Demand Estimation and Competition in the South African Banking Industry

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ABSTRACT

This paper estimates a model of demand for retail bank deposit services in order to analyse the determinants of demand and competition in the South African banking sector. It contributes to the existing literature by using individual level survey data to assess consumer decisions based upon prices, bank features and individual characteristics, following a discrete choice approach. Our empirical analysis utilises data from the All Media and Product Survey (AMPS) of 2011, augmented with information on the various banks' branch networks as well as a generated price variable for the monthly debit account fees individuals face.

The results from our conditional logit regressions indicate that consumers respond to transaction fees in choosing a depository institution. Furthermore, consumers incorporate branch density in their selection process while individual characteristics such as income, age, occupation and literacy also influence the choice decision. Developing our results to estimate price elasticity, we find significantly inelastic demand for depository services in relation to transaction fees. This conforms to results found in similar studies in the US and Europe.

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1. Introduction

Over the past two decades the South African banking industry has undergone considerable growth and consolidation. The number of banks in the market has contracted while the majority of the market share has remained in the control of a small selection of firms. High profit rates have been maintained throughout this period, with transaction fees contributing significantly to banks' revenues. These transaction fees have remained high and are often difficult for consumers to observe and fully comprehend. Indeed, banking fees in South Africa are amongst the highest in the world, with approximately two percent of consumers' income required to cover bank charges (Dorsey and Jacob, 2005, p.3).

Due to the central importance of the banking system to the well-being of the economy, the extent and effect of competition as well as the impact and costs of its impairment are especially pressing to both regulators and consumers. Financial institutions assemble, distribute and invest a large portion of the nation's savings and thus bank performance has a greatly influential effect on capital allocation, industrial expansion and overall economic development (Berger et al, 2004). Competition is critical for the efficiency, quality and innovation of such financial services. A withdrawal of competition, if its outcome is for instance increased transaction fees, is likely to result in a transfer of welfare from consumers to the shareholders and employees of financial institutions. Such a movement is of heightened concern in South Africa, considering both the nation's high inequality and the role such competitive failure may be playing in cementing the substantial proportion of the population that remains unbanked.

On the other hand an overly competitive banking market may induce bank failures, which in turn can be extremely damaging to the economy as witnessed worldwide following the financial crisis of 2008. Excessive distortionary and restrictive regulation can also have a counterproductive effect. There is therefore a trade-off between financial institution stability and competition, and consequently competition authorities must tread a thin line between protecting consumers, incentivising expansion into the less profitable unbanked sections of the population as well as ensuring the continued growth and stability of the banking sector. Empirical studies investigating the nature of the banking industry, and the determinants of demand for financial services, can hence be valuable in assisting the regulatory authorities in their efforts.

There have been numerous studies addressing the competitiveness of the banking sector within South Africa, however their conclusions have been quite disparate. Falkena et al. (2004) and the Banking Enquiry of 2008 both identified the market to be decidedly concentrated using a primarily qualitative approach. On the other hand studies by Claessens & Laeven (2003) and the more recent Simbanegavi et al (2012) that focused on interest rates, which employed aggregate data and New Industrial Organisation Empirical techniques, determined the South African banking sector to be relatively competitive.

No studies in the South African context have however, to our knowledge, exploited individual level data to build a structural demand framework of consumer utility and preferences. This paper thus endeavours to approach the issue of demand and competition in the banking industry from a new direction. In doing so it seeks firstly to understand which factors influence consumer preferences for banking services across different banks and secondly to reach an estimate of consumers' price elasticities of demand. To tackle these topics, this paper estimates a model of demand for retail bank deposit services. It contributes to the existing literature by exploiting individual level survey data, instead of the more usual aggregate industry or bank level data, to evaluate consumer decisions based upon prices, bank features and individual characteristics following a discrete choice approach.

Our empirical analysis is predominantly informed by individual level survey data from the All Media and Product Survey (AMPS) of 2011. This survey data is augmented with information on the various banks' branch networks as well as a price variable for the monthly debit account fees individuals face. In generating this price variable we exploited the fact that for the majority of the largest South African banks, the various accounts on offer to consumers are stratified by a mixture of income, age or student characteristics. This stratification enabled the identification of the account individuals are most applicable for. Based upon a representative bundle of transactions we were then able to compute a specific monthly price for each individual. Further detail on the generation of this price variable is outlined in Section 4 and Appendix A. With the aid of this collected data we were able to run a series of conditional logit models to estimate demand in the banking sector and address the determinants of consumer choice for retail deposit services.

The results from our conditional logit estimation suggest that consumers are sensitive with regard to transaction fees in their choice of financial institution. Furthermore, consumers incorporate branch density in their selection process while individual characteristics such as income, age, occupation and literacy also influence their choice decision. Extending our results to estimate price elasticity, we find that South African banks face significantly inelastic demand for their depository services in relation to transaction fees. This conforms to results found in similar studies in the US and Europe.

The rest of the paper is organised as follows. Section 2 discusses the relevant literature, both in terms of assessing competition and describing the determinants of consumer choice of financial institution. Section 3 describes the South African banking industry, highlighting trends in profitability and concentration. This is followed by Section 4 in which the data used in our models is discussed, with special attention paid to the engineering of the price variable. In Section 5 we summarise the descriptive statistics of our individual characteristics, including analysing the results of a simple preliminary logit model evaluating the leading factors guiding consumers' decision on whether to have a debit account or not. Section 6 outlines the empirical framework for our conditional logit model. The results of this model and subsequent elasticity estimations are presented and discussed in section 7. Finally, section 8 concludes.

2. Literature review

In the economic literature concerning the banking sector there are two leading methods for evaluating the degree of competition. Tests based upon structural characteristics were largely dominant prior to the 1990s while since then models focusing on non-structural characteristics of banks have risen in prominence, grouped under the term New Empirical Industrial Organisation.

The most common structural test was the Structure-Conduct-Performance model, initially defined by Bain (1956). The Structure-Conduct-Performance method argues that higher market concentration is causally related to reduced competition. This hypothesis is usually tested by regressing a measure of bank performance against a market concentration indicator such as the Herfindahl Hirschman Index. The norm in the literature is to analyse the connection between the profitability rate of banks and concentration levels with studies generally defining a positive and significant relationship. More relevant to this paper, Berger and Hannan (1989) used survey price data to employ the Structure-Conduct-Performance approach to study the deposit rate to concentration relationship for the US retail banking market. Their results overall showed a negative impact of market concentration on deposit rates.

Structural tests however have attracted several criticisms. One central criticism levelled against the Structure-Conduct-Performance model relates to its ignoring of the possibility of reverse causality in the link between market structure and performance. Work by Ravenscraft (1983) and Bresnahan (1989) observed that the assumption of exogeneity between profitability and concentration can lead to unsound conclusions. Their findings suggested that the link between profits and concentration in industry-wide regressions reflect advantages at the firm level that larger firms enjoy over their smaller rivals, for instance cost differences. The common causal source of both profitability and market shares is therefore not the structure of the industry but rather efficiencies. Consequently from the early 1990s the traditional Structure-Conduct-Performance paradigm has largely been renounced. As Berger et al. (2004) notes, “the [empirical banking] literature has now advanced well past this simple approach” (Berger et al., 2004, p.434). In more recent literature structural indicators are used only as guideposts and are not considered conclusive evidence of market power in isolation.

New Empirical Industrial Organisation techniques act to circumvent these issues. Informed by game theory, these tests instead take both industry structure and industry performance to be endogenous and endeavour to measure the determinants of bank choice and the degree of competition more directly through a varied range of approaches.

The strand of the New Empirical Industrial Organisation that is most relevant to the work done in this paper is the characteristics-based demand systems approach first applied to the banking sector by Dick (2002). In this case a demand model is directly derived from the consumer's utility function. Such an approach offers useful and interesting insight into consumer behaviour as well as allowing for bank heterogeneity. This discrete choice framework allows for an investigation of price elasticities, consumer preferences as well as market power and welfare that would be otherwise infeasible. However, the model is less adapt at situations involving the purchasing of several goods or dynamic features of demand. A further issue arising from this method is that it assumes proportional substitution across products. This independence from irrelevant alternatives property purports that the ratio of probabilities of any two alternatives is independent from any other alternative products. One manner in which the literature has attempted to overcome this often unrealistic feature is to apply mixed or nested logit models whereby banks are grouped in terms of their correlation with respect to consumer preferences over them.

Dick (2002) utilised US data from 1993 to 1999 to analyse consumers decisions centred on two sets of prices, deposit rates and service fees, along with bank characteristics. She instrumented for price with cost data in order to counteract the endogeneity arising from correlation between price and unobserved characteristics at the aggregate level. Consumers responded to changes in both deposit rates and to a smaller degree to account fees in selecting a bank to deposit with. The median price elasticity of demand with regard to account fees was estimated to be inelastic at -0.6 whereas the median deposit rate elasticity was found to be 5.9 (Dick, 2002, p.33). Furthermore, individuals in urban markets appeared to be less sensitive to prices than their rural counterparts areas. By approaching the issue with aggregate data, however, Dick was not able to differentiate between consumer types. Additionally, she worked from the total dollar amount of deposits at the local level and so was unable to distinguish between types of accounts. The format of the data thus led her to model choices in a slightly different manner to how we do so below, but as she states such differences "seem unlikely to significantly distort the interpretation of the results" (Dick, 2002 , p.2). Following

Dick (2002) several authors replicated her work for other banking markets. Nakane et al. (2006) explored the Brazilian retail banking sector. Molnár, Márton and Horváth (2006) studied Hungarian data on consumer credit and deposit markets from January 2003 to December 2005. They similarly identified inelastic or slightly elastic demands for all types of deposits with respect to service fees.

Within the South African context a number of articles have adopted the Structure Conduct Performance technique to analyse the level of competition in the South African banking sector. Okeahalam (2001) and Falkena et al. (2004) both distinguished the market to be decidedly concentrated. This was seen to be particularly the case with regard to retail deposits, where the top four banks held over 89% of the market share (Okeahalam, 2001, p.16). Such findings were a prevalent deciding factor in the disapproval of the merger between Nedcor and Stanbic in 2002 by the National Treasury, following advice from the competition authorities that "it would result in the concentration of the already concentrated banking industry, therefore lessening competition" (Competition Commission, 2001, p.68). These studies however face the same criticism mentioned above, principally that the Structure-Conduct-Performance model does not incorporate the possibility of reverse causality between market structure and performance.

On the other hand New Empirical Industrial Organisation approaches such as the cross-country study by Claessens & Laeven (2003) determined the South African banking sector to be highly competitive. However, their study by nature of being a cross-country approach was focused primarily on differences between countries rather than exploring in more depth the particular determinants of their competition indicator for South Africa. The more recent Simbanegavi et al (2012), paper, which focused on competition in interest rates, tested both Panzar and Rosse and Bresnahan models over the 1998-2007 period. In terms of interest rate competition the paper detected that the South African banking sector existed in a relatively competitive arena. However their paper does not discuss competition levels when it comes to the setting of retail banking transaction fees.

Attempts to address the determinants of bank choice from the perspective of consumer utility and price elasticity through the Dick (2002) methodology, however, have been significantly more limited. Indeed the relatively recent Coetzee, van Zyl and Tait (2012) article, which applied a straightforward survey approach, was the first thorough attempt at addressing the

sensitivity of individual retail banking consumers to features such as price. They collected data on bank selection criteria amongst a sample size of 550 urban clients located in central South Africa. Their results suggested that the most significant selection criteria related to the trustworthiness, reputation and quality of service of the bank. Conversely they reported that prices were deemed unimportant to selection. Critically however, their sample was relatively small, geographically narrow and unbalanced in terms of the age of the respondents. As they highlight, the high average age of their respondents, with 43% of the respondents being over 56 years old, suggests that their respondents already held entrenched relationships with their banks, likely leading to a decrease in sensitivity to price changes (Coetzee, van Zyl and Tait, 2012, p.10566). Other similar studies with a more age-balanced sample outside of South Africa such as Lee and Marlowe (2003) noted that perceived increases in bank fees were a key factor in switching banks. Beckett et al. (2000) observed trends in UK consumer behaviour acting to improve the degree of switching and enlarge the extent of rational-active behaviour wherein price is regarded as the most important criterion for selection.

This paper thus attempts to work towards filling this gap in the literature by developing a New Empirical Industrial Organisation model with individual level data in a related manner to that of Dick (2002) to analyse choice behaviour and examine the extent of price sensitivity for retail banking products in the South African market. To do so it applies the individual-level conditional logit approach established by McFadden (1974). Versions of this model has been applied successfully in a number of fields, for instance to the automobile industry by Goldberg (1995) to migration by Davies, Greenword and Li (2001) as well as to telecommunications by Ben-Akiva et al. (1987). It has also been applied to varied issues involving the banking sector. Hannan (1983) assessed the characteristics and choice behaviour of firms in terms of their entry decision into the banking sector. Chang (2005) studied consumers' behaviour in response to the introduction of Internet banking. Carbó-Valverde and Liñares-Zegarra (2009) investigated consumer choice of banking payment method behaviour with regard to reward programs. However, as far as we are aware it has not been applied to measure consumer choice of which financial institution to deposit with. This paper attempts to do so, with a principal purpose of calculating a more precise estimate of price elasticity in order to both gain insight into the selection criterion of South African consumers as well as to enhance understanding on the nature of elasticity and competition across the various firms in the banking sector.

3. The South African banking sector

Over the past two decades the South African banking sector has experienced extensive changes in terms of regulation and market structure following the socio-political and economic shifts since the end of apartheid in 1994. Initially buoyed by the safe and relatively stable transition from apartheid to constitutional democracy (Kumbirai and Webb, 2010), the sector saw a significant growth in entrants into the industry, both domestically and through renewed foreign interest, as noted by Van der Walt (1998). Indeed in 1996 alone banking registrations rose from 35 to a peak of 44 (Kumbirai and Webb, 2010, p.33). However, this expansion was sharply counteracted from 1999 as several banks encountered liquidity pressures. From 1996 to 2004, 22 banks withdrew from the market including most dramatically Saambou and BOE Bank in 2002, the 7th and 6th largest banks at the time (Kumbirai and Webb, 2010, p.33). It is argued by Gilbert et al (2009) that this shift was largely due to the rational consolidation of existing firms rather than bank failure but the end result is the same, a reduction in the number of banks available to the South African consumer. The trend continued from 2003 to 2012 as the number of banks operating in South Africa dropped further, from 22 to 17 (SARB, 2012, p.28).

One notable exception to this trend was the establishment of Capitec in 2001. From its creation Capitec swiftly distinguished itself by its low cost structure, aggressive pursuit of low-income and unbanked clients and emphasis on providing an efficient and simplified banking service. By 2007 it was named the top company in South Africa by the Financial Mail and had gained 1 million active customers (Keraan, 2010, p.3). By 2011 it had expanded rapidly to 2.8 million with the bank registering a return on equity of 34% (Capitec, 2011, p.8). By the end of 2013 Capitec had 4.7 million active clients and had secured just under 10% of the total banking market (Capitec, 2013, p.21). Indeed according to the AMPS 2012 survey Capitec overtook Nedbank as the fourth largest main bank for consumers (Fisher-French, 2014).

While Capitec and the other prominent banks have made some headway in gaining previously unbanked customers through policies such as the creation of the low fee Mzansi Accounts, approximately 60% of the economically active public remains unbanked (Finscope, 2009, p.4). The high costs in reaching such potential clients, including the development of infrastructure and drives to improve consumer education, have proven to be

substantial obstacles, as too has the large informal market presence in South Africa which reduces the necessity of and access to bank account services. A key theme espoused by the regulation authorities has been a push towards extending financial services to these previously unbanked sections of the population. Legislation such as the Dedicated Banks Bill, Postbank Bill and the Co-operative Banks Bill seeks to lower the sizeable barriers to entry into the market in an attempt to incentivise the formation of a second tier of banks better able to penetrate into the unbanked population.

In terms of profitability indicators, the total balance sheet of banks in South Africa has advanced persistently since 1994, from R344.6 billion to R1.436 trillion in 2004, peaking at just over R3.5 trillion in 2012. Domestic deposits were a major source of this growth, rising from R241.9 billion in 1994 to R2,892 billion in 2012 (Mboweni, 2004, p.2 and SARB, 2012, p.30). Profits have been high, although slightly contained by the fact that South African banks tend to have relatively high cost structures, a characteristic not helped by the high crime rate, geographic spread of customers and rising staff and technological costs (KPMG, 1998). While the banking sector certainly did not survive unscathed from the global financial crisis of 2008, as Kumbirai and Webb (2010) noted South African banks low leverage, high profitability, and limited exposure to foreign assets ensured the stability of the industry without the need of intrusive distortionary government support. Since the crisis the average ROE has increased steadily, rising from 14.7% to 17.7% in 2012 (SARB, 2012, p.44).

Despite the in and out flow of firms into the market the banking sector has remained consistently concentrated since 1994. In 1994 the Absa, Standard Bank, FirstRand Bank, Investec and Nedcor groups held 83.8% of total assets. By 2004 their collected holdings had climbed to 87.4%, and stayed high at 86.4% in 2009 (SARB, 2009, p. 98). The percentage of total assets held by smaller local banks dropped from 21.7% in 1994 to just over 3% in 2004 (Mboweni, 2004, p.1). To compare the situation internationally, had the Nedcor-Stanbic attempted takeover of 2001 gone ahead the three top banks in South Africa would have held 77.7% market share, compared to 10% in the US and 26.5% in the UK (Okeahalam, 2001, p.8). South Africa, however, has persisted in its commitment to a four-pillar approach whereby a minimum number of significant banks is maintained and mergers between any of the four larger banks are discouraged. Nonetheless, by 2010 the personal transactional account sector, which we concentrate on in this paper, had become increasingly concentrated with the top four banks, Absa, Standard Bank, Nedbank and First National Bank (FNB)

controlling approximately 90% of the market (Simbanegavi et al, 2012, p.6). The Herfindahl Hirschman index, a common indicator of market concentration has continued to be elevated at above 0.18 throughout recent years, further indicating a high level of concentration (SARB, 2011, p.72).

Amidst concerns surrounding this high concentration the 2008 Banking enquiry was instigated by the Competition Commission with the intention of analysing the nature of competition within the South African banking sector with attention drawn predominantly to transaction accounts. While they ultimately concluded, utilising a qualitative based approach, that no cartel was in evidence, they did make a series of recommendations with the central aim of lowering switching costs and increasing the transparency of fee structures. For instance the creation of a centralised banking fee calculator was recommended, a cap of five rand was suggested to be imposed on rejected debit order penalties and a switch from a carriage pricing system to a direct charging model for ATMs was advised so as to limit price discrimination between customers using cards issued by other firms (Jali et al., 2008). Although some such changes have been enacted by the banking industry, the Commission has largely been disappointed by the sporadic and sluggish reactions to their suggestions. The industry remains concentrated while switching costs and transparency of bank fees, although considerably improved, continue to affect consumer choice and restrict price competition (Hawthorne et al., 2014, p.7).

4. Data and the price variable

This paper utilises the All Media and Product Survey (AMPS) data from 2011. This data set comprises of responses to a questionnaire distributed by the South African Audience Research Foundation. The questionnaire asked respondents a series of questions related to individual characteristics and purchasing decisions, including decisions on which financial institution to bank with. In the regressions below we primarily employ the individual characteristics of income, race, gender, age, occupation, settlement size, province, education and home language. In addition, data on the number of branches by province was compiled from banks' annual statements and the South Africa Map of Financial Inclusion assembled by Mix Market.

Individual income was initially expressed as a long series of dummies. These dummies were converted into a continuous variable by taking the middle point of each bracket. This action allowed us to then compute the logarithm of income. Doing so however disregards individuals who declared that they received zero income from the regressions. This is problematic and to combat the loss of information the regressions are principally run with income rather than logincome, though both were tested to assess the reliability of the results. The ages of the individuals were similarly placed in brackets. These were also converted into their middle point values so that an age-squared variable could be generated and employed.

The conditional logit section of this paper looks at individuals' decisions in choosing which bank to open a debit account with. In the questionnaire the options were Absa, Capitec, FNB, Nedbank, Standard Bank, RMB, Postbank, Teba Bank, Other and Other Banks. We dropped those banks with a very limited geographic footprint such as Post Bank and Teba Bank. The very small number of individuals who chose Other and Other Banks were omitted as we had no information on which banks they had actually chosen. We also dropped the few individuals who had an account with RMB or a cheque account with Investec. The reasoning on doing so is that these are fundamentally private investment banks and so the decision to bank with them would be made on significantly different grounds to that of the five more transaction focused banks, Absa, Capitec, FNB, Nedbank and Standard Bank.

For the conditional logit models we have additionally generated a price variable, constructed from researching the 2011 fees for the different types of transaction accounts the five banks

under review offered. Information chiefly came from archived versions of the banks' websites or through telephonic discussions with bank employees where clarification was required. The different accounts were typically either income, age or student stratified and thus by using the individual characteristics information gained from the AMPS 2011 survey we were able to allocate specific accounts to individuals. It is likely that consumer's actual accounts will not match up perfectly with the account that their individual characteristics suggest they should hold. However, the accounts that are allocated under our approach will at least be the accounts that are most heavily marketed and suggested to consumers based on their individual characteristics.

The majority of banks offer a choice of fee options for their accounts, such as pay as you transact, rebate or a fixed price bundle. In general pay as you transact options offer higher fees per transaction. However bundled options presuppose that the consumer is aware of the exact number of transactions they require and that this quantity does not vary by month, as additional transactions can be penalised. Our main regression incorporates the pay as you transact fees only but in order to ensure robustness we also ran regressions where the price variable was calculated assuming each individual chooses the specific optimal fee option that would be cheapest for him or her. The results from these regressions were very comparable. In the regressions discussed below we have thus focused on prices as calculated from pay as you transact fees.

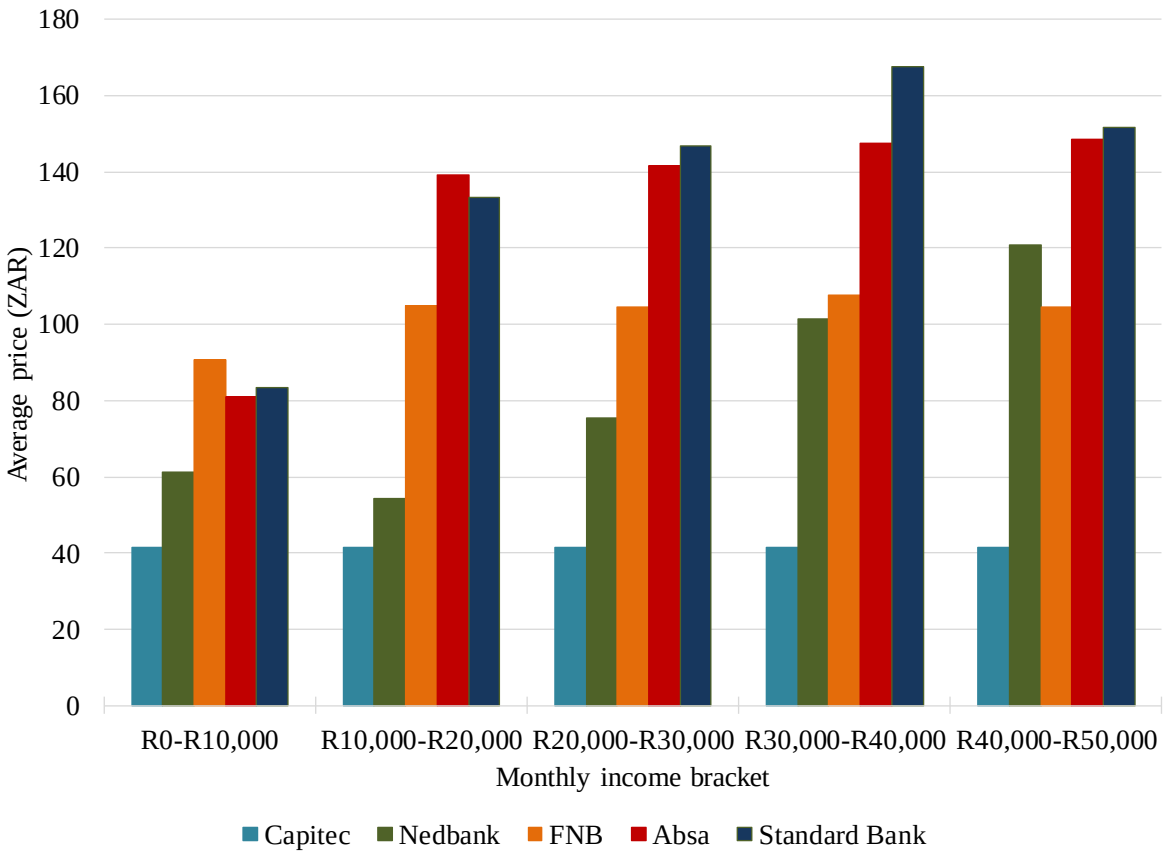
We created a bundle of fees centred on the most common and noticeable transactions, then calculated the corresponding overall price for the bundle for each individual in the sample. Two types of fees are prevalent in bank charges, unit-based and value-based fees, the latter being where part of the fee is calculated as a percentage of the value of the transaction. For the few value-based fees, such as cash withdrawals for certain banks, we calculated the value of the transaction as a percentage of the individual's income.

In the definition of the bundles we largely follow the methodology of the Solidarity reports. The Solidarity reports are issued yearly and compare bank charges between different accounts of the five largest banks in South Africa, Absa, Capitec, FNB, Nedbank and Standard Bank. Their bundles are formulated on the basis that consumers comply with the recommendations outlined by banks on how to reduce bank charges, for instance by not going into a branch for transactions that can be done electronically or at an ATM. The

transaction bundle used for the price variable in the regressions below is outlined in Appendix A.

The potential positive impact accruing from interest rates offered by some of the accounts was not included in our price analysis. We omitted the effect of interest rates as we were wary of making additional generalisations and assumptions on the savings propensity of consumers. Moreover interest rates charged by the various banks do not differ to a great extent, with Capitec offering the highest rate for amounts above R10,000 at 4.75% (Solidarity Report, 2011, p.4).

Figure 1: Average prices by monthly income bracket



Our approach generates an estimate of the prices faced by consumers and enables us to evaluate the influence of price on the decision of which bank to have a debit account with, as well as to gain insight into the nature of price elasticities within the market. The various average bank prices by income bracket are displayed in the figure above. The highest prices appear to predominantly be faced by Absa and Standard Bank clients. FNB also offers

relatively high fees on average while Nedbank account fees are generally below those of the three largest banks. However Capitec, which is the only bank not to differentiate consumers on either income or age characteristics, offers by a large extent the most reasonably priced account overall with its Global One account.

5. Individual characteristics descriptive statistics and preliminary logit model

The demographic and socioeconomic characteristics of the AMPS questionnaire respondents as they relate to banking choice are presented in Table 1. All together 25,160 consumers were surveyed, although a number of observations had missing information for certain variables. The gender split is fairly even with just under 50% of respondents male. There is also a relatively even split between genders in terms of the bank chosen. 51% of respondents are black, with 28% white, 14% coloured and 7% indian. The lion's share of individuals are aged 15-24, with the number of individuals in each age bracket decreasing steadily as age increases. The bulk of respondents have a monthly income in the R0-R10,000 range and have at least some high school education. Over 70% of individuals live in urban areas while over 98% are literate. As would be expected most responses were received from individuals in the more populated provinces, namely Gauteng, Kwa-Zulu Natal, the Eastern Cape and the Western Cape. The highest percentages of individuals are employed in the Clerical and Sales, Professional and Technical and Service sectors. 5,421 respondents are found to be unemployed, while combining the unemployed with the retired, student and housewife variables demonstrates that 60% of the survey sample are not economically active.

Table 2 displays the amount of consumers who have some sort of bank account. While over 70% of respondents asserted that they access a main bank for financial services, only 26.41% held a debit account and just 15.86% had a cheque account. Together just over 60% of the surveyed population were unbanked in the sense of not having either a cheque or debit account, which matches results from the literature. In terms of market share Absa has the largest fraction across the financial service variables, with FNB and Standard Bank second and closely third respectively. Nedbank has a noticeably reduced market share while Capitec clients represent an even smaller percentage of the market. Capitec customers appears to be grouped to a greater extent at lower incomes than the other main banks.

In order to gain a more precise understanding of the role of individual characteristics in the fundamental decision of whether or not to bank we run a basic logit model. The logit model is estimated using a maximum likelihood approach. It is non-linear in the sense that it enables the effect of a regressor to change over its range. The density of y_i given $\boldsymbol{x}_i$ can be specified as

$$f(y|\boldsymbol{x}_i: \boldsymbol{B}) = [G(\boldsymbol{x_i B})]^{y_i}[1 - G(\boldsymbol{x_i B})]^{1-y_i}, y = 0,1$$

Table 1: Respondent characteristics by debit bank account

Bank/Variable	Absa	Capitec	FNB	Nedbank	Standard Bank	Other	None	Total
Gender								
Male	47.6%	48.6%	53.2%	48.2%	53.1%	45.9%	49.7%	49.8%
Female	52.4%	51.4%	46.8%	51.8%	46.9%	54.1%	50.3%	50.2%
Age Group								
15-24	14.2%	23.5%	18.4%	15.5%	22.4%	19.8%	30.1%	26.8%
25-34	18.7%	26.9%	24.2%	16.5%	19.9%	22.7%	20.5%	20.5%
35-44	17.6%	24.8%	20.7%	17.7%	19.6%	18.6%	16.7%	17.4%
45-54	16.5%	12.6%	15.1%	19.0%	15.9%	14.5%	13.5%	14.2%
55-64	15.7%	7.5%	10.6%	14.3%	12.3%	13.4%	10.1%	10.9%
65+	17.3%	4.8%	11.0%	17.0%	9.8%	11.0%	9.1%	10.3%
Monthly Income								
0-10000	76.6%	91.9%	75.4%	71.5%	76.6%	87.3%	88.4%	85.4%
10000-20000	18.1%	7.4%	17.1%	17.9%	15.9%	6.1%	8.2%	10.4%
20000-30000	3.7%	0.7%	4.8%	6.1%	4.7%	0.6%	2.2%	2.8%
30000-40000	1.0%	0.0%	1.5%	2.5%	1.1%	1.2%	0.6%	0.8%
40000-50000	0.6%	0.0%	1.3%	1.9%	1.8%	4.8%	0.6%	0.7%
Education								
Some primary	1.0%	2.4%	0.8%	0.4%	1.6%	1.2%	4.0%	3.2%
Complete primary	2.8%	2.4%	1.8%	2.6%	2.7%	6.4%	5.5%	4.8%
Some High	29.9%	38.8%	25.6%	26.2%	28.7%	45.3%	40.1%	37.2%
Matric	38.0%	43.2%	39.2%	37.5%	39.5%	27.3%	33.2%	34.6%
Post Matric	8.4%	5.1%	9.6%	9.7%	8.6%	5.2%	5.3%	6.2%
Technical Diploma	12.0%	6.1%	14.1%	12.0%	10.9%	9.3%	6.5%	7.9%
University Degree	7.2%	1.7%	8.3%	11.5%	7.8%	3.5%	3.5%	4.6%
None	0.4%	0.3%	0.4%	0.1%	0.1%	1.7%	1.9%	1.5%
Literate	99.6%	99.3%	99.6%	99.9%	99.9%	97.8%	98.5%	98.8%
Settlement								
Urban	79.6%	82.3%	78.0%	85.2%	79.8%	68.6%	67.0%	70.4%
Rural	20.4%	17.7%	22.0%	14.8%	20.2%	31.4%	33.0%	29.6%

Bank/Variable	Absa	Capitec	FNB	Nedbank	Standard Bank	Other	None	Total
Race								
White	53.5%	18.4%	37.1%	51.8%	35.1%	32.6%	23.2%	28.5%
Black	28.1%	45.9%	41.0%	20.5%	37.9%	52.3%	56.9%	50.8%
Coloured	12.0%	32.3%	11.1%	12.3%	14.6%	8.7%	14.4%	14.1%
Indian	6.4%	3.4%	10.8%	15.4%	12.4%	6.4%	5.4%	6.6%
Province								
Eastern Cape	9.7%	8.5%	15.3%	8.0%	13.3%	1.7%	15.4%	13.9%
Free state	12.3%	9.5%	8.3%	6.7%	6.5%	3.0%	7.9%	8.1%
Gauteng	26.3%	16.9%	24.0%	23.6%	23.0%	2.8%	26.8%	25.2%
KwaZulu-Natal	23.5%	26.1%	32.2%	39.4%	33.9%	6.0%	14.9%	18.4%
Limpopo	0.6%	0.0%	0.5%	0.3%	0.3%	0.0%	7.9%	5.7%
	3.7%	3.7%	3.3%	2.8%	3.7%	82.9%	1.3%	5.0%
Northwest	2.1%	1.4%	2.4%	1.1%	0.8%	0.6%	7.1%	5.4%
Northern cape	5.0%	5.8%	3.5%	3.2%	4.6%	0.3%	5.4%	4.9%
Western cape	16.8%	28.1%	10.6%	14.8%	13.9%	2.7%	13.3%	13.3%
Occupation								
Administrative and managerial	3.8%	1.0%	4.8%	5.3%	4.2%	1.2%	1.7%	2.4%
Agriculture	3.1%	3.4%	2.1%	1.6%	2.4%	2.9%	2.5%	2.5%
Artisans and related	5.6%	7.1%	5.3%	5.3%	6.2%	7.6%	3.5%	4.1%
Clerical and sales	12.0%	11.9%	14.5%	15.1%	13.2%	11.0%	7.9%	9.3%
Production and mining	4.6%	9.5%	5.8%	4.5%	7.7%	2.9%	4.6%	4.9%
Professional and technical	10.4%	7.5%	13.8%	12.4%	12.4%	5.8%	5.5%	7.2%
Service	8.2%	11.6%	9.1%	6.9%	9.3%	6.4%	7.2%	7.6%
Transport and communication	2.5%	3.1%	3.3%	2.3%	2.1%	1.2%	1.7%	2.0%
Other	0.3%	0.0%	0.0%	0.1%	0.2%	0.0%	0.3%	0.3%
Housewife	10.3%	7.8%	8.1%	12.7%	7.8%	9.9%	8.5%	8.8%
Retired	22.5%	8.2%	12.2%	18.8%	11.9%	16.9%	12.4%	13.5%
Student	7.6%	9.5%	9.4%	8.4%	11.2%	9.3%	18.5%	16.0%
Unemployed	9.0%	19.4%	11.5%	6.7%	11.5%	25.0%	25.4%	21.5%

Table 2: Bank market shares by type of account

Bank	**Absa**		**Capitec**		**FNB**		**Nedbank**		**Standard Bank**		**Other**		**None**		**Total**	
Account Type	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Main Bank	6,486	25.8	915	3.6	4,202	16.7	1,904	7.6	3,738	14.9	673	2.7	7,242	28.8	25,160	100.0
Debit Account	2,391	9.5	294	1.2	1,535	6.1	741	3.0	1,511	6.0	172	0.7	18,516	73.6	25,160	100.0
Cheque Account	1,340	5.3	-	-	1,095	4.4	586	2.3	936	3.7	34	0.1	21,169	84.1	25,160	100.0
Debit and/or Cheque Account	3,204	12.7	292	1.2	2,246	8.9	1,067	4.2	2,003	8.0	632	2.5	15,716	62.5	25,160	100.0

where $G(x_iB)$ is the probability of $y_i = 1$ and $1 - G(x_iB)$ is the probability $y_i = 0$. Taking the log yields the log-likelihood

$$L_i(\boldsymbol{B}) = y_i \log[\, G(\boldsymbol{x_i B})] + (1 - y_i) \log[1 - G(\boldsymbol{x_i B})]$$

Restricting $G(.)$ to be strictly between zero and one ensures that $L_i(\boldsymbol{B})$ is well defined for all values of $\boldsymbol{B}$. For a sample size of N we sum over observations: $L(\boldsymbol{B}) = \sum_{i=1}^{N} L_i(\boldsymbol{B})$. The maximum likelihood estimator of $\boldsymbol{B}$, denoted $\widehat{\boldsymbol{B}}$, maximises this log likelihood. The distinction between probit and logit lies in the nature of $G(.)$. If $G(.)$ is the standard normal cdf[1] $\widehat{\boldsymbol{B}}$ is the probit estimator while if $G(.)$ is the logistic cdf[2] then $\widehat{\boldsymbol{B}}$ is the logit estimator.

From our logit model results displayed below the marginal effect of income is insignificant. When the model is run with logincome the marginal effect becomes significant and slightly positive at 0.008. This implies a 1% increase in income is linked to a growth in the probability of an individual banking of 0.008 percentage points. This however necessitates the dropping of a large fraction of individuals who have zero income and so to avoid this loss of information we primarily focus on the regression with the income variable. In any case the two models are very similar in terms of the coefficients on other variables.

The results suggest that black consumers are 9 percentage points less likely than white consumers to have a bank account, while coloured and indian individuals are 6 and 8 percentage points less likely respectively. Females have a slightly higher probability of using a bank than males, but the coefficient is insignificant at the 5% level with a p-value of 0.058. The age variable is slightly positive while the age squared variable is negative, implying that the probability of having a debit bank account rises with age though at a declining rate. The turning point[3] for this relationship is at 54.6 years of age.

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[1] $G(z) = \Phi(z) = \int_{-\infty}^{z} \phi(v)dv$ where $\phi(v)$ is the standard normal density $\phi(v) = (2\pi)^{-1/2}\exp(\frac{-z^2}{2})$

[2] $G(z) = \Lambda(z) = \exp(z)\,/[1 + \exp(z)]$

[3] Given by $-\frac{Bage}{2*Bagesquared}$

Those in administrative and management occupations have the highest probability, 20 percentage points higher, of having a bank account compared to the base case of being unemployed. Professional and technical occupations along with individuals in the transport and communication sector also have a significantly higher probability of banking at over 17 percentage point above the base case for both variables. These results are intuitive considering the probable need to be able to conduct reliable transactions and the relatively higher assets obtainable in such professions.

As might be expected housewives and students have only a small advantage in their probability of banking over those who are unemployed at 6 and under 3 percentage points respectively. For those employed, the careers with the least improvement in probability over the omitted category of being unemployed are agriculture, service, and production and mining occupations. The agriculture and mining industries are largely rural based where banking opportunities may be more limited while individuals in the service sector may be predominantly involved in more cash focused transactions that would reduce the need of holding a bank account.

Those in urban areas are 3 percentage points more likely to have a bank account. For the province variables, consumers in most provinces have a lower probability of having a debit account than those in the Western Cape, the omitted category.

Individuals with some degree of education all have greater probabilities of using a bank compared to those with none, the base category, with the greatest hikes in education arising from those with a university degree, technical diploma or some other form of postmatric education. This probability appears to increase with years of education, and is thus lowest for those with only some primary education completed, at roughly 6 percentage points above the omitted category.

For the language variables a fair number of the coefficients are insignificant. As they stand, compared to the omitted category of English home speakers most other language groups have a lower probability of having a bank account, except for Afrikaans, Swazi, Venda and Xhosa speakers. However only the Afrikaans, Tswana and Xhosa coefficients are significant at the 5% significance level. We perform the Wald, Likelihood Ratio and LM tests, which asymptotically should have the same conclusions, on these language

variables to assess their joint significance. Each of the tests found that these language variables are not jointly insignificant.

We further run a probit and linear probability model to check for robustness. The outcomes from both models are consistent with those from the logit model and tell a very similar story. Finally we also conducted the regression with the dependent variable depicting in turn whether the consumer holds a main bank, cheque account and either a debit or cheque account. The results remained analogous.

To assess the fit of the model, we ran the Hosmer-Lemeshow goodness-of-fit test considers the null hypothesis that the model is not miss-specified.[4] We found a p-value is 0.038, implying that the null is rejected at the 5% level, although not at the 1% level. The model thus is likely miss-specified and it appears that the model does not fit the data ideally, i.e. there are patterns in the residuals that the model misses. The corresponding pseudo R^2 is low at 0.143. Seeing as our model focuses on individual characteristics and does not take into account characteristics of the product or prices at this stage these results are not surprising.

It is hence very probable that we face the problems associated with omitted variables in the basic preliminary model outlined in this section. It is likely that we are missing some key variables that were not included in the questionnaire from which our data originates. For instance we do not have access to, or controlled for, product characteristics such as distance from banks, service quality, or access to ATMs. Nor have we at this stage included data on the price of banking which may have an influence on whether people bank or not. In the conditional logit section outlined below we attempt to correct for this latter omitted variable by incorporating a price variable into the model.

[4] It uses the test statistic $HL = \frac{\sum_{g=1}^{G}(\bar{P}_g - \bar{y}_g)^2}{\bar{y}_g(1-\bar{y}_g)} \sim \chi^2(G-2)$ where g is the number of groups.

Table 3: Marginal effects of logit model for debit account

	Variable	Logit Model
	Income	0.000 (0.000)*
	Female	0.011 (0.006)*
	Urban	0.032 (0.007)**
Race	Black	-0.093 (0.018)**
	Coloured	-0.064 (0.009)**
	Indian	-0.084 (0.012)**
Age	Age	0.004 (0.001)**
	Age squared	0.000 (0.000)**
Occupation	Administrative and management	0.200 (0.018)**
	Agriculture	0.141 (0.019)**
	Artisans and related	0.155 (0.014)**
	Clerical and sales	0.164 (0.011)**
	Production and mining	0.146 (0.013)**
	Professional and technical	0.170 (0.013)**
	Service	0.145 (0.012)**
	Transport and communications	0.172 (0.019)**
	Other	0.044 (0.063)
	Housewife	0.063 (0.012)**
	Retired	0.127 (0.013)**
	Student	0.026 (0.012)**
Province	Eastern Cape	-0.060 (0.011)**
	Free State	0.024 (0.012)*
	Gauteng	-0.047 (0.010)**
	KwaZulu-Natal	0.131 (0.011)**
	Limpopo	-0.442 (0.034)**
	Mpumalanga	-0.052 (0.017)**
	Northwest	-0.190 (0.019)**
	Northern Cape	-0.026 (0.014)*
Education	Some primary	0.065 (0.041)
	Primary complete	0.146 (0.038)**
	Some high school	0.220 (0.036)**
	Matric	0.284 (0.036)**
	Technical diploma	0.303 (0.037)**
	Other post matric	0.311 (0.038)**
	University degree	0.324 (0.038)**
Language	Afrikaans	0.017 (0.008)**
	Ndebele	-0.005 (0.042)
	North Sotho	-0.044 (0.025)*
	Other	-0.037 (0.031)
	South Sotho	-0.028 (0.022)
	Swazi	0.007 (0.034)
	Tsonga	-0.009 (0.034)
	Tshwane	-0.083 (0.023)**
	Venda	0.001 (0.046)
	Xhosa	0.039 (0.020)**
	Zulu	-0.028 (0.019)

**Significant at the 5% level

* Significant at the 10% level

6. Conditional logit model econometrics

Discrete choice models are employed to portray consumer's choices among countable product alternatives. The initial assumptions that need to be satisfied before proceeding with the discrete choice framework are as follows. Alternatives must be mutually exclusive and the consumer must choose only one alternative from the choice set. The choice set must be exhaustive and the number of alternatives must be finite.

In this case we are interested in the market for financial services, specifically debit accounts. We have survey data on five firms in the sector, Absa, Capitec, FNB, Nedbank and Standard Bank. There are foreseeably other substitutes within the market however the survey data we have suggests that those interviewed overwhelmingly chose primarily between these five banks. Hence the choice set seems reasonably exhaustive and the number of alternatives is certainly finite. In the data we noted that several individuals held more than one debit account, which calls into question the assumption that consumers choose only one alterative from the choice set. In these instances we assumed that the consumers predominantly used one of the accounts, and proceeded by exploiting the main bank variable to identify which bank they principally deposited with. This assumption that individuals tend to restrict their accounts to one financial institution is supported by evidence on consumer behaviour. Amel and Starr-McCluer (2001) found from the Survey of Consumer Finances that consumers in the US prefer to purchase banking products together and appear to group their purchases, such as debit accounts, with their preferred main bank. Hence overall the initial discrete choice conditions are sufficiently satisfied.

We proceed by outlining the following model based upon McFadden (1974). Consumers are indexed with subscript $i = 1, \dots, N$ and products with subscript $j = 1, \dots, J$. Let p_j be the cost of product j. r_j represents the intrinsic value of product j while $\boldsymbol{z}_{ik}$ is a vector of measured attributes of consumer i with generic element z_{ij}. We begin by formulating a utility function whereby consumer i derives utility from alternative j as calculated by

$$U_{ij}(p_j, r_j, \boldsymbol{z}_i; \theta) = V_{ij}(p_j, r_j, \boldsymbol{z}_i; \theta) + \epsilon_{ij}$$

where V_{ij} symbolises the mean observable utility, ϵ_{ij} is the unobserved stochastic error term component and θ denotes the vector of parameters to be estimated. We normalise the utility of the outside option of not having a debit bank account to zero and thus interpret all our estimates relative to it.

We further assume that $V_{ij}(p_j, r_j, \boldsymbol{z}_i; \theta) = r_j - \alpha_i p_j + \sum_n \gamma_{jn} z_{in}$. Here α is the price coefficient and γ is the vector of coefficients of selected consumer characteristics.

The individual chooses the alternative which maximises utility, i.e. consumer i chooses alternative j if $U_{ij} \geq \max_{j \neq k, k \in C_i} U_{ik}$, where C_i is the choice set of the five banks. This occurs with probability

$$P_{ij} = \Pr[V_{ij} + \epsilon_{ij} \geq \max_{j \neq k, k \in C_i} V_{ik} + \epsilon_{ik}]$$

It is assumed that ϵ_{ij} follows a Type I extreme value distribution and is thus independently and identically distributed across products and individuals, and has a double exponential distribution $F(\epsilon_{ij}) = \exp(-\exp(-\epsilon_{ij}))$.

We next derive individual choice probability. Under our assumption about the stochastic error term the choice probability will be given by the logit formula. The logit choice probabilities, i.e. the probability that consumer i chooses alternative j are

$$P_{ij} = \Pr(V_{ij} + \epsilon_{ij} > V_{ik} + \epsilon_{ij} \forall j \neq k) = \Pr(\epsilon_{ij} < \epsilon_{ij} + V_{ij} - V_{ik} \forall j \neq k)$$

The choice probability is then the integral of P| ε over all values of ε weighted by its density:

$$P_{ij} = \int \left(\prod_{k \neq j} e^{-e^{-\epsilon_{ij} - V_{ij} + V_{ik}}}\right) f(\epsilon_{ij}) \epsilon_{ij}$$

After some manipulation this results in the closed-form expression for the conditional probability of consumer i selecting alternative j

$$P_{ijt} = \Pr[j|\boldsymbol{p}_{it}] = \frac{\exp(V_{ijt})}{\sum_{k\in C_i}\exp(V_{ikt})}$$

where $\boldsymbol{p}_j$ is the vector of prices consumer i faces.

Since we normalise the outside option to zero this can be rewritten as

$$P_{ijt} = \Pr[j|\boldsymbol{p}_{it}] = \frac{\exp(V_{ijt})}{1+\sum_{k=1}^{J}\exp(V_{ikt})}$$

In the conditional logit, the probability of consumer i choosing the alternative that he or she was observed to choose can be expressed as $\Pi_j P_{ij}^{y_{ij}}$, where $y_{ij} = 1$ if person i chose product j and $y_{ij} = 0$ otherwise.

Assuming that each consumer's choice is independent of that of other consumers, the probability of each person in the sample choosing the alternative that he was observed to choose is $\prod_i \prod_{j\in C_i}(P_{ij})^{y_{ij}}$. This can be rewritten as the log-likelihood function

$$\mathcal{L}(\alpha, r, \gamma) = y_{ij}\sum_{i}^{N}\sum_{j}\log(P_{ij})$$

The estimator we utilise will therefore be the vector of parameters α, r and γ that maximises this log-likelihood function.

ε_{ijk} denotes the elasticity of demand of technology j with respect to the price of fee k for consumer i and is derived from the above formulas in Appendix B as

$$\varepsilon_{ijk} = \frac{\delta P_{ij}}{\delta p_{ik}}\frac{p_{ik}}{P_{ij}} = \begin{cases} -\alpha_i p_{ij}(1-P_{ij}) if\ j=k \\ \alpha_i p_{ik} P_{ik}\ otherwise \end{cases}$$

α_i is obtained from the coefficients on price in the regression of the equation $V_{ij}(p_j, r_j, \boldsymbol{z}_i; \theta) = r_j - \alpha_i p_j + \sum_n \gamma_{jn} z_{in}$ while P_j is the probability of choosing good j and p_j is the price of good j.

In estimation the issue of price endogeneity is in principle evaded by the use of individual level data through assuming that no single individual has a noticeable impact on bank prices or product characteristics. As Goldberg (1995) explains, this assumption of exogeneity rests on their being no shared aggregate component in the error term. Such an aggregate component could arguably arise from a macroeconomic shock impacting on all individuals as well as prices together. However, the inclusion of control variables through which this shock would primarily be conveyed through the individual, such as income level and employment status, should work towards eliminating the aggregate component from the error term. The other possible source of an aggregate component in the error term is from unobserved product characteristics that are weighted similarly across individuals. The utility function with the existence of such unobserved product characteristics can be expressed as:

$$U_{ij} = V_{ij} + \epsilon_{ij} + \xi_{ij}$$

where ξ_{ij} denotes the unobserved product characteristics, in this case incorporating variables such as distance from nearest bank branch, bank reputation and service quality. Following Nevo (2001), bank dummy variable are thus included so as to capture such unobserved product characteristics that do not vary across individuals. Individual specific unobserved characteristics are already governed by the independent and identically distributed error ϵ_{ij}.

7. Discussion of results

7.1. Conditional logit results

Table 4 displays the results of the conditional logit regression of the choice of which of the principal financial institution to acquire a debit account with on a range of explanatory variables, including both product characteristics such as bank price and number of branches in each province as well as individual characteristics. Bank dummies were included in the regression in order to remove from the error term unobserved product characteristics that do not vary across individuals.

The branches variable was constructed from data on the number of physical branches per bank in each province. We include a branch variable in the primary regression rather than an urban or province dummies as arguably the key function of such location related variables in reference to consumer choice is primarily in terms of measuring the degree of access consumers have to banks. This can be evaluated more directly through the usage of our branch variable, which can be construed as an approximate proxy for the distance from banks or physical ease of access to financial services. We also run a regression replacing the branches variable with province dummies, as well as a third model including additional interaction terms.

The crucial bank price coefficient is negative and significant at -0.002 across each of the regressions. This result suggests that consumers respond to prices, and the negativity of the coefficient is as anticipated under the Law of Demand. An increase in the price of transaction fees thus indicates a decrease in the probability of an individual choosing to bank at one of the five banks in our model, relative to the outside option of not banking. Its significance suggests that unlike as found by Coetzee, van Zyl and Tait (2012), the price of banking in terms of the fees enacted on transactions is a relevant factor in determining South African consumer choices. This price coefficient is utilised to find estimates of price elasticity in the next section. First however we discuss other informative conclusions stemming from the conditional logit models.

The resultant coefficient on our branches variable is significant and positive at 0.005. Consumers thus appear to value the scope of financial institutions branch networks, with

individuals having a slightly higher probability of holding a debit account as the number of branches for their chosen bank in their province increases. When an interaction variable joining branches and income is included in the regression we find it has a slightly negative and significant coefficient, implying that wealthier consumers care less about the number of branches in their province than their less prosperous counterparts. This conforms to Dick (2002) findings, and the argument in the literature that wealthier consumers tend to rely less on branches to carry out financial transactions, preferring to focus on Internet and telephonic banking. The interaction variable joining branches and bank price was insignificant.

In the second model we replace the branches variables with province dummies. The important bank price coefficient remains significant, while the resulting principally negative coefficients on the province dummies imply that the probability of holding a debit account with any of the five banks in our model is less in the majority of provinces as compared to the omitted category of the Western Cape. The greatest exceptions to this rule are KwaZulu-Natal and the Free State, although in the latter case only the coefficients on Absa and Nedbank variables are significant.

The positive and significant coefficients on the income variables reveal that FNB, Nedbank and Standard Bank are increasingly preferred by wealthier individuals as compared to the outside option of no debit account, although in all cases this is by a very small amount. The positive coefficient on Absa is insignificant at the 5% level. Capitec on the other hand has a negative coefficient on its income variable, signifying that a higher income level is not related to an increase, but rather a decrease, in preference for its debit account against that of the outside option. This is plausibly a consequence of Capitec's strategic endeavour to break into the unbanked and lower incomes section of the economy, as well as perhaps due in part to wealthier clients relative lack of trust in the bank considering its significantly more recent founding and far more limited brand presence. Again however, the coefficient is very small so this effect is unlikely to be large. The addition of an interaction term between income and bank price in the third model yields a weakly negative and significant coefficient, indicating that as we would have expected, consumer's sensitivity with regard to price diminishes as income increases.

The literacy coefficients are reasonably strongly positive and predominantly significant. Hence being literate increases the probability of holding a bank account for each of the five banks addressed here. This outcome conveys a key factor in the South African government's drive to increase the banking population as the illiterate and less educated sectors of the population continue to find it challenging to comprehend banking literature and access financial services. A vital strategy highlighted by the Competition Commission and implemented by the main banks, as discussed by Coetzee (2009), has been to expand education and promote basic financial knowledge. Our literacy result here suggest that such policies should yield effective improvements in financial inclusivity.

The age coefficients are positive whereas the age squared coefficients are negative, conveying that the probability of having a debit account compared to the outside option of not banking advances with age at a decreasing rate for each of the banks in the model. However, these findings are only significant in the case of Absa and Capitec. For Absa the turning point in this relationship is at 43 years of age, while for Capitec it is at 26. In the case of Absa this may reflect the lesser need for transaction banking services by older retired individuals, while the younger turning point for Capitec may suggest that older individuals have been less willing to risk switching debit accounts to a relatively unproven newcomer into the market. A Wald test on the age and age squared variables however yields a p-value of 0.1 for both groups of variables, denoting that they are jointly insignificant at the 5% level, although just significant at the 10% level.

From the largely negative and significant coefficients on the race variables we observe that black, coloured and indian individuals are less likely to bank with any of the five banks than white consumers, the omitted category. The exception to this rule is that coloured individuals appear to have a great probability of banking with Capitec than white individuals, with a significant coefficient of 0.779 on the relevant coloured variable. The largest negative coefficients are on the black variables, a finding that concurs with research on the demographics of the unbanked sector by Dorsey and Jacob (2004).

The occupation category variables are mainly positive and significant outside of the student and other dummies, the latter of which suffers from a lack of observations. This

implies that when compared to the omitted unemployed category consumers in some form of work are more likely to have a debit account at one of the five banks than to have no account, as would be predicted.

For Absa, FNB, Nedbank and Standard Bank this relationship is generally strongest in the administrative and management occupations, as well as in professional and technical careers. This concurs with the outcomes we found in the logit model above. Workers in the production, mining and agriculture tend to have the smallest coefficients, although the agriculture coefficients are insignificant at the 5% level for FNB and Nedbank. As discussed above this is possibly a consequence of these sectors being cash-based and in the case of agriculture, production and mining occupations, more commonly rurally located where banking opportunities are less developed.

Housewives and retired individuals also have a reduced probability of holding a debit account. While the student variables are mostly insignificant, as they stand students are least likely to choose a Capitec Bank account, which makes sense since Capitec does not offer any fee advantages specific to students unlike the other banks.

Capitec slightly bucks the occupation trends, with the greatest probability increases accruing to the artisans, production and mining, and transport and communications sectors. The agriculture coefficient for Capitec is also comparatively large, at 0.913, compared to those recorded by most other banks. Consequently, its push to provide services to previously less banked sections of the population may have been successful at least with regard to the agriculture sector.

In terms of fit the primary model records a reasonable pseudo R^2 of 0.504. We also perform a Linktest on the model to measure its specification. The coefficient on the _hat variable, denoting the predicted value of the model, is significant whereas the coefficient on the _hatsq variable is insignificant, indicating that the model is correctly specified. The auxiliary models have similar measures of fit, as shown in Table 7.

Table 4: Determinants of bank choice for debit account

Variables	**Conditional logit model 1**				
Bank price	-0.002 (0.001)**				
Branches	0.005 (0.001)**				
Bank specific	**Absa**	**Capitec**	**FNB**	**Nedbank**	**Standard Bank**
Bank dummies	-3.591 (0.397)**	-6.716 (1.168)**	-3.647 (0.481)**	-5.850 (1.091)**	-4.993 (0.767)**
Income	0.000003 (0.000)	-0.0001 (0.000)**	0.00001 (0.000)**	0.00002 (0.000)**	0.00002 (0.000)**
Female	0.139 (0.053)**	0.116 (0.135)	-0.057 (0.063)	0.109 (0.092)	0.005 (0.063)
Literate	0.832 (0.313)**	1.475 (1.010)	0.761 (0.388)*	1.822 (1.007)*	2.072 (0.713)**
Age variables					
Age	0.026 (0.011)**	0.051 (0.030)*	0.010 (0.013)	0.016 (0.019)	0.005 (0.013)
Age squared	-0.0003 (0.000)**	-0.001 (0.000)**	-0.0002 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)
Race variables					
Black	-1.315 (0.060)**	-0.261 (0.183)	-0.570 (0.072)**	-1.383 (0.111)**	-0.590 (0.074)**
Coloured	-0.865 (0.075)**	0.779 (0.188)**	-0.568 (0.099)**	-0.600 (0.128)**	-0.269 (0.092)**
Indian	-0.641 (0.098)**	-0.426 (0.351)	0.183 (0.102)*	0.313 (0.120)**	0.424 (0.098)**
Occupation variables					
Administrative and management	1.429 (0.156)**	0.545 (0.615)	1.515 (0.169)**	1.690 (0.245)**	1.232 (0.179)**
Agriculture	1.009 (0.159)**	0.923 (0.359)**	0.410 (0.219)*	0.195 (0.363)	0.430 (0.210)**
Artisans and related	1.234 (0.131)**	1.289 (0.291)**	0.896 (0.156)**	1.076 (0.241)**	1.012 (0.148)**
Clerical and sales	1.154 (0.104)**	1.045 (0.234)**	1.212 (0.113)**	1.402 (0.186)**	1.027 (0.116)**
Production and mining	1.014 (0.131)**	1.314 (0.247)**	0.925 (0.145)**	0.963 (0.244)**	1.111 (0.135)**
Professional and technical	1.383 (0.115)**	1.273 (0.296)**	1.434 (0.126)**	1.435 (0.202)**	1.298 (0.127)**
Service	1.104 (0.110)**	0.997 (0.231)**	0.981 (0.124)**	1.136 (0.209)**	0.903 (0.125)**
Transport and communications	1.311 (0.171)**	1.319 (0.381)**	1.256 (0.183)**	1.347 (0.298)**	0.778 (0.213)**
Other	1.097 (0.457)**	-14.177 (2162.449)	-14.182 (951.558)	-14.236 (1735.734)	0.632 (0.608)
Housewife	0.574 (0.109)**	0.128 (0.269)	0.494 (0.134)**	0.867 (0.194)**	0.318 (0.135)**
Retired	1.132 (0.114)**	0.487 (0.343)	0.643 (0.147)**	0.841 (0.208)**	0.492 (0.146)**
Student	0.095 (0.126)	-0.367 (0.269)	-0.014 (0.134)	0.444 (0.222)*	0.080 (0.140)

**Significant at the 5% level
* Significant at the 10% level

Table 5: Determinants of bank choice substituting in province variables

Variables	**Conditional logit model 2**				
Bank price	-0.002 (0.001)**				
Bank specific	Absa	Capitec	FNB	Nedbank	Standard Bank
Bank dummies	-3.448 (0.404)**	-6.140 (1.178)**	-3.922 (0.491)**	-6.014 (1.099)**	-5.057 (0.773)**
Income	0.00001 (0.000)**	-0.00006 (0.000)**	0.00002 (0.000)**	0.00002 (0.000)**	0.00002 (0.000)**
Female	0.154 (0.053)**	0.115 (0.136)	-0.050 (0.063)	0.121 (0.093)	0.009 (0.063)
Literate	0.897 (0.314)**	1.430 (1.011)	0.893 (0.390)**	1.921 (1.008)*	2.187 (0.714)**
Age variables					
Age	0.038 (0.011)**	0.064 (0.029)**	0.023 (0.013)*	0.035 (0.019)*	0.019 (0.014)
Age squared	-0.0004 (0.000)**	-0.001 (0.000)**	-0.0003 (0.000)**	-0.0003 (0.000)	-0.0002 (0.000)
Race variables					
Black	-1.246 (0.063)**	-0.104 (0.191)	-0.593 (0.075)**	-1.392 (0.115)**	-0.604 (0.077)**
Coloured	-0.904 (0.080)**	0.583 (0.200)**	-0.582 (0.104)**	-0.607 (0.136)**	-0.324 (0.097)**
Indian	-1.103 (0.107)**	-0.999 (0.367)**	-0.413 (0.112)**	-0.513 (0.135)**	-0.228 (0.108)**
Occupation variables					
Administrative and management	1.410 (0.159)**	0.460 (0.617)	1.522 (0.172)**	1.629 (0.248)**	1.219 (0.182) *
Agriculture	0.953 (0.162)**	0.801 (0.362)**	0.410 (0.221)*	0.149 (0.366)	0.433 (0.213)**
Artisans and related	1.178 (0.132)**	1.216 (0.293)**	0.848 (0.158)**	0.962 (0.244)**	0.954 (0.150)**
Clerical and sales	1.140 (0.105)**	1.037 (0.236)**	1.226 (0.115)**	1.361 (0.188)**	1.023 (0.117)**
Production and mining	0.958 (0.132)**	1.233 (0.249)**	0.885 (0.146)**	0.851 (0.247)**	1.059 (0.136)**
Professional and technical	1.330 (0.116)**	1.200 (0.297)**	1.363 (0.127)**	1.319 (0.204)**	1.216 (0.128)**
Service	1.047 (0.111)**	0.941 (0.232)**	0.948 (0.125)**	1.060 (0.211)**	0.857 (0.126)**
Transport and communications	1.263 (0.172)**	1.218 (0.383)**	1.220 (0.185)**	1.282 (0.300)**	0.735 (0.215)**
Other	0.979 (0.459)**	-15.696 (4190.722)	-16.007 (2151.840)	-16.064 (3918.997)	0.432 (0.614)
Housewife	0.512 (0.110)**	0.037 (0.272)	0.449 (0.135)**	0.763 (0.196)**	0.251 (0.136)*
Retired	1.142 (0.115)**	0.506 (0.346)	0.645 (0.148)**	0.843 (0.210)**	0.491 (0.148)**
Student	0.117 (0.126)	-0.371 (0.269)	-0.014 (0.134)	0.450 (0.222)**	0.071 (0.140)
Province variables					
Eastern Cape	-0.536 (0.095)**	-1.185 (0.241)**	0.292 (0.115)**	-0.475 (0.173)**	-0.042 (0.111)
Free State	0.198	-0.278	0.285	-0.121	-0.121

	(0.094)**	(0.245)	(0.132)**	(0.185)	(0.136)
Gauteng	-0.234	-0.949	-0.066	-0.264	-0.248
	(0.080)**	(0.211)**	(0.110)	(0.141)*	(0.104)**
KwaZulu-Natal	0.459	0.256	0.972	1.033	0.846
	(0.086)**	(0.199)	(0.111)**	(0.138)**	(0.105)**
Limpopo	-2.497	-15.927	-2.467	-3.628	-3.159
	(0.278)**	(489.602)	(0.392)**	(1.008)**	(0.509)**
Mpumalanga	-0.400	-0.913	-0.330	-0.477	-0.357
	(0.137)**	(0.359)**	(0.183)*	(0.269)*	(0.173)**
Northwest	-1.274	-2.044	-0.835	-1.573	-2.189
	(0.165)**	(0.527)**	(0.200)**	(0.375)**	(0.330)**
Northern Cape	-0.247	-0.809	-0.149	-0.473	-0.119
	(0.116)**	(0.280)**	(0.168)	(0.232)**	(0.149)

**Significant at the 5% level
* Significant at the 10% level

Table 6: Determinants of bank choice with additional interaction terms

Variables	**Conditional logit model 3**				
Bank price	-0.002 (0.001)*				
Bank price*Income	-0.0000001 (0.000)*				
Branches	0.005 (0.002)**				
Branches*Bank price	0.00002 (0.000)				
Branches*Income	-0.0000005 (0.000)**				
Bank specific	Absa	Capitec	FNB	Nedbank	Standard Bank
Bank dummies	-3.636 (0.402)**	-6.745 (1.169)**	-3.701 (0.485)**	-5.871 (1.092)**	-5.054 (0.769)**
Income	0.00004 (0.000)**	-0.00004 (0.000)**	0.00004 (0.000)**	0.00004 (0.000)**	0.00005 (0.000)**
Female	0.144 (0.053)**	0.118 (0.135)	-0.056 (0.063)	0.116 (0.092)	0.005 (0.063)
Literate	0.727 (0.313)**	1.424 (1.010)	0.671 (0.388)*	1.775 (1.007)*	1.997 (0.713)**
Age variables					
Age	0.026 (0.011)**	0.051 (0.030)*	0.011 (0.013)	0.016 (0.019)	0.004 (0.013)
Age squared	-0.0003 (0.000)**	-0.001 (0.000)**	-0.0002 (0.000)	-0.0001 (0.000)	-0.0001 (0.000)
Race variables					
Black	-1.290 (0.061)**	-0.247 (0.184)	-0.559 (0.072)**	-1.369 (0.112)**	-0.573 (0.075)**
Coloured	-0.843 (0.075)**	0.790 (0.188)**	-0.558 (0.099)**	-0.587 (0.128)**	-0.265 (0.092)**
Indian	-0.623 (0.098)**	-0.412 (0.351)	0.191 (0.102)*	0.329 (0.120)**	0.429 (0.098)**
Occupation variables					
Administrative and management	1.390 (0.158)**	0.539 (0.615)	1.507 (0.169)**	1.691 (0.245)**	1.206 (0.180)**
Agriculture	0.933 (0.163)**	0.900 (0.359)**	0.362 (0.220)*	0.108 (0.364)	0.409 (0.212)*
Artisans and related	1.180 (0.133)**	1.275 (0.291)**	0.879 (0.156)**	1.061 (0.241)**	0.984 (0.149)**
Clerical and sales	1.104 (0.106)**	1.037 (0.234)**	1.195 (0.113)**	1.388 (0.186)**	0.999 (0.117)**
Production and mining	0.962 (0.133)**	1.297 (0.247)**	0.907 (0.145)**	0.942 (0.245)**	1.085 (0.136)**
Professional and technical	1.327 (0.118)**	1.258 (0.296)**	1.415 (0.126)**	1.418 (0.202)**	1.262 (0.128)**
Service	1.054 (0.111)**	0.983 (0.231)**	0.964 (0.124)**	1.115 (0.209)**	0.882 (0.126)**
Transport and communications	1.252 (0.172)**	1.302 (0.381)**	1.235 (0.183)**	1.328 (0.298)**	0.746 (0.213)**
Other	1.045 (0.457)**	-13.181 (1308.204)	-13.183 (569.818)	-13.235 (1044.309)	0.611 (0.609)
Housewife	0.573 (0.109)**	0.128 (0.269)	0.489 (0.134)**	0.865 (0.194)**	0.312 (0.135)**
Retired	1.107 (0.115)**	0.485 (0.343)	0.645 (0.147)**	0.842 (0.208)**	0.479 (0.147)**
Student	0.117 (0.127)	-0.373 (0.269)	-0.007 (0.134)	0.445 (0.222)**	0.109 (0.141)

**Significant at the 5% level. * Significant at the 10% level

Table 7: Determinants of bank choice for debit account summary

Conditional logit	**Model 1**	**Model 2**	**Model 3**
Bank price	-.001835 (0.001)**	-.0018384 (0.001)**	-.002246 (0.001)*
Pseudo R^2	0.504	0.519	0.504

**Significant at the 5% level
* Significant at the 10% level

7.2. Elasticity estimation

In order to estimate the price elasticity of demand we employ the significant bank price coefficient of -.001835 calculated from our primary model demand estimation, bank prices and the model's predicted values. Following the below elasticity equation, we find own and cross price elasticities as described in Table 8 and Table 9.

$$\varepsilon_{ijk} = \frac{\delta P_{ij}}{\delta p_{ik}} \frac{p_{ik}}{P_{ij}} = \begin{cases} -a_i p_{ij}(1 - P_{ij}) if\ j = k \\ a_i p_{ik} P_{ik}\ otherwise \end{cases}$$

Average own price elasticity is found to be inelastic at -0.119, implying that the percentage fall in quantity demanded following a price increase in fees is considerably less than the percentage rise in price. This result is in keeping with that found by both Dick (2002) for the US and Molnár, Márton and Horváth (2006) in Hungary, and is explained in part by the necessity of having a transaction bank account for the majority of individuals as well as the high switching costs associated with changing banks. The principal distinction between their results and our findings here lies in the degree of inelasticity. South Africans banks appear to face especially inelastic demand compared to their Hungarian and US counterparts, a fact perhaps unsurprising considering the far greater concentration of the South African financial industry. The average cross price elasticity is also calculated and found to be positive at 0.009. This suggests that the five main banks are substitutes to one another, although quite weakly so.

As both Dick (2002) and Molnár, Márton and Horváth (2006) note, elasticities below unity indicate that the firms, while certainly generating large profits, are not profit maximising. Under profit maximisation banks would respond to the below unity elasticities by raising fees until they reach an elastic portion of the demand curve. However banks, particularly following the 2008 Banking Enquiry that enhanced consumer and regulatory scrutiny of banking fees, may be constrained by the political and public relations cost of raising fees further.

We can examine more informative distinctions between the financial institutions when the price elasticities are separated by bank. We find that Capitec consumers are the most price inelastic at -0.075. This result may be partly justified by the difficulty lower income

and less educated individuals, the type of client Capitec specialise in, encounter when attempting to set up an account at the other main banks. Capitec has reduced the necessary paper work and required credentials needed to open an account, and the simplicity of its product, contained in the single Global One account, lessens the confusion that such individuals may face at alternative institutions. Clients may thus effectively have potential access to a more limited number of close substitute goods in terms of their ability to access the other banks' accounts. The less close these substitutes are, the lower the elasticity is likely to be, as people find it difficult to switch from Capitec to another bank even in the event of a price shift. This argument is supported by findings on average cross price elasticity, wherein Capitec has the lowest cross price elasticity relative to the other banks at 0.001.

On the other hand the other main banks, principally the three largest institutions Absa, FNB and Standard Bank, have markedly higher own and cross price elasticities. These more established banks are thus greater substitutes with one another. This is most true for the three largest banks, Absa, FNB and Standard Bank, which are also the most closely related in terms of account requirements, branch numbers, price levels and market shares. Nedbank, which has a considerably different accounts format and a far lesser market share, faces greater price inelasticity and has a smaller cross price elasticity with the other banks.

Table 8: Average price elasticities

Variable	Observations	Mean	Std. Dev.	Min	Max
Own price elasticity	137652	-0.119	0.087	-0.701	0.000
Cross price elasticity	137652	0.009	0.014	0.000	0.158

Table 9: Average price elasticities matrix

	Absa	Capitec	FNB	Nedbank	Standard Bank
Absa	-0.166	0.001	0.012	0.004	0.014
Capitec	0.021	-0.075	0.012	0.004	0.014
FNB	0.021	0.001	-0.164	0.004	0.014
Nedbank	0.021	0.001	0.012	-0.131	0.014
Standard Bank	0.021	0.001	0.012	0.004	-0.180

8. Conclusion

This paper has estimated a demand model for the South African banking sector in order to analyse the determinants of demand, elasticities and the nature of competition in the South African deposit account market. The results from our conditional logit estimation indicate that consumers respond to prices in choosing a depository institution. Moreover, consumers respond favourably to branch density while individual characteristics including income, age, occupation and literacy influence their choice decision. Developing our results to estimate price elasticity, we find that South African banks face significantly inelastic demand for their depository services in relation to transaction fees.

This paper diverges from the existing literature by using individual level survey data instead of the more commonly collected aggregate data to evaluate consumer decisions based upon prices, bank and individual characteristics. This approach contributes to the literature in advancing understanding on the nature of the banking industry. By being based on detailed survey data our approach estimates price elasticities and consequently the degree of competition with greater precision than previous studies, under a framework that is more suitable for such analysis due to its ability to accurately convey and capture the consumer's decision problem.

The identification of price elasticity in this paper is particularly relevant considering the current climate. Since the 2008 financial crisis the pricing of retail bank accounts has become increasingly pertinent as the bank industry worldwide faces cost pressures, changing customer expectations and a fall in trust. Across Europe an Ernst and Young survey reported that 45% of customers report that the crisis has had a negative, or very negative, impact on their trust in the banking industry (Earnst and Young, 2010, p.6). A side effect of this fall in trust is a drop in loyalty and greater stringency when it comes to banking affairs, including consumers' assessment of service fees. One trend arising from the shifts of the last decade has thus been a strong push towards transparency, assisted both by technology improvements and regulatory efforts based upon enhancing the accessibility, comprehensibility and comparability of price information.

Despite considerable advances, banking fees within South Africa however remain difficult to access, to a much greater extent than is the case of many other products and

services. A major source of this difficulty arises from the complex and obscure method in which banking fee information is collated on bank websites and literature. However, part of this problem may rest with the consumer. As discussed by Wruuk (2013) financial depository products often tend to be relatively 'low involvement' goods, generating little enthusiasm or special interest in the product itself, especially considering the low percentage of income fees represent per transaction. This characteristic of retail banking could arguably result in a lesser desire on the part of the consumer to put in the effort to fully comprehend the fees he or she faces and might help explain the low price elasticities found in this paper. The effect might be further pronounced by the fact that retail banking, and its associated fees, is for a good portion of the population effectively a necessity that cannot be avoided.

Furthermore, switching costs both in terms of money and time associated with changing banks lowers the buying frequency, reducing consumer's implicit knowledge of the alternatives available as well as lessening the gains to be made from switching (Wruuk, 2013). These switching costs should not be underestimated. The Competition Commission calculated that the cost of transferring accounts could surpass 5% of three years' worth of charges on an existing account, based on the opportunity cost of a very conservative estimate of only one hour of research (Solidarity Report, 2011, p.13).

At the same time pricing is also murky from the viewpoint of banks. Colgate et al (2001) found that bank deposit fees believed to be exorbitant by consumers are a major factor influencing those individuals that do switch banks. Switching when it does occur however rarely results in these grievances being made apparent directly to the financial institution. Thus complaints regarding product characteristics such as transaction fees tend to be detected by banks with a sizeable delay as customers, perhaps considering financial institutions to be too large and impersonal to be worth complaining to, first look to social networks or word of mouth to announce their discontentment.

To gain further insight into the issues explored in this paper, a valuable addition to the work of this paper would be to extend the models over a number of years to assess the trends apparent in price elasticity and competition within the banking industry over time and more recently. Such an approach would be able to review the impact of recent legislation, firm entry, regulatory scrutiny and variations in consumer behaviour on the

price sensitivity of demand as well as the nature of competition in the banking sector. Furthermore, employing mixed or nested logit models to the data could usefully test the validity and robustness of our results in the absence of the independence of irrelevant alternatives axiom.

References

Amel, D.F. and Hannan, T.H. (1999). Establishing banking market definitions through estimations of residual deposit supply equations. *Journal of Banking and Finance,* 23, pp. 667-1690.

Aregbeyen, O. (2011). The Determinants of bank selection choices by customers: recent and extensive evidence from Nigeria. *International Journal of Business and Social Science,* 22, pp. 276-288.

Bain, J. (1956). *Barriers to New Competition*. Cambridge MA, Harvard University Press.

Becket, A., Hewer, P. and Howcroft, B. (2000). An exposition of consumer behaviour in the financial services industry. *International Journal of Bank Marketing,* 18, pp. 15-26.

Ben-Akiva, M., Train, K.E. & McFadden, D.L. (1987). The Demand for local telephone service: a fully discrete model of residential calling patterns and service choices. *RAND Journal of Economics*, 18, pp. 109-123.

Benfratello et al. (2006). Banks and innovation: microeconometric evidence on Italian firms. *IZA Discussion Papers*, 2032, pp. 1-47.

Berger, A.N. and Hannan T.H. (1989). The Price-concentration relationship in banking. *Review of Economics and Statistics*, 71, pp. 291-299.

Berger, A.N., Demirguc-Kunt A., Levine R. and Haubrich J.G. (2004). Bank concentration and competition: an evolution in the making. *Journal of Money, Credit, and Banking*, 36, pp. 433-451.

Berry, S. (1994). Estimating discrete-choice models of product differentiation. *The RAND Journal of Economics*, 25, pp. 242-262.

Berry, S., Levinsohn, J. and Pakes, A. (2004). Differentiated products demand systems from a combination of micro and macro data: the new car market. *Journal of Political Economy,* 112, pp. 68-105.

Birke, D. and Swann, G. (2006). Network effects and the choice of mobile phone operator. *Journal of Evolutionary Economics,* 16, pp. 65-84.

Borzekowski, R., Kiser, E.K. and Ahmed, S. (2008). Consumers' use of debit cards: patterns, preferences, and price response. *Journal of Money, Credit and Banking*, 40, pp. 149-172.

Bresnahan, T. (1982). The Oligopoly solution is identified. *Economic Letters, 10*, pp.87-92.

Bresnahan, T. (1989). Empirical studies of industries with market power. *Handbook of Industrial Organization*, pp. 1011- 1057.

Capitec Annual Reports 2010, 2011, 2012, 2013. [Online] Available at: https://www.capitecbank.co.za/investor-relations/financial-results/2013. [Accessed 1 February 2014].

Carbo-Valverde, S. and Linares-Zegarra, J.M. (2009). How effective are rewards programs in promoting payment card usage? Empirical evidence. *Working Paper Series*, 1141, pp. 1-38.

Change, Y.T. (2005). Dynamics of Internet banking adoption. *CCP Working Paper*, 06-3, pp. 1-63.

Cheser, A, Rosen, A.M. and Smolinski, K. (2012). An Instrumental variable model of multiple discrete choice. *CeMMAP working paper*, CWP06/11, pp. 1-48.

Christiadi and Cushing, B. (2007). Conditional logit, IIA, and alternatives for estimating models of interstate migration. *Research Paper*, 2007-4, pp. 1-28.

Claessens, S., & Laeven, L. (2003). What drives bank competition? Some international evidence. *World Bank Policy Research Working Paper*, 3113, pp. 563-583.

Coetzee, J. (2009). Personal or remote interaction? Banking the unbanked in South Africa. *South African Journal of Economic and Management Sciences*, 12, pp. 448-461.

Coetzee, J., van Zyl, H. and Tait, M. (2012). Selection criteria in the South African retail banking sector. *African Journal of Business Management*, 6, pp. 10558-10567.

Colgate, M. and Hedge, R. (2001). An Investigation into the switching process in retail banking services. *International Journal of Bank Marketing*, 19, pp. 201-212.

Competition Commission of South Africa Annual Reports 2001, 2010, 2011, 2012, 2013. [Online] Available at: http://www.compcom.co.za/annual-reports/. [Accessed 1 February 2014].

Corts, C.K. (1998). Conduct parameters and the measurement of market power. *Journal of Econometrics*, 88, pp. 227-250.

Davies, P. and Garces, E. (2009). *Quantitative Techniques for Competiton and Antitrust Analysis.* Princeton University Press

Davies, P., Greenwood, M.J. and Li, H. (2001). A Conditional logit approach to U.S. state to state migration. *Journal of Regional Science*, 41, pp. 337-360.

Degryse, H. and Ongenapg S. (2005). Competition and regulation in the banking sector: a review of the empirical evidence on the sources of bank rents. *Handbook of Financial Intermediation and Banking*, pp. 483-554.

Dick, A. (2002). Demand estimation and consumer welfare in the banking industry. *Finance and Economics Discussion Series,* Paper 58, pp. 1-55.

Dorsey, D. and Jacob, K. (2005). Financial services trends and recent innovations in South Africa: Lessons for the United States. *The Centre for Financial Services Innovation*. pp. 1-14.

Earnst and Young (2010). *Understand Customer Behaviour in Retail Banking*, pp. 1-32. [Online] Available at: http://www.ey.com/Publication/ vwLUAssets/ Understanding_customer_behavior_in_retail_banking_-_February_2010/ $FILE/EY_Understanding_customer_behavior_in_retail_banking_-_February_2010.pdf. [Accessed 17 February 2014].

Falkena, H. et al. (2004). *Competition in South African Banking*, Task Group Report

Finscope Survey 2010, 2011, 2012. [Online] Available at: http://www.finscope.co.za/pages/default.aspx [Accessed 17 February 2014].

Fisher-French, 2014. *Capitec Bank is South Africa's fourth largest bank for main accounts | Maya on MoneyMaya on Money*. [Online] Available at: http://mayaonmoney.co.za/2013/05/capitec-bank-is-south-africas-fourth-largest-bank/. [Accessed 1 February 2014].

Gilbert, E., Calitz, E., Plessis, S . (2009). Prudential regulation, its international background and the performance of the banks: a critical review of the South African environment since 1970. *Economic History of Developing Regions*, 24, pp. 43-81.

Goldberg, P.K. (1995). Product differentiation and oligopoly in international markets: the case of the U.S. automobile Industry. *Econometrica*, 63, pp. 891-951.

Hannan, T.H. (1983). Prices, capacity, and the entry decision: a conditional logit analysis. *Southern Economic Journal*, 50, pp. 539-550.

Hawthorne, R. et al. (2014). *Review of the Competition Commission Banking Enquiry*. Centre for Competition, Regulation and Economic Development, pp. 1-45

Jali et al. (2008). *Competition Commission of South Africa: Enquiry in to Banking.* [Online] Available at: http://www.compcom.co.za/enquiry-in-to-banking/. [Accessed 1 February 2014].

Keraan, T. (2010). *Banking the Bottom of the Pyramid*, pp. 1-10. [Online], Available on: http://www.deloitte.com/assets/Dcom-SouthAfrica/Local%20Assets/ Documents/Banking%20the%20Bottom%20of%20the%20Pyramid_16112010.pdf [Accessed 01 February 2014].

KPMG. (1998). *Bank Margins and Related Profitability in South Africa: a study*. pp. 1-54 [Online], Available on: http://www.compcom.co.za/banking/Documents/ Company%20Submissions/ Banking%20Ass-%20KPMG%20Study%20- %20Bank%20Margins.pdf [Accessed 01 February 2014].

Kumbirai, M. and Webb, R. (2010). A Financial ratio analysis of commercial bank performance in South Africa. *African Review of Economics and Finance*, 2, pp. 30-53.

Lee J. and Marlowe J. (2003). How consumers choose a financial institution: decision-making criteria and heuristics. *International Journal of Bank Marketing*, 21, pp. 53-71.

Mboweni, T.T. (2004). *The South African banking sector - an overview of the past 10 years.* Address by Governor of the South African Reserve Bank, at the Year-end media cocktail function, Johannesburg, 14 December 2004.

McFadden, D. (1973). Conditional logit analysis of qualitative choice behavior. *Frontiers of Econometrics* (ed. by P. Zarembka), New York, Academic Press, pp. 105-142.

Mminele A. D. (2009). *Recent Economic Developments in South Africa*. pp. 1-4. [Online] Available on http://www .bis .org/review/r091008d .pdf [Accessed 1 February 2014].

Molnár, J. (2008). Market power and merger simulation in retail banking. *Bank of Finland Research Discussion Papers*, 2008/4, pp. 1-29.

Molnár, J., Márton N. and Horváth C. (2006). A structural empirical analysis of retail banking competition: The case of Hungary. *MNB Working Papers*, No. 2007/1, pp. 1-40.

Muzenda, A. (2014). Customers retail bank selection criteria in South Africa. *European Journal of Business and Management*, 6, pp. 198-203.

Nakene, M.I., Alencar L.S. and Kanczuk F. (2006). Demand for bank services and market power in Brazilian banking. *Working Paper Series*, 107, pp. 1-46.

Nathan, A. and Neave H. (1989). Competition and contestability in Canada's financial system: empirical results. *Canadian Journal of Economis*, 22, pp. 567-594.

Nevo, A. (1998). Identification of the oligopoly solution concept in a differentiated-products industry. *Economics Letters*, 59, pp. 391-395.

Nevo, A. (2001). Measuring Market Power in the Ready-To-Eat Cereal Industry. *Econometrica*, 69, pp. 307-342.

Okeahalam, C. (2001). Structure and Conduct in the Commercial Banking Sector of South Africa. *Presented at TIPS 2001 Annual Forum*, pp. 1-20

Panzar, J.C. and Rosse J.N. (1987). Testing for monopoly equilibrium. *Journal of Industrial Economics*, 35, pp. 443-456.

Ravenscraft, D.J. (1983). Structure-profit relationships at the line of business and industry level. *Review of Economics and Statistics*, 65, pp. 22-31.

Rossouw, J. (2009). *South African Reserve Bank History, functions and institutional structure.* pp. 1-66. [Online] Available on http://www.reservebank.co.za [Accessed 1 February 2014].

Shaffer, S. (1993). A Test of competition in Canadian banking. *Journal of Money, Credit, and Banking*, 25, pp. 49-61.

Simbanegavi, W., Greenberg, J. and Gwatidzo, T. (2012). Testing for competition in the South Africa Banking Sector. *MPRA Paper*, No. 43627, pp. 1-33.

Solidarity Report. (2011). *A Comparative Analysis of the Cost of Personal Transaction Accounts at Five South African Banks*, pp. 1-80. [Online] available on http://www.solidarityresearch.co.za/ [accessed 1 February 2014].

South African Reserve Bank (SARB) Annual Report 2009, 2010, 2011, 2012, 2013 [Online] available on http://www.reservebank.co.za/ [accessed 1 February 2014].

Tirole, J. (1988). *The Theory of Industrial Organization*. Cambridge, MA, The MIT Press.

Van der Walt S.J. (1998). The Influence of socio-political developments on banks in South Africa, 1992 to 1997. *Occasional Paper*, 13, pp. 1-34.

Wruuck, P. (2013). Pricing in retail banking: scope for boosting customer satisfaction & profitability. *Deutsch Bank Research*, pp. 1-20. [Online] available on https://www.dbresearch.com/ [accessed 1 February 2014].

Appendix A: Price variable transaction bundle

Table 10: Transaction bundle

Transaction type	**Quantity**
Monthly fee	1
Internet banking subscription fee	1
Own bank ATM cash withdrawal % of income	4 5.00%
Debit or cheque card purchase (POS) % of income	4 5.00%
IB transfer to another account % of income	4 5.00%
Inter-account payment	1
Debit order (internal)	1
Debit order (external) % of income	1 5.00%
IB stop order (internal)	1
IB stop Order (external) At 5% of income	1 5.00%
Total transactions	17

This basket of transactions is similar to the bundle that the Solidarity Report applies in its analysis. The arguably most common and noticeable fees are focused on. Following the advice given by banks the number of transactions is limited, with fewer payments and cash withdrawals at higher values preferred, and payments are predominantly Internet or ATM based. Reasonably sized alterations to the bundle do not drastically change our results, as the prices affixed to each account faced by the individual changes in a fairly parallel manner across banks. Two sets of prices were tested in our models, one focused on pay as you transact fees, the other including alternative payment options such as Absa's Easy Fee or FNB's Unlimited Option. In the latter case consumers were assumed to choose the payment scheme that offered them the smallest fees.

Appendix B: Deriving elasticities

Derivation of the sensitivity of the probability of an alternative being chosen to price

$$P_{ijt} = \frac{\exp(V_{ijt})}{1 + \sum_{k=1}^{J} \exp(V_{ikt})}$$

$$V_{ij}(p_j, r_j, \boldsymbol{z}_i; \theta) = r_j - \alpha_i p_j + \sum_n \gamma_{jn} z_{in}$$

$$\frac{dP_j}{dp_k} = \frac{-\alpha_i \exp(V_{ij}) \left[1 + \sum_{k=1}^{J} \exp(V_{ik})\right] - \exp(V_{ij}) \left[-\alpha_i \exp(V_{ij})\right]}{(1 + \sum_{k=1}^{J} \exp(V_{ik}))^2}$$

$$= \frac{-\alpha_i \exp(V_{ij})}{1 + \sum_{k=1}^{J} \exp(V_{ik})} + \frac{\alpha_i \, exp(V_{ij})^2}{(1 + \sum_{k=1}^{J} exp(V_{ik}))^2}$$

$$= -\alpha_i P_{ij} + \alpha_i (P_{ij})^2 = \alpha_i P_{ij} (P_{ij} - 1)$$

$$\frac{dP_j}{dp_k} \frac{p_k}{P_j} = \alpha_i P_{ij} (P_{ij} - 1) \frac{p_k}{P_j}$$

We denote by ε_{ijk} the elasticity of demand of technology j with respect to the price of fee k for consumer i

$$\varepsilon_{ijk} = \frac{\delta P_{ij}}{\delta p_{ik}} \frac{p_{ik}}{P_{ij}}$$

In the conditional logit model, the partial derivative is

$$\frac{\delta P_{ij}}{\delta p_{ik}} = \begin{cases} -\alpha_i P_{ij} (1 - P_{ik}) if \; j = k \\ \alpha_i P_{ij} P_{ik} \; otherwise \end{cases}$$

which implies elasticities as:

$$\varepsilon_{ijk} = \frac{\delta P_{ij}}{\delta p_{ik}} \frac{p_{ik}}{P_{ij}} = \begin{cases} -\alpha_i p_{ij} (1 - P_{ij}) if \; j = k \\ \alpha_i p_{ik} P_{ik} \; otherwise \end{cases}$$