referring to the mother company), and Banco Santander purchased ABN AMRO for 71.1 billion euro in October 2007. Fortis was supposed to take over the business unit Netherlands amongst others. Yet, when the financial crisis hit the international financial markets in 2008, Fortis

[1] See, e.g., the *EDEKA/Kaiser's Tengelmann* merger in the German supermarket sector in 2015. Although the merger had been prohibited by the German Federal Cartel Office, the German Minister of Economic Affairs issued a ministerial authorization conditionally clearing the merger arguing that job security prevails over the expected restraints on competition.

faced serious difficulties raising capital and, eventually, needed to be nationalized by the Netherlands, Belgium and Luxembourg. The Dutch state purchased the Dutch business of Fortis in October 2008 including the Dutch activities of ABN AMRO. Willing to finalize the intended merger regarding the Dutch activities, the Dutch state provided liquidity facilities so that ABN AMRO and Fortis Bank NL (referring to the Dutch business unit of Fortis) finally merged under ABN AMRO in July 2010. The European Commission (EC) concluded in April 2011 that the capitalization measures constitute state aid but approved them subject to a set of conditions involving restrictions on price leadership for standardized savings and mortgage products.

While these restrictions were intended to lessen anti-competitive behavior from then on, potentially anti-competitive effects in the transitory period went unaddressed. Even though the merger was not officially effective, both parties were relatively certain to eventually merge given the consent of the Dutch government in November 2008 (European Commission, 2011, p. 8). That is, anticipating the merger, both entities might have colluded on pricing also in the Dutch retail banking market – a sector in which the EC did not see any anti-competitive effects when clearing the initial merger.[2]

In our analysis, we therefore focus on the Dutch market for savings accounts and investigate whether ABN AMRO and Fortis Bank NL exerted market power in the transitory period between the originally intended and officially completed merger. We build a model to simulate counterfactual scenarios of the merger. Specifically, we assume that ABN AMRO and Fortis Bank NL actually behave according to a combined ownership already before the official consummation of the merger (and before the potential realization of accompanying cost savings) and compute interest rates for savings accounts in the years 2008 to 2010 treating them as two separate entities.

We model demand for savings accounts as discrete choice for a differentiated goods by identifying the consumers' main savings decision on the market for savings accounts. Thereby, we employ a disaggregated approach taking into account the characteristics

[2]In its merger decision in October 2007, the EC only concluded that the merger would substantially increase concentration in an already concentrated Dutch commercial banking market as the acquisition would unite the first (ABN AMRO) and the fourth largest bank (Fortis Bank NL) thus clearing the merger conditional on divestment requirements.

of both products and consumers. The supply side is modeled assuming Bertrand Nash competition in a multiproduct oligopoly. Calibrating the model with demand-side estimates derived from a random-coefficients logit model allows us to simulate bank behavior in counterfactual scenarios. By making adjustments to the ownership structure in the model we are able to predict the pricing behavior of banks in the what-if scenario in which the two banks operated under complete separate ownership.

Our empirical analysis draws on the representative DNB Household Survey (DHS) containing detailed yearly information on the saving behavior of more than 2,000 Dutch households. We merge the survey data with product information on savings accounts including interest rates and account restrictions retrieved from price comparison websites specialized on Dutch saving products.[3] Our data covers the time period from 2008 to 2010 and enables us to observe consumer choice conditional on relevant product characteristics and the corresponding individual choice sets over time.

We predict that the merger had a significant effect on interest rates in the market. As a single entity ABN AMRO would have had interest rates being 9.9% (2008), 1.7% (2009) and 3% (2010) higher than without collusion. For Fortis Bank NL we predict a change of 25.2% (2008), -7.7% (2009) and 5.2% (2010) respectively. On average, most of the remaining market participants would also have priced higher in our demerger scenario, however to a lower extent than ABN AMRO and Fortis Bank NL.

Our results suggest that the *ABN AMRO/Fortis Bank NL* merger could have created anti-competitive effects on the Dutch retail banking market. This raises the notion of taking into account these additional social costs when trading off competition policy against financial stability.

Our paper lies at the overlap of the Empirical Banking literature and the Applied Industrial Organization literature using structural models to conduct counterfactual analyzes. Berry et al. (1995) and Goldberg (1995) provide some comprehensive work on the US car market where the latter investigates the effects of tariffs on the market. More recently an increasing number of studies is dedicated to the banking market. Dick (2008),

[3]We obtain most data from 'SpaarInformatie'. See http://www.spaarinformatie.nl.

for example, uses a structural model to estimate demand for deposit services of U.S. commercial banks and measures the effects of US branching deregulation. Molnar et al. (2013) estimate demand for deposit services in order to test supply models in the Italian retail banking market. Egan et al. (2017) analyze the feedback loop between financial distress and the ability to access (uninsured) deposits in the US. Honka et al. (2017) investigate how advertising influences choice in the US retail banking market. Finally, Crawford et al. (2018) build a comprehensive model to analyze the interactions between asymmetric information and imperfect competition in the Italian lending markets.

Examples for the implementation of merger simulations are Ivaldi and Verboven (2005), Björnerstedt and Verboven (2016) and Molnar (2008). Ivaldi and Verboven (2005) analyse a merger in the European truck market and compare the prediction of the merger simulation to other market power tests. Björnerstedt and Verboven (2016) conduct a merger simulation and ex-post evaluation in the Swedish market for analgesics to test merger simulation as a prediction tool. Molnar (2008) applies merger simulation to the Finish banking market using aggregated data.

While many studies analyzing consumer choice in a discrete choice setting use aggregated data we employ detailed consumer-level data. The use of disaggregated data promises more efficient estimates and is better suited to describe demand choices driven by heterogeneous preferences and general substitution patterns. To the best of our knowledge we are the first to apply merger simulation methods in the context of banking using disaggregated data. We aim to contribute to the understanding of the banking markets given its importance for national economies.

The paper is structured as follows. In the next section we provide background information on the merger between ABN AMRO and Fortis Bank NL and the Dutch banking market. Section 3 introduces the model and the steps we undertake for simulation. In section 4 we describe in detail the compilation of our dataset. Sections 5 and 6 present the estimation and our results respectively. The last section 7 summarizes and concludes.

2 The merger of ABN AMRO and Fortis Bank NL

The sale of ABN AMRO was initiated by a publicly disclosed letter of the British hedge funds TCI complaining to ABN AMRO about poor share price returns and urging to "actively pursue the potential break up, spin-off, sale or merger."[4] The letter from February 2007 echoed in the media and reinforced discussions and negotiations about a sale of ABN AMRO. After a bidding battle between the British bank Barclays and a consortium of Royal Bank of Scotland, Fortis, and Banco Santander, the majority of ABN AMRO's shareholders accepted the consortium's offer worth 71.1 billion euro in October 2007, making it one of the largest bank takeover until today.

The consortium's plan to split the assets of ABN AMRO assets mentioned Royal Bank of Scotland obtaining the business units Private and Business Clients in Asia, Europe, and North America while Banco Santander received Banco Real and Antonveneta. Fortis obtained the business units Asset Management, Private Banking, and Netherlands which it intended to merge with its own Dutch arm Fortis Bank NL. All cases were subject to merger control by the European Commission (EC).

Regarding the Dutch assets, the EC conditionally cleared the merger between ABN AMRO and Fortis in October 2007. The EC had concerns regarding the Dutch commercial banking market, in which the combination of the first (ABN AMRO) and fourth largest bank (Fortis Bank NL) would significantly increase the already high concentration level (European Commission, 2007). The EC required the sale of several components of the Dutch business unit before the merger could become legal in order to protect corporate customers from reduced competition. The EC, however, did not raise concerns about anti-competitive effects in the similarly concentrated retail banking market due to a modest market share of Fortis Bank NL (being a distant fourth player in terms of market position after ING, Rabobank and ABN AMRO).

During the time of preparing the merger and in the advent of the global financial crisis in 2008, Fortis faced liquidity issues also caused by the high acquisition price for ABN

[4] See http://www.telegraph.co.uk/finance/2804714/Letter-from-TCI-to-ABN-Amro.html, last accessed on February 12, 2019.

AMRO (share of Fortis: 24 billion euro) and needed to be rescued in a combined effort of the three governments of the Netherlands, Belgium and Luxembourg. The Dutch state purchased the Dutch business of Fortis for 16.8 billion euro in October 2008. This also included the stake in the holding of the consortium comprising the Dutch activities of ABN AMRO.

Willing to finalize the intended merger, the Dutch state provided liquidity facilities to implement the separation of the Dutch activities of ABN AMRO from the holding of the consortium and to cover the costs of the EC divestiture-remedy realized as the sale of several components to Deutsche Bank in April 2010. While this resulted in the finalization of the initial merger of Fortis Bank NL and ABN AMRO in July 2010, the capital injections of the Dutch state were subject to state aid investigations by the EC. The EC concluded in April 2011 that the recapitalization measures, which amounted to between 4.2 and 5.45 billion euro (excluding the takeover price),[5] constitute state aid (European Commission, 2011). Yet, the EC acknowledged that the need for supporting the banks rather stemmed from undercapitalization than from excessive risk taking or unsustainable business models thus approving the support package.

The approval, however, was subject to a set of conditions. The conditions included (amongst others) a ban on acquisitions and on advertising state ownership as well as restrictions on price leadership for standardized savings and mortgage products. That is, ABN AMRO is not allowed to offer price conditions which cannot be matched by non-aided competitors. These conditions were set for a duration of three years and would be prolonged to a maximum of five years if the Dutch state continues to hold more than 50% of the ordinary shares after three years. During the state aid investigations, the Dutch state expressed its commitment to a complete exit aiming to recover its initial investment plus funding costs. Despite a successful IPO in November 2015, it still held a 56.3% stake in ABN AMRO by the beginning of 2019.[6] The bans thus only expired in April 2016.

Years after the merger, the Dutch central bank concludes that high concentration is

[5]The purchase price was not considered as representing state aid to the two entities as they did not receive the corresponding money.

[6]See https://www.abnamro.com/en/about-abnamro/our-company/corporate-governance/shareholder-structure/index.html, last accessed on February 12, 2019.

persistent in the market and calls for less dominance of large banks and the necessity to promote the position of small banks and niche players. The central bank mentions the recent mergers in the market (*ABN AMRO/Fortis Bank NL* and *Rabobank/Friesland Bank*) as one source of high concentration (DNB, 2015). Furthermore, the Dutch competition authority finds that the retail banking sector has become less competitive after the financial crisis and identifies the consumers' limited propensity to switch banks (consumer inertia) as another reason for low competitiveness (ACM, 2014).

3 Model

Our structural model builds on demand and supply as two building blocks. We use estimated demand-side parameters to calibrate the model. Making assumptions on joint bank behavior closes the model. With our model we are able to simulate a new equilibrium representing counterfactual conditions. Among retail banking markets, we choose the market for savings accounts to be the relevant market as we can more easily compare between products contrary to other banking products. For instance, term deposits might exhibit different maturities and are thus not easily comparable. Another argument for comparability is that no fees are applied to savings accounts. Furthermore, for savings accounts we can be more confident that consumer choice is driven by a saving motive contrary to checking accounts which also serve to cater transactional purposes (e.g. payments, reference account to receive salary etc.).

3.1 Demand

We use a mixed multinomial logit model (mixed logit model) for the demand side. Assuming a random utility model (RUM) we can interpret the mixed logit model as a random-coefficients model in which the coefficients vary between individuals.

The indirect utility of consumer i for the savings account product j of bank b at time

t can be expressed as

$$\begin{aligned} U_{jt}^{i} &= V_{jt}^{i} + \epsilon_{jt}^{i} \\ &= x_{jt}\beta^{i} + y_{jt}\gamma + \epsilon_{jt}^{i}, \\ i &= 1, ..., I, j = 1, ..., J, b = 1, ..., B, t = 1, ..., T. \end{aligned} \tag{1}$$

The term V_{jt}^{i} reflects the deterministic part of consumer utility and ϵ_{jt}^{i} is a random term which is iid extreme value. In our discrete choice setting each consumer chooses one product out of a set of alternatives. RUM consistency implies that a consumer chooses the alternative yielding the highest utility. Furthermore, in the random-coefficients model we can differentiate between variables for which the coefficients differ across individuals (i.e. x_{jt}) and variables for which the coefficients are constant (i.e. y_{jt}). Note that the corresponding vector of coefficients for x_{jt} is superindexed with i in equation (1).

The mixed multinomial logit is a generalized form of the the standard conditional logit model introduced by McFadden (1973). The probability of individual i choosing alternative j conditional on the vector of random coefficients β^{i} of individual i is represented by (for expository purposes we will omit the time index t from here on):[7]

$$L_{j}^{i}(\beta_{i}) = \frac{exp\left(V_{j}^{i}(\beta^{i})\right)}{\sum_{k} exp\left(V_{k}^{i}(\beta^{i})\right)}. \tag{2}$$

The individual vector β^{i}, however, is not observable. The (unconditional) mixed logit probability for individual i to choose alternative j is derived as an integral of the standard logit probabilities by integrating out the vector of random parameters β^{i} and represented by

$$P_{j}^{i} = \int \left(\frac{exp\left(V_{j}^{i}(\beta^{i})\right)}{\sum_{k} exp\left(V_{k}^{i}(\beta^{i})\right)} \right) f(\beta) d\beta, \tag{3}$$

where $f(\beta)$ is the mixing distribution of the vector of random coefficients, usually specified to be normal or lognormal.[8]

[7] The subsequent paragraphs introducing the mechanics of the mixed logit follow Train (2009).

[8] Note that the mixed logit probabilities collapse to the standard logit probabilities when all coefficients

One of the advantages of the mixed logit model vis-à-vis the conditional logit model or the nested logit model is that it does not exhibit the independence of irrelevant alternatives (IIA) property at any stage. In the conditional logit model the ratio of probabilities of two alternatives is independent of the attributes or the existence of all other alternatives yielding rigid substitution patterns. The nested logit model mitigates this problem as the IIA property does not hold for alternatives in different nests. However, it still holds within each nest and the nesting structure requires further assumptions on potential product groupings. In contrast, in the mixed logit model the ratio of probabilities of alternative j and alternative j' is dependent on all attributes and the existence of other alternatives than j or j'. Equation (4) for the cross-price elasticity of a change in the interest rate d of alternative j illustrates the flexibility in the substitution patterns:

$$\eta^i_{j'j} = -\frac{d_j}{P^i_{j'}} \int \beta^i_d L^i_j(\beta) L^i_{j'}(\beta) f(\beta) d\beta, \tag{4}$$

where β^i_d is the individual coefficient on the interest rate d. The elasticity differs for each alternative j'. That is, an increase in the interest rate for alternative j will lead to different decreases in the probabilities for each alternative j' unlike in the standard logit model where the probability of choosing alternative j' is canceled out in the formula for the cross-price elasticity. In the mixed logit model the substitution patterns are determined by the mixing distribution and thus determined empirically by the available data. No a-priori assumptions on product groupings is required.

Based on the individual-level choices we derive market-level demand to be used in our simulation exercises through aggregation. As a consequence of the disaggregated approach we do not require any a-priori assumptions about the shape of the aggregate demand curve. The price derivatives of total demand are simply defined as the weighted sum of individual derivatives. Population weights are thereby retrieved from the representative DNB Household Survey.

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are identical across individuals.

3.2 Supply

In a simplified banking model banks generate profits by lending money to firms below their own borrowing costs. Following Canhoto (2004) we allow for separate modeling of pricing decisions in the credit and the deposit markets. Focusing on the latter we assume banks to maximize profits in the market for savings accounts with the deposit rates as their choice variables. Untypical of maximization problems, in our case the choice variables (i.e. the deposit rates) have a negative direct effect on profits. In order not to formulate a degenerated problem, we add $\bar{r_b}$ which is the expected loan rate for bank b. This set-up acknowledges that banks raise deposits to finance lending.[9] Offering savings accounts to consumers involves both variable and fixed operating costs which differ across the account products. Variable costs are for example additional needs for IT capacity and employees for administration and the provision of customer services. The difference in variable costs across products can result from reduced costs for services as for example for internet managed accounts or from differences in cost efficiencies across banks. We introduce product-specific costs c_j denoting the per unit of demand costs for account product j. We assume c_j for each product to be constant. The maximization problem of bank b owning a subset of products F_b can therefore be written as:

$$\max_{\{d_j \forall j \in F_b\}} \pi_b(\mathbf{d}) = \sum_{j \in F_b} (\bar{r_b} - c_j - d_j) q_j(\mathbf{d}) \tag{5}$$

where $q_j(\mathbf{d})$ depicts demand for savings account j and $\mathbf{d}$ is a $J \times 1$ vector of deposit rates. We can think of the term $\bar{r_b} - c_j$ $(= r_{j,net})$ as the expected loan rate (net of marginal costs) specific to product j. Setting d_j allows the bank to set the profit margin, $r_{j,net} - d_j$ for product j. This is analogous to the formulation of the problem when prices enter positively into the firms' profit functions and profit margins are equal to $p_j - mc_j$. Taking into account the optimal pricing decision rules for all banks and assuming Bertrand competition the Nash equilibrium is defined by the following system of first-

[9] Banks can also use savings accounts as instruments meant to acquire client information, or to cross sell (Džmuráňová & Teplý, 2016).

order conditions:

$$q_j(\mathbf{d}) + \sum_{k \in F_b} (\bar{r_b} - c_k - d_k) \frac{\partial q_k(\mathbf{d})}{\partial d_j} = 0, \qquad j = 1, ...J. \tag{6}$$

Equation (6) can be rewritten in vector notation:

$$\mathbf{q}(\mathbf{d}) + \{\boldsymbol{\theta} \odot \boldsymbol{\Delta}(\mathbf{d})\}(\mathbf{r_{net}} - \mathbf{d}) = 0 \tag{7}$$

where $\mathbf{q}(\mathbf{d})$ is the $J \times 1$ demand vector, $\mathbf{r_{net}}$ is the $J \times 1$ net expected loan rate vector and $\boldsymbol{\Delta}(\mathbf{d}) \equiv \partial \mathbf{q}(\mathbf{d}) / \partial \mathbf{d}'$ is the $J \times J$ Jacobian of first derivatives. $\boldsymbol{\theta}$ is the $J \times J$ product-ownership matrix, with $\theta(j,k) = 1$ if savings accounts j and k are offered by the same bank and $\theta(j,k) = 0$ otherwise. $\odot$ depicts element-by-element multiplication. Equation (7) can be used to back out the term $r_{j,net}$ which needed for the subsequent merger simulation.

3.3 Demerger Simulation

We simulate the demerger as the counterfactual event as the original situation in the data reflects ABN AMRO and Fortis Bank NL presumably operating under joint ownership between 2008 and 2010. We fit equation (7) with pre-event, i.e. actual, data to back out the net expected return rate vector r_{net}^{pre}. We rewrite equation (7) and solve for post-event (demerger) deposit rates using estimated demand parameters, bank first-order conditions, pre-event net loan return rates[10] and the demerger-adjusted product-ownership matrix:

$$\mathbf{d}^{post} = \mathbf{r}_{net}^{pre} - \{\boldsymbol{\theta}^{post} \odot \boldsymbol{\Delta}(\mathbf{d}^{post})\}^{-1} \mathbf{q}(\mathbf{d}^{post}). \tag{8}$$

We can solve for demerger deposit rates using the system of linear demand functions $\mathbf{q}(\mathbf{d}^{post}) = \mathbf{a} + \boldsymbol{\Delta}(\mathbf{d}^{pre})' \mathbf{d}^{post}$ with $\mathbf{a}$ being the vector of intercepts (Björnerstedt & Verboven, 2014).

[10] Implying that we include actual marginal cost estimates, this seems justified given that merger-related cost synergies are only to be realized after the merger's official completion. While the merging banks thus have individual costs, the factually combined ownership still enables collusion on prices.

4 Data

We construct our dataset by merging data from mainly two sources. We use data from the DNB Household Survey (DHS)[11], a representative Dutch panel survey, to obtain detailed household information including information on debt and asset holdings. Most importantly, this comprises individual product choices for savings accounts. We retrieve data from Dutch online comparison platforms for banking products, most notably 'SpaarInformatie', to obtain product-level information on savings accounts products. This includes the interest rate paid on the accounts and several forms of restrictions[12] applying to the account products. We observe all changes in the interest rate and calculate the annual average. Furthermore, we identify the introduction date for each account product and calculate how many years a product already is in the market.

Around 2,000 households participate in the DHS each year. While all members of the household answer questions on general information, only members of the household older than 16 are confronted with questions related to income and wealth. Respondents can enter information for up to seven savings accounts in the survey. We decide that a person's main account is that one yielding the highest interest rate.[13] After identifying the account product by the entered account name we match account product information to each observation.[14] We also identify whether people do not have any savings account

[11]The data are collected through the 'CentERpanel' at CentERdata, handled by Tilburg University. The DHS consists of several questionnaires to collect information about household finances and individual financial decisions. The panel used for the survey is designed to constitute a representative sample of the Dutch population. Recruitment for the panel is based on a random national sample drawn from private postal addresses. Upon commitment for participation in the panel, households are included in a database. If a household that is already in the panel drops out of the panel, another household from the database with the same characteristics is included into the panel. Despite previous agreement to participate in the panel, response rates are typically around 80% and vary across the different questionnaires. In order to achieve full representativeness sample weights can be used. Participation in the panel is awarded with a financial compensation (Teppa & Vis, 2012).

[12]This comprises: i) online usage only ii) minimum amount requirements to open and maintain account, iii) bonus on minimum amount within a quarter and base rate on remainder, iv) fixed deposits, v) withdrawal limitations and vi) group eligibility constraints.

[13]Ideally, we would use the savings account with the highest deposits but this information is only reported in relatively few cases. Still, there is a positive correlation between accounts with the highest interest rate and highest deposits for these cases.

[14]Survey participants have to report both the name of the bank and the product name for each of their accounts. Not all respondents report the exact product name which requires a hand matching procedure. During hand matching we rely on a comprehensive list of account products retrieved from 'SpaarInformatie'. Deviations in reporting from actual account names include abbreviations, typos or alternative naming. During hand matching we compare, on a bank-by-bank basis, the reported answers

which corresponds to having chosen the outside option.[15] We disregard observations for which we could not establish a match.[16]

In essence, our dataset includes one observation per person per year corresponding to the savings account a person has chosen. In case a person does not have a savings account the observation is still included indicating that the outside option has been chosen. For every year and every individual the dataset is then expanded by all available accounts an individual is able to chose, which also includes the outside option.

Table 1 lists the number of savings account products in our dataset by bank and year from 2008 to 2010. The first panel lists the four largest banks in the Dutch market and Fortis Bank NL, the second panel lists the smaller banks. The larger banks offer a wide array of products including five or more products with the exception of SNS Bank. The smaller banks seem to specialize and often only offer one product. In total, we observe around 60 products in the market per year the consumer can choose from. Roughly speaking two thirds of the products exhibit at least one of the above mentioned conditions and one third are for online usage only.

Table 2 shows the market shares derived from our sample. In line with the market description of the Dutch competition authority (ACM, 2014) we observe a highly concentrated market. The three major banks account for more than 50% of the market even in the presence of the share of the outside option. Following the three large banks the market sustains some mid-sized banks (SNS Bank, ASN Bank, Fortis Bank NL and Aegon) and a group of small fringe banks.

Figure 1 shows that there is considerable variance in the offered interest rates both across and within banks. We illustrate this by comparing the interest rates on accounts

with all available account products of the respective bank and choose the account which is closest in terms of name similarity. If a survey participant specifies a bank name but no concrete account name as the respondents have either entered '99' (equivalent to 'I don't know') or reported a generic word for savings account (e.g. rekening) we assign the basic respectively most often used account of that bank. We do not include these observations in our main dataset but use them for robustness checks.

[15] We label those respondents as having chosen the outside option who did not report any account names or reported actively that they do not have one.

[16] We drop observations for which the reported account name corresponds to another bank than actually reported by the survey participant. We drop observations for which no account identification is possible as given answers are too remote to the actual account names to constitute a reliable match. We also drop observations which could be matched but exhibit inconsistent timing. These are observations for which respondents refer to account products which are not in the market at that time.

in 2008. Accounts are grouped by bank and according to whether account restrictions apply or not. For all banks displayed restricted accounts offer on average higher interest rates than unrestricted accounts. Note that Fortis Bank NL only offered restricted savings accounts. The group of other banks offers on average the highest interest rates. Presumably, smaller fringe banks have to raise awareness in the market by higher interest rates to compensate for lower marketing expenses or presence through bank branches. The interest rate spread between and within restricted and unrestricted accounts indicates at banks applying product differentiation. Note further that banks offer several unrestricted accounts at different interest rates which seems to be implausible at first sight. These were often introduced in different years. Anderson et al. (2014) find that banks use product age for price discrimination. New products with higher deposit rates are used to attract new customers while old customers stick to old products with lower deposit rates.

The effect of loosening monetary policy after the financial crisis in 2008 is depicted in Figure 2. It displays the average interest rate across account products for the three large banks and Fortis Bank NL between 2007 and 2014. Since 2008 there is a steady decline in the interest rate for all banks with the exception of a short relief for some banks in 2011. The last products of Fortis Bank NL are withdrawn from the market in 2011.[17]

The changing macroeconomic and monetary conditions do not only affect the average interest rates but also the dispersion of interest rates offered in the market. In Figure 3 we demonstrate this trend. The spread between the highest and lowest priced account product and more generally the variance in interest rates was reduced substantially between 2006 and 2014. With loosened monetary conditions banks reduce differentiating prices within their own set of products and vis-à-vis competitors.

[17] While ABN AMRO continues these products under its name for some while, customers are successively switched to ABN AMRO products.

5 Estimation

We estimate the following main specification of the demand-side of our model:

$$\begin{aligned} U_{jt}^{i} = \alpha_b &+ \beta_1^i (\textit{interest rate}_{jt} \times \textit{multiple accounts=0}_{t}^{i}) \\ &+ \beta_2^i (\textit{interest rate}_{jt} \times \textit{multiple accounts=1}_{t}^{i}) + \gamma_1 \textit{minimum amount}_{jt} \\ &+ \gamma_2 \textit{bonus rate}_{jt} + \gamma_3 \textit{other}_{jt} + \gamma_4 \textit{product age}_{jt} \\ &+ \gamma_5 \textit{internet}_{jt} + \gamma_6 (\textit{internet}_{jt} \times \textit{age}_t^i) \\ i = 1, ..., I, j = 1, ..., J, b = 1, ..., B, t = 1, ..., T. \end{aligned} \tag{9}$$

Our model includes bank intercepts, α_b, in order to account for bank specific characteristics such as brand reputation and marketing expenses potentially driving consumer choice on the product-level. The coefficients for *interest rate* interacted with *multiple accounts* are random and vary across individuals. We employ the interaction with the dummy for whether a person has multiple savings accounts in order to account for different sensitivities for the interest rates among these groups. We consider individuals having several accounts to be more aware of market conditions and investment possibilities (shoppers). The coefficients β_1^i and β_2^i capture that the importance of the interest rate differs randomly across individuals in these groups.

The following dummy variables are product characteristics serving product differentiation. They are non-random as we assume that the taste for conditions is the same for all customers. The variable *minimum amount* indicates whether account opening requires a certain minimum amount. *bonus rate* depicts whether customers are rewarded for not withdrawing savings by offering a bonus on the minimum amount within a quarter and a base rate on the remainder. *other* subsumes the restrictions that an account features one or more of the following: fixed deposit plan, withdrawal limitations or group eligibility constraints (e.g. only for youth). The variable *product age* measures the time a product is available in the market in years. As mentioned, banks can use the age of a product as a price discrimination tool. Lastly, the dummy *internet* indicates whether an account is for online usage only. Adding the interaction between *internet* and an individual's age,

age, allows us to capture different preferences with regard to online usage. We expect the interaction term to be negative indicating that younger customers are more willing to accept self administration of their accounts online. In order to account for correlated decision making within households we cluster standard errors at the household level. Table 3 depicts the respective summary statistics for the chosen savings accounts.

6 Results

Table 4 reports our regression results. Equation (9) is estimated separately for years 2008 to 2010. The large majority of our estimated parameters are statistically significant at conventional confidence levels. Account restrictions affect choice differently. If an account features a minimum opening amount or any of the restrictions subsumed under *other*, it is less likely chosen in most of the estimations. This is not surprising as conditions such as withdrawal limitations or minimum amount impose true cost or limitations to open the account. The condition *bonus rate* has an ambiguous sign. It is positive for 2008 and negative for 2009 and 2010. Our interpretation is that unlike the before mentioned restrictions, a bonus rate could also be beneficial for a customer if she manages to avoid withdrawals. Product age has the expected positive effect on consumer choice indicating potential lock-in situations for customers. Internet only managed accounts are more likely to be chosen but less so for older customers. This result is in line with our expectation that younger customers are more prone to use internet-only services.

Regarding the interacted interest rate variables, we obtain two moments for the distribution of the coefficients as we specified them as random. The average effect for customers without multiple accounts is slightly negative for 2008 and 2009. The estimated standard deviation is quite large such that some significant share of the distribution reaches into the positive. The result of negative coefficients on the interest rate is quite counter-intuitive. However, this is due to allowing the coefficient to be estimated as a distribution and separately for both groups of customers. The mean of the coefficient for customers with more than one account is positive with most density being in the positive as the

standard deviation is relatively small compared to the mean.[18] Obviously, the estimated standard deviations reduce in magnitude over the years which could be a result of the banks reducing the spread between the highest and lowest priced accounts.

Table 5 reports the derived own-price elasticities averaged on the bank level for 2008 to 2010. Note that the signs are positive here as an increase in the interest rate usually triggers an increase in demand. Looking at the year 2008 price reactions are mostly elastic. Only Regiobank and Robeco have values of less than 1. The three large banks have some of the lowest elasticities while some of the smaller fringe banks have quite large estimates for the own-price elasticity. The range of own price elasticities reflects different degrees of market power across banks possess. Larger banks seem to be able to price less aggressively as a result. Given that both ABN AMRO and Fortis Bank NL have relatively low elasticities, we expect to predict substantial price increase from our simulation exercise.

Tables 6, 7 and 8 report our counterfactual simulations for the year 2008 to 2010, respectively. For each year we report the mean of the interest rates by bank for the demerger counterfactual scenario (post mean), in which ABN AMRO and Fortis Bank NL operate as independent entities. For comparison we also list the realized interest rates in the market (pre mean) and the percentage change. The predicted interest rate changes for ABN AMRO are positive and range between 1.6% and 9.9%. For Fortis Bank NL we obtain a larger span of predictions across years between -7.7% and 25.2%. In particular, in 2008 the joint ownership seems to have decreased interest rates for the two merged banks by a substantial amount. The effects seem to be lower for the following two years potentially due to a lower general level of interest rates and reduced scope for price differentiation. The merger also had effects on other market participants not directly involved. Most of the predicted interest rates are larger in the demerger scenario, however by relatively less compared to the merging banks.

As robustness checks we repeat the analyses based on McFadden's choice model (McFadden, 1973) in which we interact the variables with previous random coefficients

[18] Other estimations where we do not allow for a distinction between customers result in a positive estimate on the interest rate.

with personal characteristics (age, gender, number of children, university degree, and an indicator for financial experience). Tables containing the respective results are provided in the appendix. Note that this demand model maintains the IIA assumption. We present regression results in Table A1 and the results from the simulation exercise in Table A2. Our results are largely confirmed finding that counterfactual interest rates increases range between 2.7% and 3.8% for ABN AMRO and between 3.6% and 6% for Fortis Bank NL.

7 Conclusions

In this paper we estimate a structural model with an application to the Dutch retail banking market. We use our model to simulate the counterfactual scenario for the *ABN AMRO/Fortis Bank NL* merger. The merger was initiated in late 2007 and completed in July 2010. We assume that already before the final completion of the merger joint pricing decisions were made. Our counterfactual is the demerger scenario. We predict pricing in the what-if situation that the two banks operated under complete separate ownership. Using detailed consumer-level data we are able to model demand choices driven by heterogeneous preferences.

We predict that the merger had significant effects on interest rates in the market. ABN AMRO would have priced interest 9.9% (2008), 1.7% (2009) and 3% (2010) higher without the merger. For Fortis Bank NL we predict a change of 25.2% (2008), -7.7% (2009) and 5.2% (2010) respectively. On average, most of the remaining market participants would have priced higher in our demerger scenario, however to a lower extent than ABN AMRO and Fortis Bank NL.

Our findings suggest that the merger between ABN AMRO and Fortis Bank NL exhibits social costs prior to completion. It harmed consumers through lower interest rates on their savings accounts. Regarding the trade-off between financial stability and competition policy in the banking markets, our results suggest that the costs of stabilizing financial markets do not only include the capitalization measures but also costs due to lessened competition. Avenues for future research comprise incorporating financial

markets in the supply side in order to simulate effects had the state aid not been granted.

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Appendix

Table 1: Number of products by bank and year

	2008	2009	2010
rabobank	7	7	7
ingbank	8	10	8
abnamro	10	9	9
snsbank	2	2	2
fortisbank	6	6	7
aegon	4	4	4
argenta	2	2	2
asn	4	4	4
atb	2	2	2
centraalbeheer	1	1	1
crediteurope	1	1	1
dsb	2	2	-
friesland bank	1	1	1
garantibank	2	2	2
moneyou	1	1	1
nationalenederlanden	1	1	1
nibc	1	1	1
ohra	2	2	2
regiobank	4	4	4
robeco	1	1	1
triodos	1	2	2
leaseplanbank	-	-	1
total	59	62	62
restricted	41	42	42
internet only	18	20	21

Notes: The table displays the amount of account products offered by bank. The lower panel depicts the total amount of account products, the amount of account products with any kind of restriction and out of which the amount of account products which are internet managed only.

Table 2: Bank chosen for main account

	2008	2009	2010
no savings account	35.14	30.47	32.82
rabobank	23.80	24.38	23.41
ingbank	18.42	18.50	19.43
abnamro	8.03	8.40	7.82
snsbank	2.76	3.47	4.03
fortisbank	2.11	2.92	2.76
aegon	2.61	2.16	1.87
argenta	0.35	0.60	0.51
asn	3.01	3.57	3.93
atb	0.65	0.55	0
centraalbeheer	0.15	0.10	0.09
crediteurope	0.10	0.45	0.14
dsb	0.80	1.36	0
friesland bank	0.30	0.35	0.28
garantibank	0.10	0.20	0
nibc	0.05	0.65	0.66
ohra	0.35	0.80	0.66
regiobank	0.20	0	0.05
robeco	0.95	0.60	0.70
triodos	0.10	0.20	0.23
moneyou	-	0.20	0.56
nationalenederlanden	-	0.05	0.05

Notes: This table displays the distribution of identified matches across banks for the main accounts listed in the survey by year. The numbers are displayed in percentage points.

Table 3: Summary statistics

	mean	sd	min	max
2008				
Interest average	3.3	1.2	0	5.4
Minimum amount	.31	.46	0	1
Bonus rate	.17	.38	0	1
Other	.12	.33	0	1
Internet	.34	.47	0	1
Age	51	16	16	93
Product age	3.5	2.2	0	6
Multiple accounts	.25	.44	0	1
2009				
Interest average	2.8	.88	0	4.8
Minimum amount	.32	.46	0	1
Bonus rate	.18	.39	0	1
Other	.12	.32	0	1
Internet	.35	.48	0	1
Age	51	16	16	94
Product age	4.2	2.4	0	7
Multiple accounts	.26	.44	0	1
2010				
Interest average	1.9	.51	0	3.2
Minimum amount	.29	.45	0	1
Bonus rate	.19	.39	0	1
Other	.1	.3	0	1
Internet	.36	.48	0	1
Age	53	16	16	89
Product age	4.8	2.6	0	8
Multiple accounts	.26	.44	0	1

Notes: This table reports summary statistics of variables used in the main specification separately by year.

Table 4: Demand side estimates (mixed logit)

	2008	2009	2010
Account × *Household level*			
Minimum amount	-0.912***	-0.735***	0.625***
	(0.140)	(0.102)	(0.082)
Bonus rate	0.329***	-0.176*	-0.675***
	(0.100)	(0.091)	(0.078)
Other	-0.430***	-1.599***	-1.630***
	(0.135)	(0.184)	(0.199)
Internet	1.302***	1.669***	2.126***
	(0.201)	(0.196)	(0.199)
Internet=1 × age	-0.018***	-0.020***	-0.020***
	(0.004)	(0.004)	(0.003)
Product age	0.813***	0.336***	0.084***
	(0.043)	(0.030)	(0.014)
Multiple accounts=0 × Interest average	-0.349***	-0.421***	-0.138
	(0.099)	(0.149)	(0.109)
Multiple accounts=1 × Interest average	1.406***	1.513***	2.358***
	(0.107)	(0.112)	(0.121)
Normal			
sd(Multiple accounts=0 × interest_avg)	0.922***	0.609***	0.001*
	(0.132)	(0.188)	(0.000)
sd(Multiple accounts=1 × interest_avg)	0.650***	0.179	0.004
	(0.127)	(0.279)	(0.009)
Observations	114644	118793	123883

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

Notes: This table displays the results of our benchmark model using the mixed logit estimator. Reported coefficient estimates represent effects on marginal utility and not on choice probability.All estimations include bank fixed effects which are not reported in the table. Standard errors are clustered at the household level and displayed in parentheses. The mixing distribution for the random coefficients is the normal distribution. The size of the individual choice set determines how many observations enter the estimation for each person.

Table 5: Own-price elasticities averaged by bank

	2008	2009	2010
rabobank	1.683	0.359	0.754
ingbank	1.091	0.377	0.882
abnamro	1.664	0.726	1.025
regiobank	0.743	0.657	1.117
triodos	1.321	0.805	1.022
aegon	3.393	1.044	0.959
argenta	4.652	1.172	1.218
asn	2.254	0.628	1.021
garantibank	4.922	1.285	1.097
moneyou	7.606	2.003	1.213
nibc	8.205	1.959	1.219
snsbank	2.835	1.004	1.129
atb	4.662	0.952	0.737
centraalbeheer	8.512	3.236	1.258
crediteurope	6.622	1.163	0.848
nationalenederlanden	1.726	0.986	1.248
ohra	4.832	1.947	1.227
robeco	0.808	0.196	0.849
fortisbank	2.423	1.173	1.105
dsb	2.585	1.076	-
friesland bank	1.924	0.625	0.980
leaseplanbank	-	-	1.440

Notes: This table displays the unweighted average of own-price elasticities by bank.

Table 6: Predicted effects of the demerger (2008)

	pre mean	post mean	change mean
rabobank	3.085	3.140	0.018
ingbank	2.422	2.469	0.035
abnamro	3.049	3.276	0.087
regiobank	2.400	2.485	0.038
triodos	3.000	3.047	0.016
aegon	3.813	3.859	0.013
argenta	4.292	4.336	0.010
asn	3.124	3.168	0.017
garantibank	4.357	4.400	0.010
moneyou	5.098	5.139	0.008
nibc	5.267	5.308	0.008
snsbank	3.509	3.557	0.015
atb	4.263	4.307	0.010
centraalbeheer	5.370	5.411	0.008
crediteurope	4.843	4.885	0.009
nationalenederlanden	3.200	3.246	0.014
ohra	4.323	4.367	0.010
robeco	2.715	2.765	0.018
fortisbank	3.401	4.161	0.234
dsb	3.556	3.602	0.013
frieslandbank	3.297	3.343	0.014

Notes: This table displays the unweighted average of offered interest rates by banks in 2008 in column (1) assuming that ABN AMRO and Fortis Bank NL operate under joint ownership. Column (2) displays interest rate averages yielded by our simulation exercise assuming that ABN AMRO and Fortis Bank NL are operating independently from each other. Column (3) displays the changes in the average interest rate by bank in percent.

Table 7: Predicted effects of the demerger (2009)

	pre mean	post mean	change mean
rabobank	2.285	2.315	0.015
ingbank	2.117	2.124	0.007
abnamro	2.757	2.812	0.020
regiobank	2.482	2.478	-0.000
triodos	2.830	2.812	-0.008
aegon	2.969	2.971	0.002
argenta	3.241	3.238	-0.001
asn	2.507	2.505	0.000
garantibank	3.316	3.314	-0.000
moneyou	3.852	3.851	-0.000
nibc	3.844	3.842	-0.000
snsbank	3.032	3.025	-0.003
atb	3.030	3.027	-0.001
centraalbeheer	4.609	4.607	-0.000
crediteurope	3.228	3.226	-0.001
nationalenederlanden	3.058	3.055	-0.001
ohra	3.805	3.803	-0.000
robeco	2.146	2.228	0.038
fortisbank	3.201	2.951	-0.077
dsb	3.159	3.157	-0.001
friesland bank	2.705	2.699	-0.002

Notes: This table displays the unweighted average of offered interest rates by banks in 2009 in column (1) assuming that ABN AMRO and Fortis Bank NL operate under joint ownership. Column (2) displays interest rate averages yielded by our simulation exercise assuming that ABN AMRO and Fortis Bank NL are operating independently from each other. Column (3) displays the changes in the average interest rate by bank in percent.

Table 8: Predicted effects of the demerger (2010)

	pre mean	post mean	change mean
rabobank	1.516	1.532	0.013
ingbank	1.729	1.746	0.010
abnamro	1.965	2.022	0.029
regiobank	2.088	2.102	0.007
triodos	1.918	1.931	0.008
aegon	1.744	1.756	0.006
argenta	2.308	2.321	0.006
asn	1.960	1.975	0.008
garantibank	2.054	2.067	0.006
moneyou	2.302	2.316	0.006
nibc	2.316	2.330	0.006
snsbank	2.212	2.226	0.006
atb	1.392	1.408	0.011
centraalbeheer	2.353	2.366	0.006
crediteurope	1.600	1.614	0.009
leaseplanbank	2.671	2.685	0.005
nationalenederlanden	2.330	2.343	0.006
ohra	2.301	2.314	0.006
robeco	1.610	1.624	0.009
fortisbank	2.090	2.197	0.052
friesland bank	1.847	1.861	0.007

Notes: This table displays the unweighted average of offered interest rates by banks in 2010 in column (1) assuming that ABN AMRO and Fortis Bank NL operate under joint ownership. Column (2) displays interest rate averages yielded by our simulation exercise assuming that ABN AMRO and Fortis Bank NL are operating independently from each other. Column (3) displays the changes in the average interest rate by bank in percent.

Table A1: Demand side estimates (conditional logit)

	2008	2009	2010
Account × Household level			
Multiple accounts=0 × Interest average	0.076	0.027	-0.129
	(0.101)	(0.139)	(0.169)
Multiple accounts=1 × Interest average	1.224***	1.698***	2.331***
	(0.117)	(0.154)	(0.186)
Age × Interest average	-0.003*	-0.004**	0.000
	(0.001)	(0.002)	(0.002)
Female × Interest average	0.018	-0.071	-0.027
	(0.036)	(0.044)	(0.056)
Children in household × Interest average	-0.032	-0.081***	-0.093***
	(0.020)	(0.025)	(0.031)
University degree=1 × Interest average	0.221***	0.069	0.043
	(0.061)	(0.073)	(0.090)
Financial experience=1 × Interest average	0.163***	0.207***	0.253***
	(0.047)	(0.063)	(0.074)
Minimum amount=1	-1.116***	-0.774***	0.625***
	(0.120)	(0.099)	(0.082)
Bonus rate=1	0.436***	-0.154*	-0.668***
	(0.097)	(0.091)	(0.078)
Other=1	-0.395***	-1.553***	-1.645***
	(0.138)	(0.179)	(0.199)
Internet	1.092***	1.572***	2.256***
	(0.197)	(0.199)	(0.213)
Internet=1 × Age	-0.016***	-0.019***	-0.022***
	(0.004)	(0.004)	(0.004)
Product age	0.704***	0.325***	0.084***
	(0.032)	(0.028)	(0.014)
Observations	114526	118490	123647

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

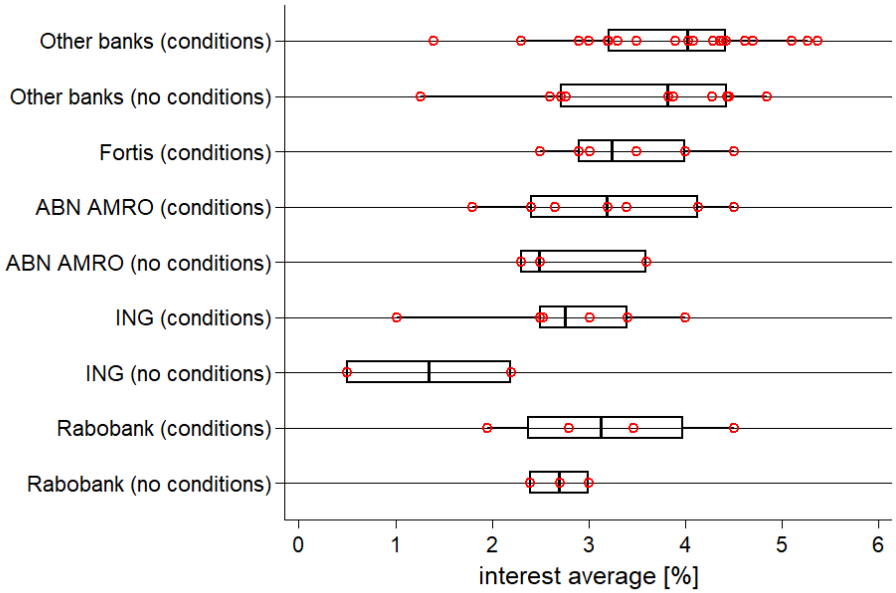
Notes: This table displays the results of our robustness check using the conditional logit estimator. Reported coefficient estimates represent effects on marginal utility and not on choice probability. All estimations include bank fixed effects which are not reported in the table. Standard errors are clustered at the household level and displayed in parentheses. Observations are at the Account x Household level. The size of the individual choice set determines how many observations enter the estimation for each person.

Table A2: Predicted effects of the demerger (conditional logit)

	2008	2009	2010
	change mean	change mean	change mean
abnamro	0.027	0.038	0.030
aegon	0.004	0.007	0.008
argenta	0.003	0.007	0.006
asn	0.006	0.010	0.008
atb	0.004	0.007	0.014
centraalbeheer	0.003	0.005	0.006
crediteurope	0.003	0.007	0.009
dsb	0.004	0.007	-
fortisbank	0.060	0.036	0.053
friesland bank	0.005	0.008	0.008
garantibank	0.003	0.007	0.007
ingbank	0.011	0.013	0.011
moneyou	0.003	0.006	0.006
nationalenederlanden	0.005	0.007	0.006
nibc	0.003	0.006	0.006
ohra	0.003	0.006	0.006
rabobank	0.007	0.013	0.014
regiobank	0.007	0.010	0.008
robeco	0.006	0.013	0.009
snsbank	0.005	0.008	0.007
triodos	0.005	0.008	0.008
leaseplanbank	-	-	0.005

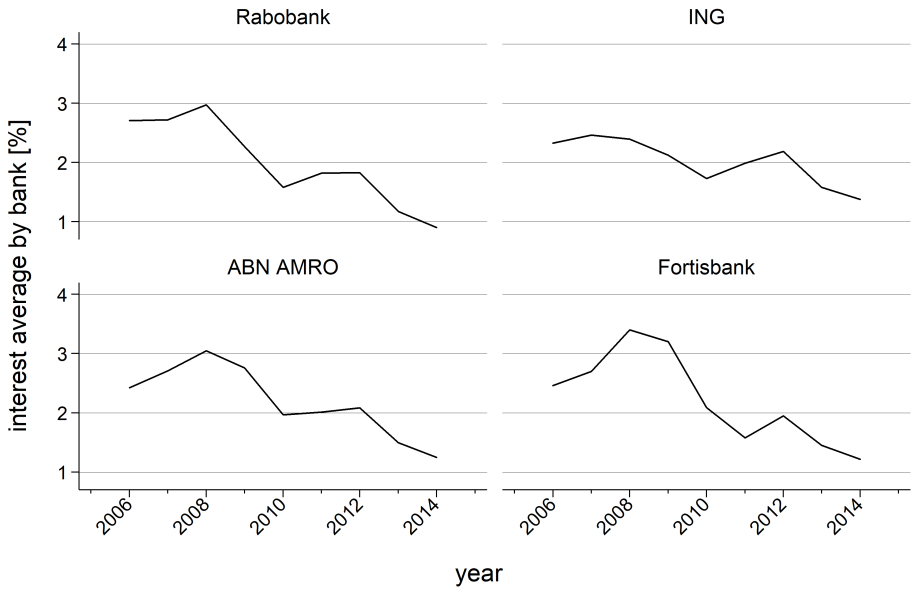
Notes: This table displays the predicted change of interest rate averages yielded by our simulation exercise assuming that ABN AMRO and Fortis Bank NL are operating independently from each other. In this specification we are using the conditional logit estimator. Results for the years 2008 to 2010 are presented in columns (1) to (3) seperately.

Figure 1: Interest rate dispersion (2008)



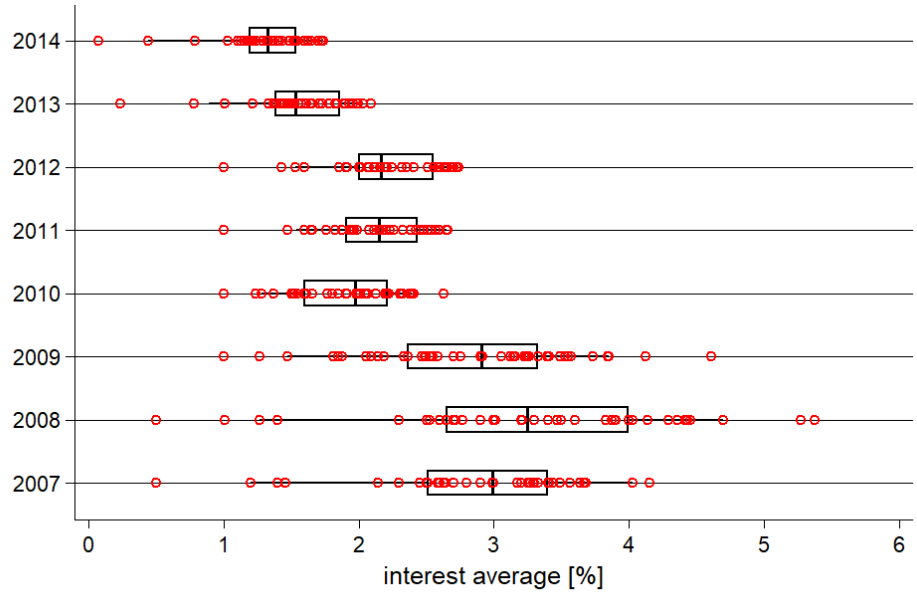
Notes: This figure illustrates interest rates paid on restricted and unrestricted accounts by banks in 2008. Fortis Bank NL only offered restricted account products.
Source: 'SpaarInformatie' and own calculations.

Figure 2: Development of average interest rates by banks



Notes: This figure illustrates the development of the average interest rate across account products by bank between 2007 and 2014.
Source: 'SpaarInformatie' and own calculations.

Figure 3: Interest rate dispersion by year



Notes: This figure compares interest rates of all available account products between 2007 and 2014.
Source: 'SpaarInformatie' and own calculations.