

BANKS AND FINANCIAL DISCRIMINATION: WHAT CAN BE LEARNT FROM THE SPANISH EXPERIENCE?

Authors

Beatriz Fernández-Olit, Associate Professor at the Faculty of Communication and Business, International University of La Rioja, UNIR.

Address: International University of La Rioja, UNIR, Almansa 101, 28040 Madrid

Email: beatriz.fernandez@unir.net

Name: Cristina Ruza, Senior Lecturer at the Applied Economics Department of UNED.

Address: UNED, Economic and Business Faculty, Senda del Rey nº 11, 28040 Madrid

Email: cruza@cee.uned.es

Marta de la Cuesta, Senior Lecturer at the Applied Economics Department of UNED.

Address: UNED, Economic and Business Faculty, Senda del Rey nº 11, 28040 Madrid

Email: mcuesta@cee.uned.es

Mariano Matilla-Garcia, Professor at the Department of Applied Economics and Statistic of UNED.

Address: UNED, Economic and Business Faculty, Senda del Rey nº 11, 28040 Madrid

Email: mmatilla@cee.uned.es

We acknowledge the support of PhD. Marien Aguilera, main researcher in the National R + D Project "The Court of Justice of the European Union: its impact on the normative configuration of the Spanish civil process and on the protection of fundamental rights" (Ref. DER 2016-75567 -R), funded by the Ministry of Economy and Competitiveness. We would like to convey special thanks to Pr. Christophe Muller, who provided us with the code for the test of endogeneity in conditional quantiles. We also thank the two anonymous referees for their helpful comments and suggestions on the work.

Funding

This work was supported by the Fundación de las Cajas de Ahorro (FUNCAS) [no grant number].

BANKS AND FINANCIAL DISCRIMINATION: WHAT CAN BE LEARNT FROM THE SPANISH EXPERIENCE?

Abstract

The paper analyses the phenomenon of financial discrimination that have been identified in many developed countries in the aftermath of the financial crisis. We would consider the process of quality worsening in the provision of banking products and services as part of the increasing problem of financial exclusion, which should consider not only the physical access to branches but also the difficulties of use of banking services and products. Our primary concern is focused on the collective of vulnerable customers, so we have carried out an analysis at a micro-scale (urban districts and municipalities) to identify the main determinants of the financial discrimination of territories according to their socioeconomic profile. This study constitutes a first attempt to analyse financial discrimination in the provision of banking products and services at an urban micro-scale. We have considered as good references the cases of Madrid and Barcelona in Spain, large urban territories with high level of social inequality. The methodology that had been applied is quantile regressions, useful technique for analysing the ‘extreme’ nature of the phenomenon of financial discrimination. Our results confirm that the more overloaded branches are settled in districts characterised by a lower socioeconomic profile, indicating a banking industry trend towards ‘low-cost’ retail banking to serve the group of less profitable – more vulnerable customers. Some recommendations are outlined for policymakers in line with the aims and scope of the Payment Accounts Directive of the European Union.

Keywords: financial inclusion, discrimination, social inequality, vulnerable customer, financial crisis, financial system restructuring, quantile regressions.

JEL classification codes: G21- Banks • Depository Institutions • Micro Finance Institutions • Mortgages; R12- Size and Spatial Distributions of Regional Economic Activity; R51- Finance in Urban and Rural Economies.

1. Introduction

Financial Exclusion (FE) had been defined as ‘those processes that serve to prevent certain social groups and individuals from gaining access to the financial system’ (Leyshon and Thrift, 1995). More recently, a broader definition has gained currency in the academic arena: ‘the process whereby people encounter such great difficulties to either access or use financial services that they can no longer lead a normal social life’ (Gloukoviezoff, 2007).

The recent financial crisis has produced significant changes in the banking industry, mainly characterised by the reduction of diversity and the restructuring of the whole sector. These seem to threaten financial inclusion, as less diverse markets are associated with lower access to finance (World Bank, 2014). Furthermore, current low interest rates have diminished the banking sector profitability and have led to an emerging low- cost banking (Claessens et al., 2017). In order to increase productivity, banks have reorganised their network and employees to increase the number of clients attended by a branch, which has seriously affected the employee-customer relationship, one of the components of banking quality (Levesque and McDougall, 1996). These changes have increased the problem of physical access and the difficulties of use of banking services (financial discrimination), particularly for the group of low income customers (Sinclair, 2013).

To engage in the financial market, individuals should be able to fully understand mainstream offerings as well as their benefits (Salignac et al., 2016; Devlin, 2014; Cnaan et al., 2012). Otherwise, it can increase financial vulnerability, which may involve the lack of control by the user (even abuse by the entity) leading to: unhealthy dependence (over-indebtedness); irrational decisions like payday loans or subprime mortgages (Hill and Kozup, 2007; De Meza, 2008); general misuse of financial services and, finally, greater use of alternative informal financial services, which are at least five to ten times more costly and less reliable than formal ones (Ardic et al., 2011).

Our paper tries to assess the process of quality worsening in the provision of banking services and products as part of the problem of financial exclusion, which should consider not only the physical access to branches but also the difficulties of use of banking services and products. We will focus the attention on the group of vulnerable customers according to their socioeconomic profile. Although there are other psychological, cultural and educational aspects that can explain financial exclusion from the demand perspective

(Rhine and Greene, 2006, 2013; Campbell et al., 2012), our approach is centred on the supply perspective; i.e. the impact of branching decisions based on efficiency indicators. We want to analyse whether banking reorganisation has had a differential impact on disadvantaged communities, which in turn are the most intensive users of branches and personal financial assistance (Leyshon et al., 2004). Specifically, the research objectives are (1) to assess if there has been discrimination in the provision of financial services after the reorganisation of the banking sector; and if so, (2) what are the main socioeconomic factors of this phenomenon.

The study is based on Spain, a country that had experienced an increment in terms of social inequality as well as a pronounced reduction of banking branches. We have considered the cases of the two largest urban areas, Madrid and Barcelona, in order to visualise inframunicipal socioeconomic differences. According to Bernad et al. (2008), the local perspective is necessary and complementary to more generalised analyses carried out at provincial and national levels. The suburbanisation of cities based on market rules tends to segregate the population according to their income level, ethnic origin or nationality. However, the settlement of branches in vulnerable urban areas is no longer considered by banks and public authorities to be a duty to maintain the socio-economic equilibrium among neighbourhoods, even though there is growing academic evidence in favour of their presence (Aalbers, 2007; Dymski, 2003; Leyshon and Thrift, 1995).

The paper is structured as follows. The second section reviews the FE literature from the perspective of discrimination in the use of banking services. We set the hypothesis that overloading of bank branches tends to be higher in deprived territories, contributing to their financial discrimination. The third section focuses on the empirical analysis. We analyse the existing correlation between a set of socioeconomic characteristics of urban micro-territories and the difficulties of use of banking services, proxied by the ratio of “saturation (overload) of bank branches”. To do that, we apply Quantile Regressions as an alternative statistic technique, appropriate for the analysis of extreme cases such as the problem of financial discrimination. In the next section we discuss how to better approach the issue of financial inclusion from a consumer protection perspective and we discuss the adjustment of new regulation to this reality and identify potential gaps and improvement areas.

The results of this paper are especially relevant for policymakers interested in preventing financial exclusion and the misuse of financial products. Recent European regulation has

focused on guaranteeing the universal access to banking services as an essential issue to digitalise payments. We offer some suggestions about how the European regulation development could contribute to solve the problem of financial discrimination in a context of loss of social banking and increasing levels of social and economic inequality.

2. Literature Review and Hypothesis

From a supply point of view, financial exclusion was considered a geographical phenomenon and a consequence of the lack of bank branches in a territory (Seaver and Fraser, 1979; Evanoff, 1988). These studies were encouraged by the strict territorial regulations regarding the expansion of bank branches. The liberalisation of the banking markets during the 80's entailed a new orientation for FE research, i.e. analysing the impact of social and economic inequalities affecting communities. Kempson et al. (2000) introduced the idea of FE as a product of diverse barriers (access, conditions, price, marketing and self-exclusion), which make it difficult for the individual to access and use banking services (Devlin, 2005; Anderloni et al., 2007, Leyshon et al., 2004; Cnaan et al., 2012; Gómez-Barroso and Marbán-Flores, 2013). Correlations have generally been found between higher socioeconomic development and a greater presence (or lower decline) of branches. Devlin (2005) showed that the level of use of financial services in the UK was strongly determined by unemployment, income and housing tenure. More recently, Ampudia and Ehrmann (2016) concluded that low income, unemployed, or poor educated households are the most likely to be affected by unbanking. Table 1 summarises the social and economic determinants of FE and the main conclusions of previous empirical studies. Many of the socioeconomic determinants can be considered distinctive of geographically deprived areas.

[**Table 1** Relevant Socioeconomic Determinants of FE]

The financial desertification of certain territories is a consequence of the process of cost rationalisation, which has generated ‘gaps’ in the banking network in highly financialised economies like US and UK (Leyshon and Thrift, 1995; Dymksi, 2003; Leyshon et al., 2004; French et al., 2013). Transactional business models and mechanical relationships with customers allow banks to maintain the return on equity expected by shareholders (Bowman et al., 2014), however it threatens the relational banking business model (Deeg, 2010). This increasing de-personalisation of financial services and products is jeopardising the close relationship between banks and their customers, leading to higher costs for those who do not match the profile expected by the entity¹. In fact, Devlin et al. (2014) attempted to measure ‘fairness in financial services’ and found differences in customer care related to the type of customer considered, showing that customers of financial institutions perceive a biased behaviour in favour of more profitable customers receiving a better attention.

Branch closures involve reorganising the existing branch network and reallocating affected customers. This either could result in efficiency gains, but also lead to poorer customer care in overloaded branches (low-cost branches), and the promotion of electronic transaction channels to the detriment of personal counselling.

An EU survey showed that 72% of unbanked individuals – defined as those without a bank account- were not interested in banking online (Ipsos Mori, 2013). In fact, experiences combining financial and technologic literacy to promote the use of online banking among low-income individuals have not obtained positive results (Servon and Kaestner, 2008). Online banking involves the standardisation of products and services and risk management procedures based on predesigned models (credit scoring), which are not adequate for the vulnerable, low-income population (Gloukoviezoff, 2007). Branches are still relevant in the XXI century because their replacement by technology requires the population to have adequate access, technological knowledge and confidence, as well as a medium or high level of financial literacy.

Carbó et al. (2005) described the coexistence of super-included, under-included and excluded individuals and examined their relationship with banking services in highly financialised economies. ‘Under-included’ or ‘underbanked’ people have access to basic banking services but usually at a higher cost than super-included individuals. They encounter barriers to access more complex and attractive products and receive lower-

¹ That is particularly relevant in a competitive context characterised by the entrance of new competitors, very low interest rates and new capitalisation requirements for banks in Europe.

quality assistance and customer care. Underbanking is a problem of financial vulnerability defined in the European context. In a research conducted by Fernández- Olit et al. (2018) the profile of underbanked people was clearly linked to economic precariousness (monetary poverty, material deprivation and immigration). They show a negative relationship between the risk of social exclusion and the intensity of use of banking services, suggesting that underbanking is the most relevant situation of financial vulnerability in Europe. Therefore, underbanking can lead to financial discrimination, and even exclusion in the most extreme situations.

People in a vulnerable situation need banking products and services with adapted conditions to their needs because they face serious risks when they misuse banking services. This is particularly relevant for elderly people, immigrants, and people who are unemployed or in a situation of working precariousness or poverty. As Gloukoviezoff (2007) emphasised, these people need personal financial advice to avoid the pernicious effects of inadequate product selection. Thus, the assistance provided by bank branches becomes even more important for these collectives.

Our hypothesis (see figure 1) states that, after the financial crisis, the more overloaded branches are settled in deprived territories characterised by a lower socioeconomic profile, indicating a banking industry trend towards ‘low-cost’ retail banking to serve the group of less profitable – more vulnerable customers. Taking this into consideration, we would argue that the financial crisis has led to increasing financial discrimination in developed countries.

[Fig. 1 Theoretical model.]

3. Empirical Analysis

We focus our empirical analysis in Spain for two reasons. First, the recent restructuring of the Spanish banking system reduced the branch network (and the number of bank employees) - by one-third between 2008 and 2015 (Maudos, 2017)), and has almost eliminated savings banks, which have historically been the social banking model with greatest incidence in geographic financial inclusion in Spain. Martin-Oliver (2018) supports the negative consequences of this process in terms of FE and shows that the physical distance between branches has grown more in territories with higher unemployment and lower income or educational levels. Large urban territories have

been particularly affected, showing a rate of branches reduction generally higher than the national average (table 2). Secondly, the financial crisis has fostered inequality and precariousness, particularly in Spain and especially in urban areas. The EU Draft Joint Employment Report 2018 (European Union, 2017a) pointed out that Spain is the European country where income inequality has increased more during the crisis: whereas in the EU the upper quintile is receiving an average income share five times higher than the lower quintile, this difference is 6.5 times for Spain. According to Fundación Foessa (2014), from 2007 to 2013 severe exclusion increased in Spanish cities with over 100,000 inhabitants. Thus, a large proportion of urban households lost their condition of total financial integration, bringing them closer to social exclusion.

[**Table 2.** Reduction of the banking network in provinces with the main functional urban areas in Spain]

Two largest Spanish urban areas have been analysed, Madrid and Barcelona, where branch reduction has been significant: 2,254 branches closed between 2008 and 2013 (24.79%). An urban micro-scale analysis (districts and municipalities) has been carried out to assess financial discrimination of territories according to their socioeconomic profile. Information from 63 municipalities – belonging to the metropolitan area- and 31 districts – belonging to the inner city- has been used, which accounts for a total population of 8,824,772 inhabitants².

² The territories comprised in the sample are: in the Madrid metropolitan area (i) districts (Centro, Arganzuela, Retiro, Salamanca, Chamartín, Tetuán, Chamberí, Fuencarral-El Pardo, Moncloa, Latina, Carabanchel, Usera, Puente De Vallecas, Moratalaz, Ciudad Lineal, Hortaleza, Villaverde, Villa De Vallecas, Vicálvaro, San Blas-Canillejas, Barajas); (ii) municipalities (Alcalá de Henares, Alcobendas, Alcorcón, Boadilla del Monte, Brunete, Colmenar Viejo, Coslada, Fuenlabrada, Getafe, Leganés, Majadahonda, Mejorada del Campo, Móstoles, Paracuellos de Jarama, Parla, Pinto, Pozuelo de Alarcón, Rivas-Vaciamadrid, Rozas de Madrid, San Fernando de Henares, San Sebastián de los Reyes, Torrejón de Ardoz, Velilla de San Antonio, Villanueva de la Cañada, Villanueva del Pardillo, Villaviciosa de Odón, Tres Cantos. In the Barcelona metropolitan area (i) districts (Ciutat Vella, Eixample, Sants-Montjuic, Les Corts, Sarrià-Sant Gervasi, Gràcia, Horta-Guinardó, Nou Barris, Sant Andreu, Sant Martí); (ii) municipalities (Badalona, Badía del Vallés, Barberá del Vallés, Begues, Castellbisbal, Castelldefels, Cerdanyola del Vallés, Cervelló, Corbera de Llobregat, Cornellá de Llobregat, Esplugues de Llobregat, Gavá, L'Hospitalet de Llobregat, Molins de Rei, Montcada i Reixac, Montgat, Pallejá, La Palma de Cervelló, El Papiol, El Prat de Llobregat, Ripollet, Sant Adrià de Besós, Sant Andreu de la Barca, Sant Boi de Llobregat, Sant Climent de Llobregat, Sant Cugat del Vallés, Sant Feliú de Llobregat, Sant Joan Despí, Sant Just Desvern, Sant Vicenç dels Horts, Santa Coloma de Cervelló, Santa Coloma de Gramanet, Sitges, Tiana, Torrelles de Llobregat, Viladecans

3.1. Model, Variables and Sample

Branch saturation as dependent variable:

The ratio of branches per population is commonly used for the assessment of financial capacity and banking structure worldwide: it is used by the European Central Bank in its reports on financial structures (BCE, 2017), as well as by the World Bank and the International Monetary Fund in the Financial Access Survey³, and it is generally included in their financial inclusion studies (Alter and Yontcheva, 2015). This indicator is also considered in banking management literature to measure the potential market of banking entities and establish the parameters of their expansion at a national level. For example, Maixé-Altés (2010) uses it as an efficiency and productivity factor of the banking network, and states that there is a strategic fit between the location selection and the competitive performance of banking branches. Delgado et al (2008) find that, despite technological progress, the growth of the population in a territory is, along with GDP, a factor of expansion of the branch network, considering as variables both the number of branches per 1000km² and the ratio of inhabitants per branch. There are also several examples of the use of the ratio of inhabitants per branch in general geographic studies regarding the provision of banking services, like in Martin and Pollard (2017) and Alessandrini et al (2009).

At the specific FE level, this indicator has been largely considered as a proxy of the quality of the service offered by banking branches. Seaver and Fraser (1979) introduced it in the FE literature and stated that branches with higher saturation lose ability to offer a personalised service and a good customer service. Pollard (1996) included this ratio in the analysis of the branch network reduction during the real estate crisis of the 1980s in the United States. Recent FE studies in Spain have considered this ratio: Alamá et al (2015) assessed the under-branching or over-branching of territories through the average of branches per volume of population, and discussed the consequences of under-branching in terms of use difficulties for the inhabitants of these territories; Martin-Oliver (2018) bases his theoretical model and empirical analysis of the geographical distribution of bank branches on the potential demand of services existing in a territory, determined by the population level and density.

³ See for example the variable “Commercial bank branches per 100,000 adults” in countries and regional reports <https://data.worldbank.org/>

Therefore, from a supply perspective, the ratio "branches per population" (and obviously its inverse) is determined by efficiency and productivity criteria of banking network. Branch rationalisation in an era of low interest-rate demands the closing of branches in less profitable areas (IMF, 2016), as well as the increase of the volume of customers attended by the remaining ones. An overloaded branch may reduce the time devoted per customer and may increase the commercialisation of standardised products with lower quality of service. Thus, the measurement of the market volume potentially attended per branch can be considered (from the customer point of view) a proxy of the degree of difficulty in the use of financial services and in the relationship with banking entities.

The proposed model evaluates the level of branch saturation (*BRANCHSAT*), which can be defined as the number of inhabitants potentially assisted by a branch, considered after the main wave of network rationalisation in Spain due to the financial crisis. This variable allows the assessment of differences on the average volume of market attended by banking offices in different territories. The analysis focuses on the socio-economic profile that characterises each territorial unit, considering the existence of important social disparities among territories and different risks of vulnerability (Alguacil et al., 2014; De la Cuesta et al., 2016).

Model:

$$\begin{aligned}
 (BRANCHSAT) = & \beta_0 + \beta_1 (LOGPOP-DENS) + \beta_2 (POP-65) + \beta_3 (IMMIGR) + \\
 & \beta_4 (UNEMPLOY) + \beta_5 (LOGGDI) + \beta_6 (LOGTOURDYNAM) + \beta_7 (HOUSE-PRICE) \\
 & + \beta_8 (INTERN) + \varepsilon
 \end{aligned}$$

The dependent variable has been obtained from the Historic Archive of the Banking Guide of Ediban⁴. As this database offers detailed information on all bank branches in Spain, it allowed us to classify branches by district and municipality using postal codes and addresses. This database was also used in the studies of Maudos (2014; 2017) and Alamá et al. (2015).

The independent variables included in the model were the relevant socio-economic determinants previously identified in the literature (see Table 1). The following

⁴ www.maestre-ediban.com

independent variables were selected to represent the demographic structure of the territories: population density (LOGPOP_DENS), which is considered an indicator of overpopulated and disadvantaged territories; percentage of population over 65 years (POP-65), as this collective is at a higher risk of technological exclusion and can be potentially excluded from alternative banking channels (i.e. online banking); and percentage of immigrants of the four main nationalities residing in these two metropolitan areas (IMMIGR)⁵, because there is evidence of residential segregation of immigrants in large cities (Alguacil, 2014).

Regarding labour and economic variables, unemployment rate (UNEMPLOY) and Gross Disposable Income per capita (LOGGDI) were selected as potential determinants of poverty and socially excluded areas and as a proxy of households' profitability-risk profile (from a banking perspective).

The variable dynamism of tourism (LOGTOURDYNAM), defined as the ratio of hotels and other touristic accommodations in the area, was also included and considered as a proxy of commercial and economic activity. With regard to residential vulnerability, the rate of variation in housing prices (HOUSE-PR) was included, as long as social vulnerability has increased more in territories affected by housing depreciation. This variable is complementary to LOGGDI and reflects the phenomenon of degradation of new residential developments on the outskirts of cities. Percentage of households with internet access (INTERN) is a relevant factor to explore the use of alternative channels such as online banking. Table 3 shows the expected sign of the selected variables based on the literature review.

[Table 3 Expected sign of covariates from previous literature]

Most data were collected for the years 2008 and 2013⁶, the period in which the reduction of branches was faster due to bank mergers and bailouts. The scope of analysis was municipal or infra municipal (district level), following the definition of the sample units. As some data at the infra-municipal level could not be obtained from a single database, alternative data sources were combined instead of omitting these

⁵ To include the factor of ethnic diversity, relevant in other studies, we considered the most numerous national groups of immigrants living in Madrid and Barcelona from different continents: Romania, Ecuador, China, Pakistan and Morocco. The economic and cultural background of foreign nationalities is associated with their residential segregation (Echazarra, 2010).

⁶ Details are summarised in Table 4.

variables. Table 4 summarises the sources and periods of data and table 5 shows descriptive statistics regarding the 94 territories considered in the database.

[Table 4 Variables and information sources included in the analysis]

[Table 5. Descriptive Statistics.]

3.2 Quantile Regression

In this paper we applied Quantile Regressions (QR) to estimate models of conditional quantile functions of the response variable given a dependant variable defined as a linear function of the covariates (Koenker and Bassett, 1978, Koenker, 2005). The underlying assumption of QR is that impacts on the response variable could not be the same over the entire conditional distribution (Hao and Naiman, 2007, Coad and Hölzl, 2009).

Based on these arguments, we decided to apply QR due to its flexibility and because its estimations at the tails of the distribution are more accurate than OLS (average impacts). In our case of study, the issue of ‘financial discrimination’ arises as an extreme case of study, so we would be better able to capture and analyse its main determinants if we focus on the tails of the distribution by applying QR. In particular, the phenomenon of financial discrimination might potentially arise in the upper tail of our variable, which reflects the most serious cases of branch saturation as a sign of quality deterioration in the provision of banking services. Therefore, QR appears as a suitable technique for the problem under study.

Within this line we found studies like Cunningham (2003) that analyses the determinants of growth and find that the response variable differs remarkably for the tails of the distribution. Alama and Tortosa-Ausina (2012) have showed empirical evidence that the geographic expansion patterns of Spanish financial institutions differ markedly depending on the tail of the distribution we focus on. They demonstrated that signs and magnitude of estimated coefficients vary to a significant extent from one quantile to others.

The QR methodology defines the minimising problem as follows:

$$\text{Min}_{b \in \mathbb{R}} [\sum_{Y_i \geq b} \theta [Y_i - b] + \sum_{Y_i < b} (1 - \theta) [Y_i - b]] \quad (2)$$

Where $0 < \theta < 1$

Parameters are estimated by minimising absolute deviations:

$$\text{Min}_{\beta \in \mathbb{R}} [\sum_{Y_i \geq X_i \beta} \theta [Y_i - X_i \beta] + \sum_{Y_i < X_i \beta} (1 - \theta) [Y_i - X_i \beta]] \quad (3)$$

where θ represents the vector containing each quantile and β is the vector of coefficients to be estimated.

All observations that fall above the estimated plane by equation $X_i \beta_\theta$ are weighted by a factor θ (positive errors), while all observations that fall under the estimated equation are weighted by a factor $(1-\theta)$ (negative errors). This asymmetric weight procedure ensures that the full conditional distribution is considered for estimation purposes⁷.

Among its main advantages, QR is robust to the presence of outliers, estimates the impact of covariates on location (central and non-central) and scale parameters, does not impose restrictions on the error term, fits either non-normal or heteroscedastic data and takes into account how changes in the covariates might affect the underlying shape of the distribution of the response variable (Hao and Naiman, 2007).

In our case of study is of particular interest to focus the attention on the tails of the distribution because ‘financial exclusion’ is itself an extreme case of study.

3.3. Results and Discussion

In this section we present the estimated coefficients for different quantiles to identify the sign and strength of association of different socio and economic determinants in terms of branch saturation. We also discuss the obtained results bearing in mind that they should be interpreted taking into account that correlations cannot necessarily be interpreted as causal links.

⁷ Other authors propose splitting the sample into quantiles and carrying out OLS estimations separately. However, this procedure suffers from selection bias as demonstrated by Hallock, Madalozzo and Reck (2003).

It can be argued that the level of population density might act as endogenous explanatory variable because of simultaneity determination. In other words, the dependent variable (number of inhabitants per branch) and the explanatory variable (population density) might be both driven by the level of economic activity across the different districts and municipalities. In this case, conditional estimated quantiles would be biased.

Although our model already incorporates several economic variables that characterized each district, it could be the case that other non-observed economic variables might cause bias. In order to detect the presence of potential endogeneity in conditional quantiles, we use a Hausman based test for endogeneity proposed by Kim and Muller (2013). To implement the test the variable “number of public primary care centers per hectare in district i ” is used as an instrument. This variable highly correlates with population density (with a significant correlation coefficient above 0.9), while, given the nature of the health variable, the instrument is not directly determined by other variables not already considered in the specified model. To put it differently, decisions on the number of public primary care centers are not governed by the same reasons (non observed variables) that potentially might govern the number of inhabitants per branch.

According to the endogeneity conditional quantiles tests (see appendix) we cannot reject the null of exogeneity. This occurs for all quantile indexes. For completeness, we have also conducted a Hausman endogeneity test for the conditional mean model and, as happened in the quantiles, the null cannot be rejected. These results support that economic variables specified in the model capture the effect of potential common economic drivers and, accordingly, the partial effects are not suffering of endogeneity.

[Table 6 Determinants of branch saturation (inhabitants per branch)]

From Table 6 some conclusions can be drawn. First, estimated coefficients differ across different quantiles indicating that quantile regressions are useful for capturing the different relationships at different points of the conditional distribution, and better capture the complex nature of the financial discrimination phenomenon.

Second, our empirical results show higher goodness-of-fit of the model at the upper quantiles, i.e. the territories where the number of inhabitants per branch is higher and that are more exposed to financial discrimination.

Focusing on the quantile index $\theta = 0.9$ we can distinguish two main groups of determinants of the problem of financial discrimination. First, the socio-economic factors that worsen the existing problem of branch saturation are the presence of immigrant population and the population density of a territory (estimated coefficients of 1.56 and 0.34, respectively). Secondly, we have identified as factors that reduce the level of branch saturation, the following: unemployment, presence of population over 65, level of Internet access, variation of housing prices, dynamism of tourism, and finally level of GDI.

According to these results, the saturation of branches tends to be more present in territories more densely populated, and with higher presence of immigrants, and additionally with lower rates of unemployment and less population over 65, less access to the Internet, where the housing prices have decreased, and where the dynamism of tourism and GDI are low. Most of these features are characteristic of socio-economic vulnerable territories according to theoretical backgrounds.

Results reveal that all the socioeconomic variables previously identified in this study as relevant characteristics of the territory appear to be relevant factors for banks in defining the location of branches or deciding the pattern of branch closures, particularly in territories where bank saturation appears to be higher ($\theta = 0.9$). However, some of these socioeconomic factors do not seem to be significant for territories with a less saturated branch network. For instance, at the other extreme of the spectrum ($\theta = 0.1$) we see that in those territories where branch saturation is extremely low there are only significant the variables of unemployment (positive sign) and house price and dynamism of tourism (negative signs). Not only are lower the number of significant the variables, but also the sign of the relationship, like in the case of unemployment. If we look at the quantile 25%, only remain significant house price and dynamism of tourism (negative signs), while the rest of variables are not significant.

Summarising, the following variables had a homogeneous effect on the level of branch saturation across all the quantiles:

- Reducing saturation (negative sign): presence of population over 65 years, level of GDI, rate of variation in housing prices and dynamism of tourism.
- Increasing saturation (positive sign): presence of immigrants.

The remaining variables show different signs at the upper and lower tails of the distribution, which itself seems to underline the complexity of the FE phenomenon.

These results partly agree with previous studies carried out in Spain. For instance, Alamá et al. (2015) found density to negatively affect the provision of banking services, while Alamá and Tortosa-Ausina (2012) found high population density, low income and low economic activity as relevant factors. Bernad et al. (2008) found population density and low income to negatively affect the quality of banking services. In a study on other European urban areas, Aalbers (2007) found a negative effect of ethnic diversity, low income and depreciation of housing.

The contradictory effect of the variable unemployment in this study (in the upper quantile show a negative sign) was previously observed by Bernad et al. (2008), who explained it through the preference of social banking entities– credit unions and former Spanish savings banks - to settle branches in the more deprived areas, with high unemployment rate.

Finally, it is worth mentioning that access to the Internet has a negative effect on branch saturation, precisely at the upper quantiles. Thus, we cannot affirm that higher saturation of branches is related to territories with higher technological capacity and potential higher use of electronic banking channels (replacement effect). Furthermore, giving vulnerable customers more responsibility, encouraging the use of technology and increasing their financial education do not seem to be thoroughly adequate solutions⁸. As reported by De Meza et al. (2008), psychological factors define consumers' financial behaviour to a greater extent than their capabilities. Thus, guidance by banking experts seems to be essential during the decision-making process of vulnerable consumers, including those who lack access to the abilities or technology required to take part in the new 'virtual' financial market (Hogg et al., 2007).

Our results indicate that in the aftermath of the financial crisis the increased difficulties in the use of banking services have especially affected the most socially and economic vulnerable areas. Territories where branches attended a higher number of inhabitants generally corresponded to low-income districts and municipalities with young and immigrant population, less access to Internet and lower levels of economic activity. Having an elderly population, which has not been so negatively affected by the crisis (Fundación Foessa, 2014), seems to be a factor in maintaining greater personal attention by branches in the territory.

⁸ This argument is in line with behavioural economics: individual economic action is not guided by rationality and education has little effect.

After considering the experience of the restructuring of the Spanish financial system as an example for other countries and policymakers, some lessons should be extracted. De-branching decisions of banks have contributed to intensifying financial discrimination in urban areas with prominent socioeconomic problems. Improving financial literacy of individuals cannot be the unique response. Regulatory advances in line with the recent Payment Accounts Directive of the European Union are also necessary; i.e., the promotion of neutral and adequately tailored assistance of customers by qualified banking staff.

3.4. Consumer Policies Implications and Regulatory Suggestions

In the recent past, different financial policies had been designed to increase access to financial services to different industries, regions or individuals (i.e. social and public banks or compulsory credit lines for specific sectors). Nowadays, access to this basic resource is in hands of the private sector, and regulatory and supervisory bodies monitor it through more intensive customer protection and supervisory policies (i.e. MiFID⁹), social policies and specific regulations designed to protect vulnerable consumers.

This is the case of the European Union who has set priorities concerning financial exclusion in the 2020 European Strategy to foster social inclusion (Anderloni et al. 2007). Specifically, The Payments Account Directive (European Union, 2014) addresses some specific needs for including vulnerable consumers, like the right to a basic bank account with payment facilities and on-line services with no cost or at reasonable fees. This Payments Account Directive (PA Directive) requires banks to offer a supply of competitive basic services, regardless of the consumers circumstances (legal or labour status, level of income, credit records or solvency). Moreover, it requires banks to offer independent financial education to the group of vulnerable consumers. Thus, to avoid use difficulties not only must the physical access be guaranteed, but also the quality of the service (Gómez-Barroso and Marbán-Flores, 2013).

Financial education has been fostered among different countries, both by public institutions and by private banks, but it is usually an “out of the business” activity and primarily addressed to youths and students. As Fernandes et al (2014) show financial

⁹ Markets in Financial Instruments Directive.

education is more effective if it is provided “just in time” and tied to a consumer’s decision or behaviour. According to our results, financial advice and education activities could be better undertaken in less overloaded branches located in higher income districts and municipalities with more economic dynamism.

We agree with Esteban-Sánchez et al. (2017) that, apart from financial education, accurate regulation to protect customers in the financial sector must be developed and MiFID application could be more adapted to vulnerable consumers those facing a poorer banking assistance and higher use difficulties: low income, young and immigrant population.

To improve knowledge about real or potential financial discrimination, new transparency requirements might also be fostered within the banking industry to disclose information related to the provision of services in deprived areas. We agree with Gadanez and Tissot (2017) that accountability is a key element for financial inclusion, especially regarding the performance of related public policies and central banks. Some good examples of interesting initiatives are the US Home Mortgage Disclosure Act of 1975, the Community Reinvestment Act of 1977 or the UK voluntary reporting of banks quarterly data about mortgages granted by postal codes¹⁰. The creation of specific research organisms will also contribute to come up with new proposals (supported by public institutions). See for example the initiative of the British Financial Inclusion Taskforce or the *Observatoire de l’Inclusion Bancaire*, dependant on the *Banque de France*, whose primary aim is to monitor policies for financial inclusion and appraise its impacts.

Finally, it also seems necessary to establish a closer relationship among the social sector, the public institutions and the banking industry in specific programmes related to financial literacy, microcredit and saving products tailored to vulnerable consumers and aimed at specific needs (Gómez-Barroso and Marbán-Flores, 2013)¹¹. According to our results young and immigrant residents in low income districts could be specific targets of this alliances.

¹⁰ British Bankers’ Association (BBA) and Council of Mortgage Lenders. <https://www.cml.org.uk/industry-data/about-postcode-lending>.

¹¹ As an example, it could be cited the IDA (Individual Development Accounts) developed in the US.

4. Conclusions

In this paper we wonder if the transformation of banking industry in developed countries has affected the quality equilibrium in the provision of financial services. We have analysed the case of two main urban areas after the restructuration of the Spanish financial system. We consider that financial discrimination is taking place in developed countries through a process of worsening of the quality of banking services (customer assistance), which increases the difficulties of use, especially in vulnerable areas. Vulnerable customers have lower technological skills and financial literacy, essential knowledge to operate in a low-cost and digitalised banking market.

The methodology applied in this study permitted us to focus the attention on the more 'extreme' situations concerning branch saturation. Empirical evidence reveals that in the aftermath of the crisis the more overloaded branches, where vulnerable customers receive a poorer customer care and assistance, tended to be located in more deprived areas with less access to technological channels. This outcome is a direct consequence of banking institution's decisions regarding branch settlement and branch restructuration.

Therefore, this is an early warning that increasing difficulties in the use of banking products and services in Europe could be the 'starting point' of a vicious circle of financial vulnerability and financial discrimination. Furthermore, the phenomenon of use difficulties is one of the main causes of over-indebtedness, financial exclusion and auto-exclusion from formal banking sector in most developed economies.

As a consequence of these results, we want to raise concerns about a potential scenario of dual banking in the near future. On one hand, 'low-cost' retail banking would serve the segment of less profitable customers, while 'value-added' banking services would only be offered to wealthy customers. Recent European regulation is concerned about guaranteeing the universal access to banking services as an essential issue to digitalise payments. However, this regulation itself does not entirely solve the problem of financial discrimination.

The main contributions of this study are the following. First, the phenomenon of FE and financial discrimination is analysed at a micro-level, considering the qualitative dimension of the problem under study. Previous studies of bank branch location carried out at a national level should be interpreted broadly, since aggregated results could be concealing patterns that only emerge at a district and municipality levels. Second, the

theoretical model proposes a set of social and economic variables as determinants of financial discrimination that go beyond previous studies. Thirdly, quantile regression models are applied as an alternative and complementary technique to previous classical linear models. This approach is consistent with theories that define financial exclusion, and particularly financial discrimination, as an extreme problem with multidimensional causes (Kempson et al., 2000; Carbó et al., 2005). Lastly, the paper is of great interest for policymakers because it contributes to identify some gaps of the EU PA Directive in addressing the needs of vulnerable customers. We propose several economic policy measures aimed at reinforcing the impact of EU regulation to avoid financial discrimination of vulnerable consumers.

We are aware of the limitations of this study in terms of data coverage and geographical scope. The primary aim of this work has been to serve as a reference case of study in the analysis of financial discrimination within the banking sector (from the supply perspective). We agree with Salignac et al. (2016) who questions whether a supply and demand view are sufficient to substantially improve financial inclusion and to reduce financial hardship. More holistic analysis must be used to study this phenomenon.

Interesting lines for future research would be the assessment of the costs and consequences derived from difficulties of use and financial discrimination (low-cost banking, limited choice of financial products, restricted access to credit, self-exclusion, and inadequate financial decisions leading to over-indebtedness, among others), and the role played by the financial infrastructure, that is, elements that support the functioning of the financial system (robust, safe, efficient and widely accessible information and communication technologies).

References.

Aalbers M.B. (2007). What types of neighbourhoods are redlined? *Journal of Housing and the Built Environment* 22(2), 177-198. DOI: 10.1007/s10901-007-9074-9

Alamá L. & Tortosa-Ausina E. (2012). Bank branch geographic location patterns in Spain: Some implications for financial exclusion, *Growth and Change* 43(3), 505-543. DOI: 10.1111/j.1468-2257.2012.00596.x

- Alamá L., Conesa D., Forte A. & Tortosa-Ausina E. (2015). The geography of Spanish bank branches, *Journal of Applied Statistics*, 42(4), 722-744. DOI:10.1080/02664763.2014.980792
- Alessandrini P., Presbitero A.F. & Zazzaro A. (2009) Geographical Organization of Banking Systems and Innovation Diffusion. In: Zazzaro A., Fratianni M., Alessandrini P. (eds) *The Changing Geography of Banking and Finance*. Springer, Boston.
- Alguacil J., Camacho J. & Hernández A. (2014). La vulnerabilidad urbana en España. Identificación y evolución de los barrios vulnerables [Urban vulnerability in Spain. Identification and assessment of vulnerable neighbourhoods], *Empiria* 27, 73-94. DOI: <http://dx.doi.org/10.5944/empiria.27.2014.10863>
- Alter, A. & Yontcheva, B. (2015). *Financial Inclusion and Development in the CEMAC*. International Monetary Fund.
- Ampudia M. & Ehrmann M. (2016). Financial Inclusion—What's it Worth? Report of the ECB Working Paper Series, European Central Bank.
- Anderloni L., Braga M.D. & Carluccio E.M. (2007). *New frontiers in banking services: Emerging needs and tailored products for untapped markets*, Berlin-Heidelberg: Springer.
- Ardic O.P., Heimann M. & Mylenko N. (2011). *Access to Financial Services and the Financial Inclusion Agenda Around the World: A Cross-Country Analysis with a New Data Set*, World Bank Policy Research Working Paper No. 5537, January. Available at SSRN: <https://ssrn.com/abstract=1747440> [accessed 15.02.2018].
- BCE (2017). *Report on financial structures*, October 2017, European Central Bank.
- Bernad C., Fuentelsaz L. & Gómez J. (2008). Deregulation and its long-run effects on the availability of banking services in low-income communities, *Environment and Planning A* 40(7), 1681-1696.
- Bowman A., Erturk I., Froud J., Johal S., Law J., Leaver A. & Williams K. (2014). *The end of the experiment*, Manchester: Manchester University Press.

- Campbell D., Martínez-Jerez F.A. & Tufanob P. (2012). Bouncing out of the banking system: An empirical analysis of involuntary bank account closures, *Journal of Banking & Finance*, 36 (4), 1224-1235. DOI: <https://doi.org/10.1016/j.jbankfin.2011.11.014>
- Carbó S., Gardener E.P. & Molyneux P. (2005). *Financial exclusion*, Basingstoke: Palgrave MacMillan.
- Claessens S., Coleman N. & Donnelly M. (2017). “Low-For-Long” interest rates and banks’ interest margins and profitability: Cross-country evidence, *Journal of Financial Intermediation*, DOI: <http://dx.doi.org/10.1016/j.jfi.2017.05.004>
- Cnaan R., Moodithaya M.S. & Handy F. (2012). Financial Inclusion: Lessons from Rural South India, *Journal of Social Policy*, 41, 1, 183–205.
- Coad, A. & Hölzl, W. (2009). On the autocorrelation of growth rates, *Journal of Industry, Competition and Trade*, 9, 2, 139-166.
- Cunningham, B.M. (2003). The distributional heterogeneity of growth effects: some evidence, *The Manchester School*, 71, 4, 417-447.
- De Meza D., Irlenbusch B. & Reyniers D. (2008). *Financial capability: A behavioural economics perspective*, London: Financial Services Authority.
- Deeg R. (2010). Institutional Change in Financial Systems, In: Morgan G. et al. (eds) *Oxford Handbook of Comparative Institutional Analysis*, Oxford University Press.
- De la Cuesta M., Ruza C. & Fernández-Olit B. (2016). Banking System and Financial Exclusion: Towards a More Comprehensive Approach, in Carbó Valverde S., Cuadros Solas P., Rodríguez Fernández F. (eds) *Liquidity Risk, Efficiency and New Bank Business Models*, Palgrave Macmillan Studies in Banking and Financial Institutions. Palgrave Macmillan, DOI https://doi.org/10.1007/978-3-319-30819-7_6
- Delgado, J., Saurina, J., & Townsend, R. (2008). Estrategias de expansión de las entidades de depósito españolas. Una primera aproximación descriptiva. *Revista de Estabilidad Financiera*, 15, 101-117.
- Devlin J.F. (2005). A detailed study of financial exclusion in the UK, *Journal of Consumer Policy*, 28(1), 75-108. DOI:10.1007/s10603-004-7313-y

- Devlin J.F., Sanjit K.R. & Sekhon H. (2014). Perceptions of fair treatment in financial services, *European Journal of Marketing*, 48(7), 1315-1332, DOI: <http://dx.doi.org/10.1108/EJM-08-2012-0469>
- Dymski G.A. (2003). Immigration, finance, and urban evolution: An illustrative model, with a Los Angeles case study, *The Review of Black Political Economy*, 30(4), 27-50. DOI: 10.1007/BF02687549
- Echazarra A. (2010). Segregación residencial de los extranjeros en el área metropolitana de Madrid. Un análisis cuantitativo [Residential segregation of foreigners in the metropolitan area of Madrid. A quantitative analysis], *Revista Internacional de Sociología*, 68(1), 165-197. DOI:10.3989/ris.2007.11.12
- Esteban-Sanchez P., De la Cuesta-Gonzalez M. & Paredes-Gazquez J.D. (2017). Corporate social performance and its relation with corporate financial performance: International evidence in the banking industry, *Journal of Cleaner Production* 162 (2017) 1102-1110.
- European Union (2014). Directive 2014/92/EU of the European Parliament and of the Council of 23 July 2014 on the comparability of fees related to payment accounts, payment account switching and access to payment accounts with basic features, *Official Journal of the European Union*, 28th August 2014.
- European Union (2017a). *Draft Joint Employment Report 2018*, Directorate-General for Employment, Social Affairs and Inclusion.
- Evanoff, D. (1988). Branch banking and service accessibility, *Journal of Money, Credit and Banking*, 20(2), 191-202. DOI: 10.2307/1992110
- Fernandes D., Lynch J.G. & Netemeyer R.G. (2014). Financial Literacy, Financial Education, and Downstream Financial Behaviors, *Management Science* 201460:8, 1861-1883. DOI: <https://doi.org/10.1287/mnsc.2013.1849>.
- Fernández-Olit B., Paredes-Gázquez, J.D. & De la Cuesta-González M. (2018). Are Social and Financial Exclusion Two Sides of the Same Coin? An Analysis of the Financial Integration of Vulnerable People, *Social Indicators Research*, 135(1),135: 245. DOI:<https://doi.org/10.1007/s11205-016-1479-y>

- French S., Leyshon A. & Meek S. (2013). The changing geography of British bank and building society branch networks, 2003-2012, Report, University of Nottingham, UK.
- Fundación Foessa (2014). Análisis y perspectivas 2014: Precariedad y cohesión social. [Analysis and perspectives 2014: Precariousness and social cohesion] Report, Fundación Foessa and Cáritas Española, Spain.
- Gadanez B. & Tissot B. (2017). *Measures of financial inclusion – a central bank perspective*, Bank for International Settlements, Basel, Switzerland.
- Gloukoviezoff G. (2007). From financial exclusion to overindebtedness: The paradox of difficulties for people on low incomes? In: Anderloni et al. (eds) *New frontiers in banking services*, Berlin-Heidelberg: Springer, pp. 5-105.
- Gómez-Barroso J.L. & Marbán-Flores R. (2013). Basic financial services: A new service of general economic interest? *Journal of European Social Policy*, 23(3), 332-339. DOI: <https://doi.org/10.1177/0958928712471226>
- Hallock, K. F., Madalozzo, R., & Reck, C. (2003). Uncovering heterogeneity in managerial pay-firm performance relationships using quantile regression. CEP, 1323(001).
- Hao L. & Naiman D.Q. (2007). *Quantile Regression, Quantitative Applications in the Social Sciences*, Thousand Oaks: Sage.
- Hill R.P. & Kozup J.C. (2007). Consumer experiences with predatory lending practices, *Journal of Consumer Affairs*, 41(1), 29-46. DOI: 10.1111/j.1745-6606.2006.00067.x
- Hogg M.K., Howells G. & Milman D. (2007). Consumers in the knowledge-based economy (KBE): What creates and/or constitutes consumer vulnerability in the KBE? *Journal of Consumer Policy*, 30(2), 151-158. DOI:10.1007/s10603-007-9030- 9
- IMF (2016). *Global Financial Stability Report: Fostering Stability in a Low-Growth, Low-Rate Era*. October 2016, International Monetary Fund.

- Ipsos Mori (2013). *Road to Inclusion. A look at the financially underserved and excluded across Europe*, Report, Ipsos Mori, UK.
- Kempson E., Whyley C., Caskey J. & Collard S. (2000). *In or out?: Financial exclusion: Literature and research review*, London: Financial Services Authority.
- Kim, T.H. & Muller, C. (2013). *A test for endogeneity in conditional quantiles*. Working Paper 42, Aix Marseille School of Economics.
- Koenker R. (2005). *Quantile Regression*. New York: Cambridge University Press.
- Koenker R. & Bassett G. (1978). Regression quantiles, *Econometrica* 46(1): 33–50.
- Kuriyama, N. (2016). Testing cointegration in quantile regressions with an application to the term structure of interest rates. *Studies in Nonlinear Dynamics & Econometrics*, 20(2), 107-121.
- Levesque, T., & McDougall, G. H. (1996). Determinants of customer satisfaction in retail banking. *International Journal of Bank Marketing*, 14(7), 12-20.
- Leyshon A. & Thrift N. (1995). Geographies of financial exclusion: Financial abandonment in Britain and the United States, *Transactions of the Institute of British Geographers*, 20(3), 312-341. DOI: 10.2307/622654
- Leyshon A., Burton D., Knights D., Alferoff, C. & Signoretta, P. (2004). Towards an ecology of retail financial services: Understanding the persistence of door-to-door credit and insurance providers, *Environment and Planning A*, 36(4), 625-646. DOI: 10.1068/a3677
- Maixé-Altés, J. C. (2010). Competition and choice: banks and savings banks in Spain, *Journal of Management History*, 16 (1), 29-43, <https://doi.org/10.1108/17511341011008296>
- Martin, R., & Pollard, J. (Eds.). (2017). *Handbook on the Geographies of Money and Finance*. Edward Elgar Publishing.
- Martin-Oliver, J. (2018). Financial exclusion and branch closures in Spain after the Great Recession, *Regional Studies*, DOI: 10.1080/00343404.2018.1462485

- Maudos J. (2014). Reestructuración bancaria y accesibilidad financiera [Banking restructuring and financial accessibility] *Cuadernos de Información Económica*, (238), 103-120.
- Maudos, J. (2017). Bank restructuring and access to financial services: The spanish case. *Growth and Change*, 48(4), 963-990.
- Pollard, J. S. (1996). Banking at the margins: a geography of financial exclusion in Los Angeles. *Environment and Planning A*, 28(7), 1209-1232
- Rhine S.L.W. & Greene W.H. (2006). The Determinants of Being Unbanked for U.S. Immigrants, *Journal of Consumer Affairs*, 40: 21–40. DOI: 10.1111/j.1745-6606.2006.00044.x
- Rhine S.L.W. & Greene W.H. (2013). Factors That Contribute to Becoming Unbanked, *Journal of Consumer Affairs*, 47: 27–45. DOI:10.1111/j.1745-6606.2012.01244.x
- Ryan B. & Burhouse S. (2009). Findings from the FDIC survey of bank efforts to serve the unbanked and underbanked, *FDIC Quarterly*, 3(2), 39-47.
- Salignac F., Muir K. & Wong J. (2016). Are you really Financially Excluded if you Choose not to be Included? Insights from Social Exclusion, Resilience and Ecological Systems, *Journal of Social Policy*, 45(2), 269-286. DOI:10.1017/S0047279415000677.
- Seaver W.L. & Fraser D.R. (1979). Branch banking and the availability of banking services in metropolitan areas, *Journal of Financial and Quantitative Analysis*, 14(01), 153-160. DOI: <http://dx.doi.org/10.2307/2330660>
- Servon L.J. & Kaestner R. (2008). Consumer financial literacy and the impact of online banking on the financial behavior of Lower Income bank customers, *Journal of Consumer Affairs*, 42(2), 271-305. DOI: 10.1111/j.1745-6606.2008.00108.x
- Sinclair S. (2013). Financial inclusion and social financialisation: Britain in a European context, *International Journal of Sociology and Social Policy*, 33(11/12), 658-676 DOI 10.1108/IJSSP-09-2012-0080

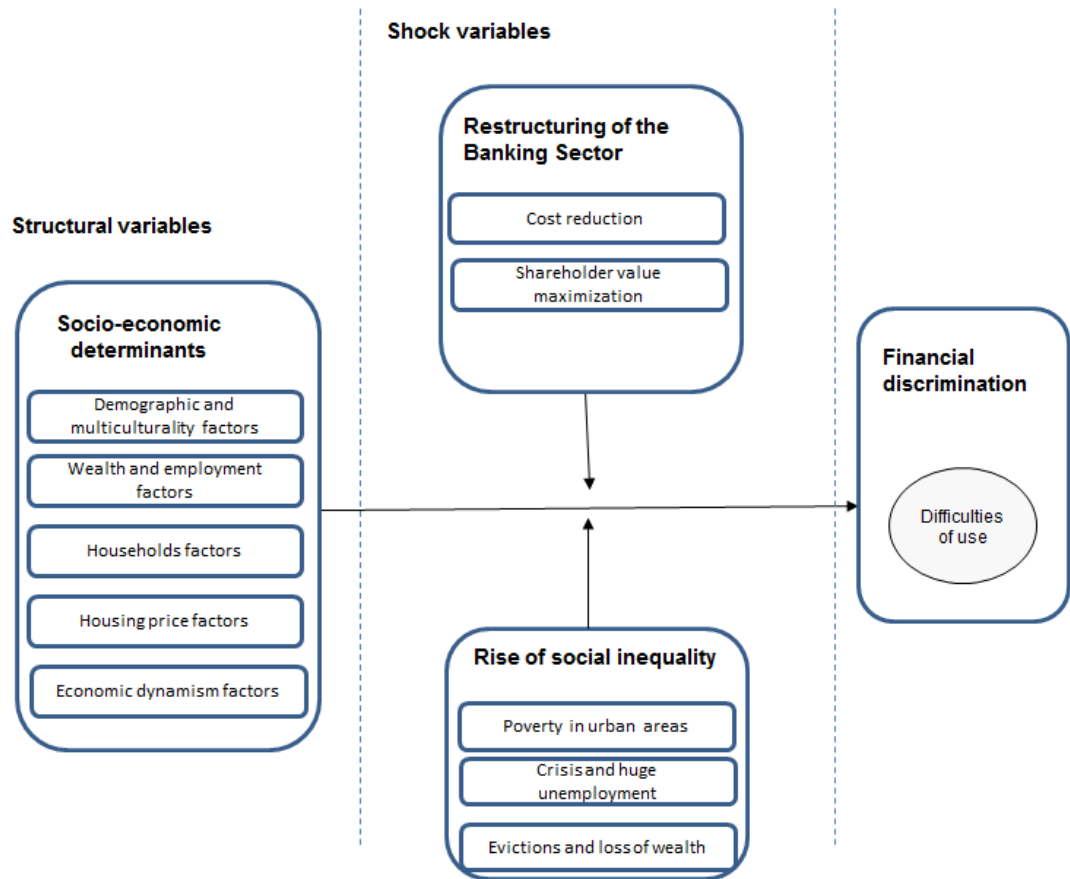
World Bank (2014). *Global Financial Development Report 2014: Financial Inclusion*,
Washington, DC: World Bank. DOI:10.1596/978-0-8213-9985-9.

APPENDIX

Kim and Muller Endogeneity Test

Quantile	Endogeneity Statistic	P-value
0,1	4,9864	0,8355
0,25	6,5225	0,6867
0,5	0,8741	0,9997
0,75	2,2904	0,986
0,9	0,7975	0,9998
Mean model	0,63	0,9999

Fig. 1 Theoretical model.



Source: Own elaboration

Table 1 Relevant Socioeconomic Determinants of FE

STUDY	VARIABLE	DETERMINANTS	METHOD
		Unemployment (proxy of income <i>per capita</i>)	
Alamá et al. (2015)	Number of branches per municipality (Spain)	Population density Foreign population Province and municipality of origin of banking entity Number of branches of other typology of banking entities Urban areas	Poisson regression model within the framework of a GLMM (Generalised linear mixed model)
French et al. (2013)	Rate of branch closure per postal code (UK)	Low income High unemployment Social housing Over-branched areas (vs. under-branched) Low income High unemployment Social housing	Longitudinal and Cross-sectional analysis of branch networks based on Experian's Shop Point and Goad databases
Alamá and Tortosa-Ausina (2012)	Number of branches per municipality (Spain)	General and retail commercial activities Construction activities Tourism Population density	Quantile regression based on the database of Anuario Economico de La Caixa
	Number of branches in	Population	Ordinary Least Squares
Bernad et al. (2008)	generally low-income and high-income municipalities (Spain)	Population density Income	(OLS) based on the model of Lanzillotti and Saving (1969)
Aalbers (2007)	Redlining in terms of credit (Rotterdam)	Low income Ethnic diversity Low housing prices	Spearman correlation, discriminant analysis and 'outlier' analysis by clusters, based on the lending behaviour data of 2 large Dutch banks.
Leyshon and Thrift (1995)	'Balls' of branch closures per municipality (UK)	Urban areas (inner-city) Low economic activity Rural areas	Based on Skuse (1993).

Source: Own elaboration

Table 2. Reduction of the banking network in provinces with the main functional urban areas in Spain

Province	Number of branches			Reduction
	2013	2008	Closed branches	%
MADRID	4,810	6,198	-1,388	-22.39%
BARCELONA	4,293	6,034	-1,741	-28.85%
VALENCIA	2,062	2,730	-668	-24.47%
SEVILLE	1,230	1,588	-358	-22.54%
VIZCAYA	938	1,120	-182	-16.25%
MALAGA	1,085	1,434	-349	-24.34%
ALICANTE	1,396	1,843	-447	-24.25%
PALMAS, LAS	604	791	-187	-23.64%
ZARAGOZA	932	1,260	-328	-26.03%
SPAIN	37,819	48,377	-10,558	-21.82%

Source: Own elaboration, based on data from *Anuario Histórico de la Guía de la Banca Ediban* and OECD (www.oecd.org)

**Data considered at the end of the period (year).*

Table 3. Expected sign of covariates from previous literature

Variable	Effect (a)	Previous references
Population density (POP_DENS)	-	Alamá et al. (2015), Alamá and Tortosa-Ausina (2012), Bernad et al. (2008)
Population over 65 years old (POP-65)	+	Devlin (2005)
Immigration from the 4 main nationalities (IMMIGR)	+	Alamá et al. (2015), Aalbers (2007)
Unemployment rate (UNEMPLOY)	+	Alamá et al. (2015), French et al. (2013), Alamá and Tortosa-Ausina (2012), Devlin (2005)
Gross Disposable Income <i>per capita</i> (GDI)	-	French et al. (2013), Alamá and Tortosa-Ausina (2012), Bernad et al. (2008), Aalbers (2007)
Rate of variation in housing prices (HOUSE-PR)*	-	Aalbers (2007)
Households with internet access (INTERN)	+	(b)
Rate of hotels per inhabitant (TOURDYNAM)	-	Alamá and Tortosa-Ausina (2012), Leyshon and Thrift (1995)

Source: Own elaboration.

(a) It has been considered the expected effect on the variable ‘inhabitants per branch’. When reviewed studies have assessed the existence of branches in an area (see Table 1), we have considered the opposite effect of determinants.

(b) No reviewed studies have included this variable. A replacement effect is assumed between online banking service and branches service.

**A positive variation in housing prices means an increase of prices.*

Table 4 Variables and information sources included in the analysis

Type of variable		Year	Source
Dependent variable <i>BRANCHSA</i>	Inhabitants per branch	2013	Historic Archive of the Banking Guide of Ediban
Independent variables			
<i>Socio-demographic vulnerability:</i>			
<i>LOGPOP-DENS</i>	Population's density	2013	Statistics Institutes of Autonomous Communities of Madrid and Catalonia
<i>POP-65</i>	Percentage of population over 65	2013	National Statistics Institute. Continuous Municipal Register
<i>IMMIG</i>	Percentage of main immigrant nationalities	2013	National Statistics Institute. Continuous Municipal Register
<i>Socio-economic vulnerability:</i>			
<i>UNEMPLOY</i>	Rate of unemployment per 100 inhabitants	2013	Own elaboration with data from General Office of Statistics of Madrid and Barcelona City Councils, and Statistics Institutes of Autonomous Communities of Madrid and Catalonia
<i>LOGGDI</i>	Gross Disposable Income per capita (GDI)	2010	
<i>LOGTOURDYNAM</i>	Hotels per 1000 inhabitants	2013	
<i>Residential vulnerability:</i>			
<i>HOUSE-PRICE</i>	Variation in housing price	2008 y 2013	Historic Database of Idealista Real Estate Agency. www.idealista.com
<i>Technological vulnerability:</i>			
<i>INTERN</i>	Rate of Internet access	2011	National Statistics Institute. Population and Housing Census

Source: Own elaboration.

Table 5. Descriptive Statistics.

Districts and Municipalities (N=94)	Minimum Value	Maximum Value	Median	Quantil 25	Quantil 75	Mean	Stand. Deviation
POP-65 (Rate of population over 65)	0.050	0.245	0.149	0.117	0.183	0.152	0.048
POP-DEN (Inhabitants per sq. km)	129.400	35415.441	3705.440	1118.364	12255.358	7561.874	8764.853
IMMIGR (Rate of main immigrant nationalities)	0.003	0.213	0.040	0.022	0.067	0.049	0.037
UNEMPLOY (Rate of unemployment)	0.036	0.0140	0.0079	0.061	0.097	0.080	0.022
GDI (thousand €)	12.167	36.640	16.721	14.753	21.900	17.700	4.776
TOURDYNAM (Hotels/1.000 inhabitants)	0.000	2.003	0.061	0.014	0.130	0.130	0.276
HOUSE-PRICE (Rate of variation in housing price)	-0.448	-0.154	-0.311	-0.358	-0.257	-0.261	0.066
INTERN	0.544	0.871	0.665	0.628	0.710	0.629	0.079
BRANCHRED (Rate of variation in number of branches)	-0.467	0.000	-0.263	-0.312	-0.179	-0.244	0.106
BRANCHSAT (Inhabitants/Branch)	480.235	2706.200	1440.868	1239.802	1675.835	1477.568	435.791

Sources: own elaboration from databases described in table 4.

Table 6. Determinants of branch saturation (inhabitants per branch)

Quantile 10%				
Covariates	Coef.	St. Error	(95% conf Interval)	
Intercept	2.53**	.93	.66	4.40
POPDENS	-.05	.05	-.15	.04
POP65	-1.00	1.48	-3.97	1.96
IMMIGR	.59	1.44	-2.27	3.46
UNEMPLOYMENT	2.79*	1.51	-.23	5.80
GDI	-.02	.01	-.05	.01
HOUSEPRICE	-.62*	.31	-1.25	.02
INTERNET	.62	.81	-1.00	2.25
TOURISMDYNAMIS	-.15**	.02	-.19	-1.10
R ²	59.57%			
Quantile 25%				
Covariates	Coef.	St. Error	(95% conf Interval)	
Intercept	2.94**	.63	1.66	4.21
POPDENS	-.05	.03	-.12	.02
POP65	-1.23	.89	-3.01	.55
IMMIGR	.64	.56	-.48	1.76
UNEMPLOYMENT	.76	1.57	-2.37	3.89
GDI	-.01	.01	-.04	.02
HOUSEPRICE	-.98**	.32	-1.62	-.33
INTERNET	.16	.59	-1.02	1.34
TOURISMDYNAMIS	-.13**	.02	-.18	-.06
R ²	47%			
Quantile 50%				
Covariates	Coef.	St. Error	(95% conf Interval)	
Intercept	4.35**	.71	2.92	5.78
POPDENS	-.04	.03	-.11	.04
POP65	-2.52**	.96	-4.44	-.59
IMMIGR	.11	.57	-1.04	1.25
UNEMPLOYMENT	-1.88	1.8	-5.47	1.71
GDI	-.01	.01	-.03	.24
HOUSEPRICE	-.73**	.31	-1.35	-.09
INTERNET	-1.13*	.62	-2.37	.11
TOURISMDYNAMIS	-.10**	.03	-.16	-.03
R ²	36.51%			
Quantile 75%				
Covariates	Coef.	St. Error	(95% conf Interval)	
Intercept	4.15**	.54	3.06	5.24
POPDENS	.01	.03	-.05	.07
POP65	-2.40**	.76	-3.92	-.86
IMMIGR	.61*	.35	-.10	1.32
UNEMPLOYMENT	-2.87**	1.44	-5.75	.00
GDI	-.01	.01	-.02	.01
HOUSEPRICE	-.55**	.20	-.96	-.13
INTERNET	-.88*	.48	-1.85	.08
TOURISMDYNAMIS	-.09**	.02	-.13	-.04
R ²	40.1%			
Quantile 90%				
Covariates	Coef.	St. Error	(95% conf Interval)	
Intercept	4.55**	.30	3.94	5.15
POPDENS	.03**	.01	.00	.06
POP65	-2.80**	.39	-3.58	-2.02
IMMIGR	1.56**	.14	1.26	1.85
UNEMPLOYMENT	-4.66**	0.72	-6.09	-3.22
GDI	-.02**	.00	-.03	-.01
HOUSEPRICE	-.32**	.07	-.47	-.16

INTERNET	-1.11*	.24	-1.59	-.62
TOURISMDYNAMIS	-0.07**	.01	-.10	-.04
R²	44,45%			

*Source: Own elaboration. * Significance level 10%, ** Significance level 5%*

